Lexicon of New Formal Geologic Names of the United States 1981–1985

By GWENDOLYN W. LUTTRELL, MARILYN L. HUBERT, *and* CYNTHIA R. MURDOCK

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TABLE

METRIC CONVERSION FACTORS

For readers who wish to convert measurements from the inch-pound system of units to the metric system of units, the conversion factors are listed below:

Multiply	By	To obtain
	Length	
inch (in.)	25.4	millimeter (mm)
foot (ft)	.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
square mile (mi^2)	2.590	square kilometer (km^2)

MAJOR GEOCHRONOLOGIC AND CHRONOSTRATIGRAPHIC UNITS

Subdivisions in use by the U.S. Geological Survey (map symbols)						Age estimates of boundaries in million years[1, 2]	
Eon or Eonothem	Era or Erathem	Period or System		Epoch or Series			
Phanerozoic	Cenozoic (Cz)	Quaternary (Q)		Holocene		0.010	
				Pleistocene		2	(1.7–2.2)
		Tertiary (T)	Neogene subperiod or subsystem (N)	Pliocene		5	(4.9–5.3)
				Miocene		24	(23–26)
			Paleogene subperiod or subsystem (Pe)	Oligocene		38	(34–38)
				Eocene		55	(54–56)
				Paleocene		63	(63–66)
	Mesozoic (Mz)	Cretaceous (K)		Late	Upper	96	(95–97)
				Early	Lower	138	(135–141)
		Jurassic (J)		Late	Upper		
				Middle	Middle		
				Early	Lower	205	(200–215)
		Triassic (T̄R)		Late	Upper		
				Middle	Middle		
				Early	Lower	~240	
	Paleozoic (Pz)	Permian (P)		Late	Upper		
				Early	Lower	290	(290–305)
		Carboniferous Periods or Systems (C)	Pennsylvanian (P)	Late	Upper		
				Middle	Middle		
				Early	Lower	~330	
			Mississippian (M)	Late	Upper		
				Early	Lower	360	(360–365)
		Devonian (D)		Late	Upper		
				Middle	Middle		
				Early	Lower	410	(405–415)
		Silurian (S)		Late	Upper		
				Middle	Middle		
				Early	Lower	435	(435–440)
		Ordovician (O)		Late	Upper		
				Middle	Middle		
				Early	Lower	500	(495–510)
		Cambrian (€)		Late	Upper		
				Middle	Middle		
				Early	Lower	~570[3]	
Proterozoic (P)	Late Proterozoic[4] (Z)					900	
	Middle Proterozoic[4] (Y)					1600	
	Early Proterozoic[4] (X)					2500	
Archea (A)	Late Archean[4] (W)					3000	
	Middle Archean[4] (V)					3400	
	Early Archean[4] (U)						
		(3800?)					
pre-Archean[5] (pA)						4550	

[1] Ranges reflect uncertainties of isotopic and biostratigraphic age assignments. Age of boundaries not closely bracketed by existing data shown by ~. Decay constants and isotopic ratios employed are cited in Steiger and Jäger (1977).

[2] Age estimates for the Phanerozoic are by G.A. Izett, M.A. Lanphere, M.E. MacLachlan, C.W. Naeser, J.D. Obradovich, Z.E. Peterman, M. Rubin, T.W. Stern, and R.E. Zartman at the request of the Geologic Names Committee. Age estimates for the Precambrain are by International Union of Geological Sciences Working Group on the Precambrian for the United States and Mexico, J.E. Harrison, Chairman. The chart is intended for use by members of the U.S. Geological Survey and does not constitute a formal proposal for a geologic time scale. Estimates of ages of boundaries were made after reviewing published time scales and other data. Future modification of this chart will undoubtedly be required. The general references apply where references are not given for specific boundaries.

[3] Rocks older than 570 Ma also called Precambrian (p€), a time term that has no specific rank.

[4] Geochronometric units.

[5] Informal time term that has no specific rank.

LEXICON OF NEW FORMAL GEOLOGIC NAMES OF THE UNITED STATES 1981–1985

By Gwendolyn W. Luttrell, Marilyn L. Hubert, and Cynthia R. Murdock

Abstract

Brief descriptions of new formal geologic names in the United States and Puerto Rico introduced between 1981 and 1985 are compiled from the naming papers. Information given for each name includes geologic age, geographic location, geologic province, type locality, subunits, and a summary of the lithology, genesis, structure, adjoining units, correlations, and thickness.

INTRODUCTION

In 1902, the U.S. Geological Survey published Bulletin 191, *North American Geologic Formation Names*, by F.B. Weeks, for use in assigning names to the formations that were being delineated in the folios of the Geologic Atlas of the United States. Weeks (1902) stressed the importance of recording and publishing the usage of geologic nomenclature in order to preserve the stability of the nomenclature. Following the rules of nomenclature adopted for U.S. Geological Survey publications, he specifically recommended that a formation at the particular locality from which it takes its name should be defined in such a manner that it can be differentiated from other strata with which it occurs; that, in determining the names to be applied to formations, the laws of priority and general usage should be observed; and that there should be no duplication of names, so that ". . . in time all the present discrepancies in the nomenclature of formations would disappear from geologic literature." The present volume is the ninth in the series of lexicons published by the U.S. Geological Survey as a means of

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preserving the stability of the nomenclature and recording the usage of geologic names of the United States. The lexicon series, listed chronologically, is as follows:

Weeks, F.B., 1902, North American geologic formation names: Bibliography, synonymy, and distribution: U.S. Geological Survey Bulletin 191, 433 p.

Wilmarth, M.G., 1938, Lexicon of geologic names of the United States (including Alaska): U.S. Geological Survey Bulletin 896, pt. 1, A–L, p. 1–1244; pt. 2, M–Z, p. 1245–2396.

Wilson, Druid, Sando, W.J., and Kopf, R.W., 1957, Geologic names of North America introduced in 1936–1955: U.S. Geological Survey Bulletin 1056–A, p. 1–405.

Wilson, Druid, Keroher, G.C., and Hansen, B.E., 1959, Index to the geologic names of North America: U.S. Geological Survey Bulletin 1056–B, p. 407–622.

Keroher, G.C., and others, 1966, Lexicon of geologic names of the United States for 1936–1960: U.S. Geological Survey Bulletin 1200, pt. 1, A–F, p. 1–1448; pt. 2, G–O, p. 1449–2886; pt. 3, P–Z, p. 2887–4341.

Keroher, G.C., 1970, Lexicon of geologic names of the United States for 1961–1967: U.S. Geological Survey Bulletin 1350, 848 p.

Luttrell, G.W., Hubert, M.L., Wright, W.B., Jussen, V.M., and Swanson, R.W., 1981, Lexicon of geologic names of the United States for 1968–1975: U.S. Geological Survey Bulletin 1520, 342 p.

Swanson, R.W., Hubert, M.L., Luttrell, G.W., and Jussen, V.M., 1981, Geologic names of the United States through 1975: U.S. Geological Survey Bulletin 1535, 643 p.

Luttrell, G.W., Hubert, M.L., and Jussen, V.M., 1986, Lexicon of new formal geologic names of the United States 1976–1980: U.S. Geological Survey Bulletin 1564, 191 p.

SELECTION OF NAMES FOR THE LEXICON

In 1933 the Committee on Stratigraphic Nomenclature, having representatives from the Association of American State Geologists, U.S. Geological Survey, American Association of Petroleum Geologists, and Geological Society of America, recognized the need for uniform procedures for classifying and naming stratigraphic and related units in the United States and formulated a code of Classification and Nomenclature of Rock Units. An outgrowth of this group, the Commission on Stratigraphic Nomenclature, now called the North American Commission on Stratigraphic Nomenclature, was founded in 1946. The Commission recognizes the desirability of uniform usage of stratigraphic nomenclature throughout North America and issued major revisions of the Code in 1961, 1970, and 1983. Geologic names in this lexicon have been selected following the rules for establishment of a formal geologic name in the North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983) or, for those names published before 1983, the Code of Stratigraphic Nomenclature (American

Commission on Stratigraphic Nomenclature, 1970). Both Codes state that proper establishment of a formal geologic name requires publication, in a recognized scientific medium, of a comprehensive statement that includes intent to designate a formal unit; designation of rank; selection and derivation of name; specification of stratotype (where applicable); description of unit; definition of boundaries; historical background; dimensions, shape, and other regional aspects; geologic age; correlations; and genesis (where applicable). Abstracts, theses, microfilms, open-file releases, and guidebooks that have distribution limited to participants of a field excursion do not constitute publication within the meaning established by the Code. We have attempted to include in this lexicon only names that meet these criteria, although a few exceptions have been made in dubious cases where formal proposals seem to have been intended or where informal names have become established in the literature through continued use. These exceptions are noted in the text.

LEXICON EXPLANATION

The following information is given for each name:

- Unit name and affiliated units of higher rank. Bold print indicates usage accepted by the U.S. Geological Survey (USGS).
- Geologic age assigned in naming paper.
- State(s) in which the unit is described. State having the type locality is listed first.
- Geologic province of type area as established by the American Association of Petroleum Geologists Committee on Statistics of Drilling (Meyer, 1970).
- Reference to naming paper.
- Type or reference section, locality, or area and derivation of name if not implicit in the type description.
- Formally named subunits in ascending order.
- Summary of the naming paper including definition and historical background; geographic distribution; formal and informal subdivisions listed in ascending order; description of the unit including lithology, color, distinctive textures, and other features; genesis; structure; boundaries, adjoining units, and correlations; thickness; and basis for age determination. In summary description, the designation "(new name)" indicates that the name is described herein.
- Reference to revision paper (where applicable).
- Summary of the revision paper.

Units of measurements are those used in the naming papers; therefore, use of the inch-pound and metric systems of units differs from summary to summary.

Able Member of the **Lehigh Acres Formation** of the **Glades Group**

Early Cretaceous (Comanchean)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies Transactions, v. 31, (supplement), October, p. 447–453.

Type section: Humble Number 1 Lehigh Acres well P–407, depth interval 12,250–12,460 ft, sec. 14, T. 45 S., R. 27 E., Lee County, Fla. Named for the nearby Able Canal.

The Able Member, here named, is the upper member of the Lehigh Acres Formation (new name) of the Glades Group in the subsurface of the South Florida basin, where it is the uppermost of four regionally persistent anhydrite units that have been identified below the Punta Gorda Anhydrite of the Glades Group. Consists of white to gray anhydrite interbedded with brown micritic, pure limestone, and gray argillaceous limestone containing occasional dolomite beds. Overlies the Twelve Mile Member (new name) of the Lehigh Acres; underlies the Punta Gorda Anhydrite. Thickness is 210 ft in the type well. Age is Early Cretaceous (earliest Comanchean).

Accomack Member of the **Omar Formation**

Pleistocene
Virginia, Maryland
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Facies A–E, borehole H–20, northwest of Wattsville, northern Accomack County, Va. Reference sections: facies E and F, sand pits near Wattsville, Persimmon Point, and Accomack, Accomack County, Va.

The informal Accomack beds of Mixon and others (1982), which underlie the upland in the area north and west of the Ames Ridge shoreline in Accomack County, Va., and are well developed from Wallops Station, Va., to Shelltown, Md., are here named the Accomack Member of the Omar Formation. Consists of a dominantly transgressive sequence of sand, gravel, silt, clay, and peat divided into seven principal interfingering and overlapping sedimentary facies, A through G, representing marginal marine depositional environments. Unconformably overlies the Tunnels Mill Member (new name) of the Yorktown

Formation; disconformably underlies the Occohannock Member (new name) of the Nassawadox Formation (new name); or is truncated by and disconformably underlies the Joynes Neck Sand (new name) or the Kent Island Formation. Thickness ranges from 58 ft at the type section to 80 ft. Age is middle or late Pleistocene based on paleomagnetic data, uranium-thorium ages, and fossils.

Accotink Schist of the **Annandale Group**

Late Proterozoic or Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Lyttle, P.T., 1981, The Accotink Schist, Lake Barcroft Metasandstone, and Popes Head Formation—Keys to an understanding of the tectonic evolution of the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1205, 16 p.

Type locality: Outcrops along Accotink Creek west of the Capital Beltway, Interstate Highway I–495, just north of the Little River Turnpike exchange, Annandale quadrangle, Fairfax County, Va.

The Accotink Schist, here named, is the lower unit of the informal Eastern Fairfax sequence, defined as the structurally lowest metamorphic rocks in northern Virginia. Consists of beds of deformed pelitic quartz-muscovite-biotite-chlorite-plagioclase schist containing thin basal intervals of fine-grained metasiltstone, interbeds of metasandstone, and turbidite sequences. Gradationally underlies the Lake Barcroft Metasandstone (new name), the upper unit of the Eastern Fairfax sequence. Exotic blocks of Accotink Schist are contained in the Sykesville Formation, which is believed to have been emplaced by subaqueous sliding on top of the Lake Barcroft. Intruded by Early Cambrian Occoquan Granite. Thickness is unknown because the base is not exposed.

Drake, A.A., Jr., 1985, Tectonic implications of the Indian Run Formation—A newly recognized sedimentary melange in the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1324, 12 p.

The Accotink Schist is the lower unit of the Annandale Group (new name), formerly the informal Eastern Fairfax sequence of Drake and Lyttle (1981). The Accotink and the upper unit of the Annandale Group, the Lake Barcroft Metasandstone (new name), lie between two melanges, the newly recognized underlying Indian Run Formation (new name) and the overlying Sykesville Formation. Fragments of Accotink and Lake Barcroft are restricted to an area of melange originally defined as Sykesville, but now considered to be a separate unit, the Indian Run. Age is Late Proterozoic or Cambrian.

Alamos Canyon Siltstone Member of the Peace Valley Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Along the western side of Pyramid Lake from north of the tuff horizon to the Piru Creek arm of Pyramid Lake and across the lake and along the west side of Canada de los Alamos, Los Angeles County, Calif.

The Alamos Canyon Siltstone Member, here named, is the uppermost member of the redefined Peace Valley Formation of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif., where the Peace Valley is separated into five members by clastic tongues of the Ridge Route Formation of the Ridge Basin Group. Consists of gray-green shale, mudstone, and siltstone containing a few brown sandstone layers and vertebrate fossils. Extends laterally for 6,100 m; interfingers laterally with the Violin Breccia to the southwest and the Apple Canyon Sandstone Member (new name) of the Ridge Route Formation to the northeast. Conformably overlies the Posey Canyon Shale Member (new name) of the Peace Valley, from which it is separated by a distinctive tuff horizon; conformably underlies the Apple Canyon Sandstone Member. Thickness is 1,500 m at the type section. Age is late Miocene based on vertebrate (Kinsey Ranch fauna) and plant fossils from underlying units.

Albion Creek Chert Member of the Tenmile Creek Formation of the Stanley Group

Late Mississippian
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type area: Along the upper branches of Albion Creek, north of Albion, southeastern Potato Hills, Pushmataha County, Okla.

The Albion Creek Chert Member, here named, is in the lower part of the Tenmile Creek Formation of the Stanley Group in the Ouachita

Mountains in Pushmataha County, southeastern Oklahoma. Replaces the preempted name Albion Shale or Formation of former usage. Consists of alternating beds of gray sandstone and gray siliceous shale and chert. In the Stanley Group type section, T. 2 N., R. 20 E., it lies about 1,700 ft above the Friendship Chert Member (new name) of the Tenmile Creek and about 2,000 ft above the Arkansas Novaculite. Thickness ranges from 45 to 185 ft. Age is Late Mississippian.

Alexandria Bay Gneiss of the Piseco Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type area: Exposures within 1 km of Alexandria Bay, St. Lawrence River, Jefferson County, N.Y.

The Alexandria Bay Gneiss, here named, is in the Piseco Group (new name) in the Adirondack Mountains in New York. Consists of fine-grained pink and gray leucogranitic gneiss. Overlies the Pharaoh Mountain Gneiss (new name) of the Piseco in the Northwest Lowlands; unconformably underlies the Baldface Hill Gneiss (new name) of the Oswegatchie Group. Equivalent to the Brant Lake Gneiss in the central and eastern Adirondacks. Thickness is 1,200 m. Age is Proterozoic.

Alkali Canyon Formation of the Dalles Group

Miocene and Pliocene(?)
Oregon
Eastern Columbia basin

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C., Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, v. 43, no. 10, p. 131–140.

Reference section: Chem-Security Systems access road, SE¼ sec. 25, T. 2 N., R. 20 E., Gilliam County, Oreg. Named for Alkali Canyon, 16 km southwest of Arlington, T. 2 N., R. 20–21 E.

Vitric tuff, silty clay, silt, and basalt gravel alluvial fan and braided stream deposits in the Arlington basin are here named the Alkali Canyon Formation of the Dalles Group. Conformably and unconformably overlies units of the Columbia River Group and the Ellensburg Formation; underlies Quaternary loess. Age is late Miocene and early Pliocene(?) based on vertebrate fossils.

Allens Grove Member of the Walworth Formation

Pleistocene (Wisconsinan)
Wisconsin, Illinois
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84-1, p. 1-15.

Type section: Base of west wall of borrow pit, 0.8 km east of Allens Grove, 4 km west of Capron Ridge and north of old Highway 15, NW¼SE¼SW¼ sec. 32, T. 2 N., R. 15 E., Sharon and Clinton 7.5-minute quadrangles, Walworth County, Wis.

The Allens Grove Member of the Walworth Formation (new name), here named following the informal usage of Fricke (1976), is in south-central Wisconsin and northern Illinois. Consists of light-brown to yellowish-brown sandy, pebbly till and associated deposits. Sharply overlies the Foxhollow Member (new name) and sharply to gradationally underlies the Clinton Member (new name), both of the Walworth Formation. Equivalent to the Argyle Till Member of the Winnebago Formation in Illinois. Thickness attains 3.9 m. Age is late Pleistocene (early Wisconsinan or older).

Amboy Drift

Pleistocene (Wisconsinan)
Washington
Western Columbia basin

Mundorff, M.J., 1984, Glaciation in the lower Lewis River basin, southwestern Cascade Range, Washington: Northwest Science, v. 58, no. 4, p. 269-281.

Type area: Exposures in the vicinity of the town of Amboy, Clark County, Wash.

Glacial drift, including till, lacustrine and fluvial outwash deposits, ice-contact deposits, and boulder deposits in the Lewis River valley, East Fork Lewis River valley and on interfluves between the two rivers, in Clark County, Wash., are here named the Amboy Drift. Blue or gray till, weathering brown, forms a discontinuous blanket as much as 30 m thick over most of the area. Overlies the Troutdale Formation. Correlates with the Hayden Creek Drift. Age is late Pleistocene (early Wisconsinan) based on the ^{14}carbon date of wood of greater than 60 ka.

Andy Mountain Formation of the Sandy Springs Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: Andy Mountain, 1.5 mi west of Winston, Winston 7.5-minute quadrangle, Douglas County, Ga.

The Andy Mountain Formation of the informal Roosterville group, here named, is in the Austell-Frolona antiform, west-central Georgia. Consists of garnet-muscovite-quartz schist and quartzite containing local horizons of gneiss. Stratigraphically overlies but structurally underlies the New Georgia Group (new name); stratigraphically underlies the Bill Arp Formation (new name), but folding has placed it structurally over the Bill Arp and the intrusive Austell Gneiss. Age is Proterozoic.

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

The Andy Mountain Formation is here assigned to the Sandy Springs Group (western belt). Conformably overlies the Dog River Formation (new name); stratigraphically underlies the Bill Arp Formation (new name), both of the Sandy Springs Group. Age is Late Proterozoic and (or) early Paleozoic.

Annandale Group

Late Proterozoic or Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., 1985, Tectonic implications of the Indian Run Formation—A newly recognized sedimentary melange in the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1324, 12 p.

Type locality: Exposures along Accotink Creek, Holmes Run, and Tripps Run, Annandale 7.5-minute quadrangle, Fairfax County, Va. Named for the city of Annandale, Fairfax County.
Subunits: **Accotink Schist, Lake Barcroft Metasandstone.**

The Annandale Group, an allochthon in Fairfax County, Va., was originally termed the Eastern Fairfax sequence by Drake and Lyttle (1981). Contains the lower Accotink Schist (new name) and the overlying Lake Barcroft Metasandstone (new name). Thought to be a coarsening-upward sequence of an outer submarine fan association. Overlies the Indian Run Formation (new name), with which it forms a melange-allochthon motif, on the Red Fox thrust fault; underlies the Sykesville Formation melange on the Burke thrust fault. Intruded by the Cambrian Occoquan Granite. Age is probably Late Proterozoic although it must be considered Late Proterozoic or Cambrian.

Antelope Range Formation

Early Mississippian (Osagean or later)
Nevada
Great Basin province

Hose, R.K., Armstrong, A.K., Harris, A.G., and Mamet, B.L., 1982, Devonian and Mississippian rocks of the northern Antelope Range, Eureka County, Nevada: U.S. Geological Survey Professional Paper 1182, 19 p.

Type section: Outcrops in sec. 22, T. 16 N., R. 51 E., northern Antelope Range, Eureka County, Nev.

The Antelope Range Formation, here named, is in the northern Antelope Range, Nev., and is also recognized in the southern Fish Creek Range, 10 km to the east, where there is a similar sandstone-shale sequence overlying a profound basal unconformity. Deposition was in a deltaic or estuarine environment. Consists of a 30-m-thick basal sequence of dark-yellowish-orange- to light-brown-weathering fine- to coarse-grained sandstone containing quartz, feldspar, and chert, overlain by olive-gray silty shale or thin-bedded, platy siltstone. Sharply and unconformably overlies the Kinkead Spring Limestone (new name) or the Davis Spring Formation (new name) in the Antelope Range and the Devils Gate Limestone in the Fish Creek Range. Upper part is faulted or removed by erosion. Thickness is unknown. Age is Early Mississippian (Osagean or later) based on its stratigraphic position above the Osagean Kinkead Spring Limestone.

Apple Canyon Sandstone Member of the Ridge Route Formation of the Ridge Basin Group

Miocene (Hemphillian)
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Exposure on the northeast side of Interstate Highway I–5, beginning at its intersection with Hungry Valley Road, about 8 km south of Gorman, Los Angeles County, Calif.

The Apple Canyon Sandstone Member, here named, is in the Ridge Route Formation of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif. Is the uppermost of five major clastic tongues in the Ridge Route and consists of light-brown medium-grained, arkosic sandstone interbedded with mudstone and conglomerate and minor amounts of limestone; contains freshwater mollusk, ostracode, stromatolite, plant, and vertebrate fossils. Lateral extent is 8,000 m; interfingers with the Ridge Route (undivided) and the Posey Canyon Shale Member (new name) and the Alamos Canyon Siltstone Member (new name), both of the redefined Peace Valley Formation, to the northeast, and the Violin Breccia to the southwest. Conformably overlies the Alamos Canyon; conformably underlies the Hungry Valley Formation of the Ridge Basin Group. Thickness is 1,000 m at the type section and attains 1,130 m. Age is late Miocene (Hemphillian) based on vertebrate fossils (Kinsey Ranch fauna).

Arapahoe Sand Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type locality: Outcrops in bluffs of the Neuse River near Smith Gut, west of the mouth of Beard Creek, and near Pine Cliff Recreation Area, Cherry Point 7.5-minute quadrangle, Pamlico County, N.C. Probably named for the nearby town of Arapahoe.

Barrier sand deposits exposed near Smith Gut and at the Pine Cliff Recreation area in the Neuse River valley, Pamlico County, N.C., are here named the Arapahoe Sand Member of the Flanner Beach Formation, following the informal usage of Mixon and Pilkey (1976). Consists of crossbedded, fine to coarse sand, sandy mud, and pebbly sand containing clay laminations and cylindrical burrows. Gradationally overlies the Smith Gut Member (new name) of the Flanner Beach; intertongues to the east with the Beard Creek Member (new name) of the Flanner Beach; is truncated to the east by the Suffolk (Grantsboro) Scarp. Thickness attains 7.5 m. Age is middle Pleistocene.

Archer Mountain Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Sinha, A.K., and Bartholomew, M.J., 1984, Evolution of the Grenville terrane in the central Virginia Appalachians: Geological Society of America Special Paper 194, p. 175–186.

Type locality: Along U.S. Highway 29, 100 m south from its junction with Virginia Highway 6 North where it crosses Rockfish River at Woods Mill, Lovingston 7.5-minute quadrangle, lat 37°51′ N., long 78°49′30″ W., Nelson County, Va. Derivation of name not stated.

The Archer Mountain Suite, informally called the Archer Mountain pluton by Bartholomew and others (1981), here named, is in the Lovingston massif of the central Virginia Blue Ridge. Consists of biotite-quartz monzonite intruded by small massive charnockite plutons and coarse pegmatites. Age is Middle Proterozoic based on a uranium-lead age of 1,060 Ma.

Argo-Fay Bed of the Scales Formation of the Maquoketa Group

Late Ordovician
Illinois
Wisconsin arch

Kolata, D.R., and Graese, A.M., 1983, Lithostratigraphy and depositional environments of the Maquoketa Group (Ordovician) in northern Illinois: Illinois Geological Survey Circular 528, 49 p.

Type section: Mt. Carroll Southwest Section: Quarry on the north side of U.S. Highway 52, 2.5 mi southwest of Mt. Carroll and 5 mi north of Argo-Fay, SW¼NE¼SW¼ sec. 10, T. 24 N., R. 4 E., Savanna 15-minute quadrangle, Carroll County, Ill.

The Argo-Fay Bed, here named, is in the lower part of the Scales Formation of the Maquoketa Group in Carroll County, northwestern Illinois. Consists of hard, brownish-black to black carbonaceous, fissile clay shale. Fragments of graptolites and chitinozoans stand out on weathered bedding planes. Lies 4 ft above the unconformable contact of the Scales with the Dubuque Formation. Equivalent to beds in the brown shaly unit of Brown (1974) in Clayton County, Iowa, and in Grant County, Wis. Thickness is 1 ft. Age is Late Ordovician.

Armstrong Hill Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut on Kentucky Highway 2 north of Armstrong Hill, just north of its intersection with Interstate Highway I–64, Olive Hill 7.5-minute quadrangle, Carter County, Ky.

The Armstrong Hill Member, used informally by Ettensohn (1977) and here named and assigned to the Slade Formation (new name), was previously assigned to the Newman Limestone, here restricted from the Cumberland Escarpment area of east-central and northeastern Kentucky. Consists predominantly of calcilutite containing thin shale partings. Conformably overlies the Cave Branch Bed of the Slade; disconformably underlies the Holly Fork Member (new name) or Tygarts Creek Member (new name), both of the Slade, although local intertonguing may occur with these units. Maximum thickness is 5 m. Age is Late Mississippian.

Arnett Member of the **Sleeping Buffalo Rhyolite**

Miocene
Arizona
Basin and Range province

Creasey, S.C., Peterson, D.W., and Gambell, N.A., 1983, Geologic map of the Teapot Mountain quadrangle, Pinal County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ–1559, scale 1:24,000.

Type locality: Exposures in Arnett Creek, NW¼ sec. 22, T. 2 S., R. 12 E., Teapot Mountain 7.5-minute quadrangle, Pinal County, Ariz.

The Arnett Member of the Sleeping Buffalo Rhyolite (new name), here named, is in the Teapot Mountain quadrangle, Pinal County, Ariz. Consists of light-gray to buff flow-banded, vitrophyric and glomeroporphyritic rhyolite, locally comprising alternating zones of agglomeritic, pumiceous, and dense aphanitic rhyolite. Contains phenocrysts of plagioclase and quartz in a glassy or devitrified groundmass. Conformably overlies older Tertiary tuff; unconformably underlies the Road Runner Rhyolite (new name). Age is Miocene based on potassium-argon ages of 18 to 15.9 Ma of rhyolite in the Mineral Mountain quadrangle to the west.

Aspen Range Formation

Mississippian (Osagean to Chesterian)
Idaho
Wasatch uplift

Sando, W.J., Sandberg, C.A., and Gutschick, R.C., 1981, Stratigraphic and economic significance of Mississippian sequence at North Georgetown Canyon, Idaho: American Association of Petroleum Geologists Bulletin, v. 65, no. 8, p. 1433–1443.

Type section: Outcrops at North Georgetown Canyon on a spur extending across the S½NE¼ sec. 16, T. 10 S., R. 44 E., Harrington Peak 7.5-minute quadrangle, Bear Lake County, Idaho.

Rocks previously mapped as Brazer Limestone by Cressman (1964) and Deseret [Limestone] equivalent by Sando and Sandberg (1979) are here named the Aspen Range Formation and are recognized as part of a facies belt of Mississippian rocks in the Overthrust belt of Idaho. Exposed on the west side of Aspen Range at North Georgetown Canyon and on the east side at Wells Canyon. North Georgetown Canyon section contains a lower phosphatic member, 20 m thick, that has a basal phosphorite bed, 5 to 8 cm thick; a thin-bedded limestone member, 91 m thick; a sandy crinoidal limestone member, 195 m thick; a birdseye limestone member, 132 m thick; a chertified siltstone member, 28 m thick; and a thick-bedded limestone member, 65 m thick. The phosphatic member is equivalent to phosphatic members in the Deep Creek, Little Flat, and Brazer Formations. Conformably overlies the Mission Canyon Limestone of the Madison Group; disconformably underlies the Wells Formation. Thickness is 531 m at the type section. Age is Mississippian (middle Osagean to middle Chesterian) based on foraminifers, conodonts, and corals.

Atlanta Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type area: Area around Atlanta, Fulton County, Ga.
Subunits: **Inman Yard Formation, Wolf Creek Formation, Promised Land Formation** and its **Hannah Member, Norcross Gneiss, Clairmont Formation, Senoia Formation, Wahoo Creek Formation, Stonewall Formation, Clarkston Formation** and its **Fairburn** and **Tar Creek Members, Big Cotton Indian Formation, Intrenchment Creek Quartzite, Camp Creek Formation.**

The Atlanta Group, here named, is a eugeosynclinal sequence of flysch-like rocks that crop out in the 90-km-long by 40-km-wide Newnan-Tucker synform in northern Georgia. Subdivided into 12 formations and 3 members (all new names), listed above in ascending order. Thickness ranges from 6,000 to 18,000 m. Contact with the discordantly overlying Lithonia Gneiss and Snellville Formation (new name) is a thrust fault or an unconformity. Younger than the Snellville Formation (1,100 Ma) and intruded by the Stone Mountain and Panola Granites (325 Ma). Age is Late Proterozoic and (or) early Paleozoic.

Badger Gulch Formation

Early Permian (Leonardian)
Idaho
Great Basin province

Mytton, J.W., Morgan, W.A., and Wardlaw, B.R., 1983, Stratigraphic relations of Permian units, Cassia Mountains, Idaho, *in* Miller, D.M., Todd, V.R., and Howard, K.A., eds., Tectonic and stratigraphic studies in the eastern Great Basin: Geological Society of America Memoir 157, p. 281–303.

Type section: Composite of, in the lower part, exposures on a ridge southwest of the confluence of A.H. Creek and Third Fork, S½ sec. 17, T. 14 S., R. 19 E., Pike Mountain 7.5-minute quadrangle, Cassia County, Idaho, and, in the upper part, exposures on a northwest-facing ridge on the south side of Badger Gulch, NW¼ sec. 20, T. 15 S., R. 20 E., Mahogany Butte 7.5-minute quadrangle, Cassia County, Idaho.

The Badger Gulch sequence of Morgan (1980) in the Cassia Mountains, southern Idaho, is here named the Badger Gulch Formation. Consists of brownish-gray to black, very fine grained, thin-bedded lime mudstone containing silt-sized skeletal fragments replaced by calcite, quartz silt, and argillaceous material. Outcrops form castellated cliffs that have jagged spires. Beds have sharp contacts and evenly spaced laminae and are marine basin deposits. May be part of the depositional sequence of the northern Oquirrh basin. Conformably and gradationally overlies the Third Fork Formation (new name); conformably and gradationally underlies the Trapper Creek Formation (new name). Thickness at the composite section is 313.7 m. Age is Early Permian (early Leonardian) based on conodonts in the Trapper Creek. The Wolfcampian-Leonardian boundary lies within the poorly fossiliferous Third Fork-Badger Gulch sequence and, for convenience, is drawn at the Third Fork-Badger Gulch contact.

Baker Hill Formation of the **Wilcox Group**

Paleocene
Alabama, Georgia
Mid-Gulf Coast basin

Gibson, T.G., 1982, New stratigraphic unit in the Wilcox Group (upper Paleocene-lower Eocene) in Alabama and Georgia: U.S. Geological Survey Bulletin 1529–H, p. H23–H32.

Type locality: Exposure on south wall of Lynn Griffin no. 1 mine, west side of County Highway 29, 5.2 mi southwest of Baker Hill, NE¼ sec. 4, T. 8 N., R. 27 E., Lawrenceville 7.5-minute quadrangle, Henry County, Ala.

Rocks previously included in the time-equivalent Nanafalia Formation are here named the Baker Hill Formation of the Wilcox Group in southeastern Alabama and southwestern Georgia. Consists of kaolinitic and bauxitic massively bedded clay, carbonaceous clay, and crossbedded micaceous quartz sand deposited in a fluvial to estuarine environment. Overlies the Clayton or Porters Creek Formations of the Midway Group; unconformably underlies the Tuscahoma Formation of the Wilcox Group. Thickness is 55 ft at the type locality and ranges from 50 to 150 ft. Age is late Paleocene based on dinoflagellates and its equivalency to the Nanafalia Formation.

Bakerville Member of the Lincoln Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Gravel pit, east side of Robin Road, 200 m south of its intersection with Highway B, 1.7 km west of Bakerville, SE¼NW¼NW¼ sec. 26, T. 25 N., R. 2 E., Marshfield 15-minute quadrangle, Wood County, Wis. Named for Bakerville.

The lower member of the Lincoln Formation (new name) in the Chippewa sublobe in central Wisconsin is here named the Bakerville Member, following the informal usage of Mode (1976). Consists of reddish-brown cobbly, pebbly, sandy loam; in some places is texturally indistinguishable from the till of the adjacent Merrill Member (new name), which is given a different name because continuity between the units has not been established. Sharply overlies Precambrian or Cambrian bedrock or the Edgar Member (new name) of the Marathon Formation (new name); is the surface unit in the Marshfield moraine. Maximum thickness is 10 m. Age is Pleistocene (early Wisconsinan) based on the age of organic material overlying the Merrill Member.

Baldface Hill Gneiss of the Oswegatchie Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Exposures along the rocky face of Baldface Hill, 3 to 5 km north of Harrisville, Harrisville 7.5-minute quadrangle, Lewis County, N.Y.

The Baldface Hill Gneiss of the Oswegatchie Group, here named, is at Baldface Hill in the Northwest Lowlands of the Adirondack Mountains, N.Y. Consists of layered, rusty-brown-weathering biotite-garnet-sillimanite gneiss. Although outcrops are discontinuous, the unit may be continuous but not well exposed. Unconformably overlies the Alexandria Bay Gneiss (new name) of the Piseco Group (new name); underlies the Poplar Hill Gneiss (new name) and Gouverneur Marble of the Oswegatchie Group in the Northwest Lowlands. Correlates with the Eagle Lake Gneiss of the Lake George Group (both new names) in the eastern Adirondacks. Thickness ranges from 30 to 300 m. Age is Proterozoic.

Ball Mountain Formation of the Lynchburg Group

Late Proterozoic
Virginia
Piedmont-Blue Ridge province

Wehr, Frederick, 1985, Stratigraphy of the Lynchburg Group and Swift Run Formation, Late Proterozoic (730–570 Ma), central Virginia: Southeastern Geology, v. 25, no. 4, p. 225–239.

Type locality: Exposures on Ball Mountain south of the Rockfish River, Schuyler 7.5-minute quadrangle, Nelson County, Va.
Subunit: Johnson Mill Member.

The Ball Mountain Formation of the Lynchburg Group, here named, is in the Culpeper and Rockfish River areas in Virginia. Consists of coarse-grained to pebbly quartz wacke and quartzite interbedded with laminated siltstone and graphitic mudstone. The upper 100 m consists of graphitic schist named the Johnson Mill Member, the revised Johnson Mill Formation of Nelson (1962). Truncates underlying units and either unconformably overlies or is in fault contact with the Thorofare Mountain Formation (new name) of the Lynchburg. Is in fault(?) contact with the overlying Charlottesville Formation. Is equivalent to the upper part of the Rockfish Conglomerate. Age is Late Proterozoic based on an age of 730 to 570 Ma for the Lynchburg Group.

Bandera Mesa Member of the **Devil's Graveyard Formation** of the **Buck Hill Group**

Oligocene
Texas
Permian basin

Stevens, J.B., Stevens, M.S., and Wilson, J.A., 1984, Devil's Graveyard Formation (new), Eocene and Oligocene age, Trans-Pecos Texas: Texas Memorial Museum Bulletin 32, p. 1–21.

Type area: Area along the front of Bandera Mesa from Puerto Potrillo to Red Hill, and east across Green Valley to McKinney Mountain, Jordan Gap quadrangle, Presidio County, Tex. Boundary stratotypes are designated.

The Bandera Mesa Member, here named, is in the upper part of the Devil's Graveyard Formation (new name) of the Buck Hill Group. Consists of pink, red, and brown fluvial and lacustrine tuffaceous mudstone, conglomerate, clay, and limestone, thin basalt flows, and sandstone- and conglomerate-filled channels informally named the Skyline and Cotter channels. Overlies the middle member of the Devil's Graveyard and is separated from it by the Skyline channels. The Cotter channels occur higher in the section. Underlies the Mitchell Mesa Rhyolite or the informal Yellow conglomerate. Thickness is about 1,000 ft. Age is Oligocene based on vertebrate fauna.

Banzet Formation of the Cherokee Group

Middle Pennsylvanian (Desmoinesian)
Kansas, Oklahoma
Cherokee basin, Chautauqua platform

Denesen, S.L., 1985, Depositional environments of the Banzet Formation (Middle Pennsylvanian) in southeastern Kansas and northeastern Oklahoma: Shale Shaker, v. 36, no. 2, p. 164–169.

Type area: 11,000 mi^2 between T. 26 S. in Kansas and T. 22 N. in Oklahoma and between R. 2 E. and R. 23 E. Derivation of name not stated.
Subunits: Bevier Member and Bevier coal bed; Lagonda Member and Iron Post coal bed; Mulky Member and Kinnison Shale Bed, Breezy Hill Limestone Bed, and Mulky coal bed.

The interval of shales, siltstones, thin limestones, thin coals, and lenticular, discontinuous sandstones found in repetitive sequences between the top of the Ardmore Limestone and the base of the Excello Shale in southeastern Kansas and northeastern Oklahoma is here named the Banzet Formation of the Cherokee Group. Includes the Bevier, Lagonda, and Mulky Members, here reduced from formation rank, and the Bevier coal bed in the Bevier Member, the Iron Post coal bed in the Lagonda Member, and the Kinnison Shale Bed, Breezy Hill Limestone Bed, and Mulky coal bed in the Mulky Member. The Kinnison and Breezy Hill are reduced from members of the Mulky Formation. Age is Middle Pennsylvanian (Desmoinesian).

Barlow Gneiss Member of the Pumpkinvine Creek Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

German, J.M., 1985, The geology of the northeastern portion of the Dahlonega gold belt: Georgia Geologic Survey Bulletin 100, p. 1–41.

Type locality: Exposures in a large hydraulic cut near the inactive Barlow gold mine near Dahlonega, Dawsonville and Campbell Mountain 7.5-minute quadrangles, Lumpkin County, north-central Georgia.

The Barlow Gneiss Member of the Pumpkinvine Creek Formation, here named, is in the Dahlonega, Ga., area. Consists of gray, pin-striped-appearing muscovite-biotite-plagioclase-quartz gneiss locally interlayered with amphibolites. Lithologically similar to and may be correlative with the Galts Ferry Gneiss Member (new name) of McConnell and Abrams (1984) of the Pumpkinvine Creek. Is a well-exposed marker horizon and is sharply bounded by undifferentiated amphibolite of the Pumpkinvine Creek. Age is Late Proterozoic and (or) early Paleozoic.

Bat Mountain Formation

Miocene
California
Great Basin province

Cemen, Ibrahim, Drake, Robert, and Wright, L.A., 1982, Stratigraphy and chronology of the Tertiary sedimentary and volcanic units at the southeastern end of the Funeral Mountains, Death Valley region, California, *in* Cooper, J.D., Troxel, B.W., and Wright, L.A., eds., Geology of selected areas in the San Bernardino Mountains, western Mohave Desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, volume and guidebook no. 9, p. 77–88.

Type locality: Exposures along the crest and southeastern flank of Bat Mountain, southeastern Funeral Mountains, Ash Meadows 15-minute quadrangle, Inyo County, Calif.

The Bat Mountain Formation, here named, is in the southeastern end of the Funeral Mountains in the Death Valley region of Inyo County, Calif. Denny and Drewes (1965) divided the formation into an informal lower unit, which they called the upper fanglomerate, and an informal upper unit, which they called the upper conglomerate. Their upper fanglomerate is here referred to as the conglomerate member and their upper conglomerate as the sandstone member. The conglomerate member consists of poorly sorted, angular clasts of Proterozoic and Paleozoic carbonate and siliceous rocks in a sand to clay matrix, which is gray in the lower part and red in the upper part of the member. The sandstone member consists of reddish-brown to brown fining-upward cycles, conglomeratic at the base and silty at the top, and represents stream deposits marginal to the alluvial fan deposits of the conglomerate member. The sandstone member grades laterally and vertically down into the conglomerate member. The Bat Mountain unconformably overlies algal limestone and is exposed at the surface. Thickness of the conglomerate member ranges from 200 to 1,000 ft. Age is middle(?) Miocene based on the ages of tuffs in the Artist Drive Formation.

Bay View Coral Bed of the Windom Shale Member of the Moscow Formation of the Hamilton Group

Middle Devonian
New York
Appalachian basin

Baird, G.C., and Brett, C.E., 1983, Regional variation and paleontology of two coral beds in the Middle Devonian Hamilton Group of western New York: Journal of Paleontology, v. 57, no. 3, p. 417–446.

Type section: Abandoned Penn-Dixie Cement Company quarry, 0.2 mi northeast of the junction of Big Tree and Bay View Roads, near Bay View, Buffalo SE 7.5-minute quadrangle, Erie County, N.Y.

The coral-rich bed in the lower middle part of the Windom Shale Member of the Moscow Formation of the Hamilton Group is here named the Bay View Coral Bed. This important marker bed extends for 150 km from Lake Erie east to Onondaga County, N.Y. The western facies, 15 to 30 cm thick, consists of coral and other fossils in soft, blocky, gray mudstone. The eastern facies, 1 to 2 m thick, is gray, fissile to blocky, calcareous mudstone containing shell beds and nonseptarian concretions. Overlies the *Ambocoelia umbonata* zone of Brett (1974); underlies the coral-trilobite bed of Brett (1974), here named the Smoke Creek Bed (new name) of the Windom. Age is Middle Devonian.

Beard Creek Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type locality: Bluffs on the north shore of the Neuse River, 0.6 km northwest of Beard Creek and 0.3 km upstream from Whisk Point, Upper Broad Creek 7.5-minute quadrangle, Pamlico County, N.C.

Estuarine and lagoonal backbarrier deposits in the Neuse River area of the North Carolina Coastal Plain are here named the Beard Creek Member of the Flanner Beach Formation, following the informal usage of Mixon and Pilkey (1976). Consists of fine- to medium-grained sand

and muddy sand containing mollusks and minor amounts of silt and clay interbeds. Gradationally and conformably overlies the Smith Gut Member (new name) of the Flanner Beach; intertongues to the east with the Arapahoe Sand Member (new name) and to the northwest with the Newport Sand Member (new name), both of the Flanner Beach. Thickness is 4 m at the type locality. Age is middle Pleistocene.

Bear Pond Gneiss

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB-2, p. 3–15.

Type locality: Exposures on the northwest shore of Bear Pond and along Route 10 to the west over a distance of 0.4 km, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.
Subunit: High Pond Member.

The Bear Pond Gneiss, here named, is in the Loon Pond syncline in the Bog River synclinorium of the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y., where it occurs as a layer of varying thickness that rings the central portion of the syncline and produces topographic features such as high ridges, lakes, ponds, and swamps. Includes the High Pond Member (new name), a quartz-rich granulite, with which it is transitional. Consists of several different quartz-microcline gneisses containing magnetite as well as plagioclase, biotite, garnet, and sillimanite. Overlies the Little Charley Pond Formation (new name); underlies the Lost Pond Marble (new name) or its Bog River Member (new name). Is intruded by the Otter Pond Dioritic Gneiss (new name). Thickness attains 420 m. Age is Precambrian.

Beaver Creek Sand Member of the Winnebago Formation

Pleistocene (Illinoian)
Illinois
Wisconsin arch

Berg, R.C., and Kempton, J.P., 1985, Stratigraphic relationships of the Beaver Creek Sand Member of the Winnebago Formation: Illinois Geological Survey, Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 121–129.

Type section: State Street Quarry Section, 100 m east of the Boone-Winnebago County line, north of State Street, SW1/4SW1/4NW1/4 sec. 19, T. 44 N., R. 3 E., Boone County, Ill. Named for Beaver Creek in Boone County.

The Beaver Creek Sand Member of the Winnebago Formation, here named, is in Boone and Winnebago Counties, Ill. Consists of yellow to tan, calcareous, crossbedded, contorted medium sands containing coarse cobbles and boulders. As the glacier that deposited the overlying Nimtz Till Member (new name) of the Winnebago overrode the Beaver Creek, the sand and gravel beds of the Beaver Creek were contorted and large inclusions of diamicton were thrust into the beds. Overlies the Glasford Formation and is the oldest member of the Winnebago. Thickness is 3.5 m. Age is middle Pleistocene (Illinoian).

Belfry Member of the Fort Union Formation

Paleocene (Tiffanian)
Montana
Bighorn basin

Yuretich, R.F., Hickey, L.J., Gregson, B.P., Hsia, Y.L., 1984, Lacustrine deposits in the Paleocene Fort Union Formation, northern Bighorn basin, Montana: Journal of Sedimentary Petrology, v. 54, no. 3, p. 836–852.

Type section: Cody Road section, 2.5 km south of the town of Belfry on State Highway 397 (Cody Road), sec. 27, T. 18 S., R. 22 E., Hollenbeck Draw 7.5-minute quadrangle, Carbon County, Mont.

A lacustrine facies of the Fort Union Formation exposed near the center of the Clarks Fork basin, Montana, is here named the Belfry Member, following the informal usage of Hickey (1980). Consists of repetitive sequences of both fining-upward and coarsening-upward cycles of lenticular sandstone, siltstone and shale, mudstone, lignite, argillaceous and fossiliferous limestone, and tabular sandstone that are characterized by the predominance of laterally persistent, relatively thin beds. Grades into fluvial facies both laterally and vertically and lies within sediments belonging to the Tongue River Member of the Fort Union. Thickness may be as much as 600 m. Age is middle to late Paleocene (Tiffanian) based on megaflora and pollen.

Belhaven Phosphatic Sand Member of the **Pungo River Formation**

Miocene
North Carolina
Atlantic Coast basin

Gibson, T.G., 1983, Stratigraphy of Miocene through lower Pleistocene strata of the United States central Atlantic Coastal Plain, *in* Ray, C.E., ed., Geology and paleontology of the Lee Creek Mine, North Carolina, I: Smithsonian Contributions to Paleobiology, no. 53, p. 35–80.

Type section: AU–1–GRL corehole, depth interval 152–210 ft, near Aurora, Aurora 7.5-minute quadrangle, Beaufort County, N.C. Named for the town of Belhaven, Beaufort County.

The Belhaven Phosphatic Sand Member of the Pungo River Formation, here named, is in the Albemarle embayment in North Carolina. Consists of medium-greenish-brown phosphatic sand containing gray-green clay and limestone and dolomite beds. Unconformably overlies the Castle Hayne Formation; conformably underlies the Bonnerton Member (new name) of the Pungo River. Thickness at the type section is 58 ft. Age is early and middle Miocene.

Belle Rive Coal Member of the Mattoon Formation of the McLeansboro Group

Late Pennsylvanian (Missourian)
Illinois
Illinois basin

Nance, R.B., and Treworgy, C.G., 1981, Strippable coal resources of Illinois: Part 8—Central and southeastern counties: Illinois Geological Survey Circular 515, 32 p.

Type section: Exposure along a tributary to Goose Creek, 6 mi south of the village of Belle Rive, SE¼SE¼NE¼ sec. 35, T. 4 S., R. 4 E., Jefferson County, Ill.

The Belle Rive Coal Member of the Mattoon Formation of the McLeansboro Group, here named, is in Jefferson County, Ill. Lies 400 ft above the Shoal Creek Limestone Member of the Bond Formation and 35 to 40 ft below the Opdyke Coal Member of the Mattoon. Correlates tentatively with the Loudon Coal Member (new name) of the Mattoon in Fayette County to the north. Thickness at the type section is 2 ft. Age is Late Pennsylvanian (Missourian).

Bellingham Bay Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Coastal exposures along Bellingham Bay and on Chuckanut Drive, secs. 9, 8, 7, and 6, T. 36 N., R. 3 E., sec. 1, T. 36 N., R. 2 E., and secs. 36 and 25, T. 37 N., R. 2 E., Bellingham, Whatcom County, Wash.

The Bellingham Bay Member is here named the basal member of the Chuckanut Formation in the Bellingham Bay area in the western part of the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands to the foothills of the North Cascades, Wash. Consists of fining-upward cycles of coarse-grained, crossbedded, ripple-laminated sandstone and minor conglomerate intervals alternating with fine-grained sandstone, mudstone, and minor coal intervals. A dacite lithic-tuff bed is near the top of the unit. Represents fine-load meandering river deposits in an extensive fluvial system. Unconformably overlies pre-Tertiary rocks; conformably underlies the Governors Point Member (new name) and Padden Member (new name), both of the Chuckanut, in the western part of the outcrop belt, and the Slide Member (new name) of the Chuckanut, in the eastern part of the outcrop belt. Thickness is 2,700 m along Bellingham Bay in the west and 3,300 m in the east. Age is early Eocene based on zircon fission-track ages of about 55 Ma for the base and 49.9 Ma for the tuff at the top of the Bellingham Bay Member.

Bellmore Formation

Pleistocene (Wisconsinan)
New York
Atlantic Coast basin

Rampino, M.R., and Sanders, J.E., 1981, Upper Quaternary stratigraphy of southern Long Island, New York: Northeastern Geology, v. 3, no. 2, p. 116–128.

Type section: Borehole 200–C, Wantagh Pollution Control Plant, Wantagh, Nassau County, N.Y. Named for the town of Bellmore.

Glacial outwash deposits in south-central Long Island, N.Y., are here named the Bellmore Formation. Consists of brown to yellow-brown, dense, crossbedded sand and gravelly sand. Unconformably overlies the Wantagh Formation (new name); forms the surficial sediment of much of south-central Long Island. Correlates with the Roslyn Drift of northern Long Island. Thickness at the type section is 31.5 ft. Age is late Pleistocene (late Wisconsinan).

Bell Mountain Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: SE¼NE¼ sec. 2, T. 33 N., R. 1 E., Edgehill quadrangle, Reynolds County, Mo. Named for Bell and North Bell Mountains, Reynolds and Iron Counties.

Rocks previously mapped as the Bell Mountain ash flows by Anderson (1962) and the upper part of Unit D of the tuff of Stouts Creek by Anderson (1970) in the western St. Francois Mountains of southeast Missouri are here named the Bell Mountain Rhyolite. Consists of maroon to dark-maroon air-fall tuff containing lapilli and lithophysae. Overlies the Wildcat Mountain Rhyolite (new name); underlies the revised Royal Gorge Rhyolite. Thickness is 25 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Bell Mountain Rhyolite.

Belpre Ash Bed

Late Devonian
Ohio, Kentucky, Pennsylvania, Tennessee, Virginia, West Virginia
Illinois basin

Roen, J.B., and Hosterman, J.W., 1982, Misuse of the term "bentonite" for ash beds of Devonian age in the Appalachian basin: Geological Society of America Bulletin, v. 93, no. 9, p. 921–925.

Type section: Lamp 1 well, depth 1,182 m, Lot 66, Belpre Township, Washington County, Ohio.

The informal Belpre bentonite of Collins (1979) is here named the Belpre Ash Bed. Lies in the Appalachian basin near the base of the black shale beds of the Olentangy Shale in the subsurface of eastern Ohio and eastern Kentucky; lies in the Rhinestreet Shale Member of the West Falls Formation in the subsurface of northwestern Pennsylvania, western West Virginia, southwestern Virginia, and northeastern Tennessee; and lies at the surface in southwestern Virginia and northeastern Tennessee in that part of the Chattanooga Shale that is equivalent to the Rhinestreet Shale Member in the subsurface. Consists of illite, kaolinite, illite-smectite mixed layer clay, quartz, and biotite. Thickness ranges from 0.5 to 30 cm. Age is Late Devonian.

Belvidere Till Member of the Glasford Formation

Pleistocene (Illinoian)
Illinois
Wisconsin arch

Kempton, J.P., Berg, R.C., and Follmer, L.R., 1985, Revision of the stratigraphy and nomenclature of glacial deposits in central northern Illinois: Illinois Geological Survey, Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 1–19.

Type section: Belvidere South Boring, near junction of U.S. Route 20 and Genoa Road, 0.8 km southeast of Belvidere, NW1/4NW1/4NW1/4 sec. 6, T. 43 N., R. 4 E., Boone County, Ill.

The Belvidere Till Member of the Glasford Formation, here named, has been identified in exposures and borings in Boone, De Kalb, McHenry, and Kane Counties, Ill. Consists of pinkish to tan-brown diamicton and has a texture ranging from loam to clay loam to silty clay loam. Overlies the Esmond Till Member of the Glasford or older deposits where the Esmond is absent; underlies the Nimtz Till Member (new name) of the Winnebago Formation. Replaces the Capron Till Member in southern Boone, northern De Kalb, and southwestern McHenry Counties. Age is Pleistocene (Illinoian).

Ben Hill Granite

Mississippian to Pennsylvanian
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Community of Ben Hill, Ben Hill quadrangle, Fulton County, Ga.

The Ben Hill Granite, here named, is in Fulton County, Ga. Consists of coarse-grained, porphyritic muscovite-biotite-quartz granite containing microcline phenocrysts. Is of batholithic size and intrudes the Clarkston, Stonewall, Wahoo Creek, and Clairmont Formations and the Norcross Gneiss, all of the Atlanta Group (all new names). The contact is sharp and discordant but is locally marked by dikes and sills of Ben Hill Granite alternating with altered country rocks over about a 30-m interval. Contains numerous xenoliths or roof pendants of country rock. Age is Mississippian to Pennsylvanian based on the age of zircon dated at 325 Ma.

Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type section: See type sections listed under individual subunit entries. Named for the Big Bear area, San Bernardino Mountains, San Bernardino County, Calif.
Subunits: Wildhorse Meadows Quartzite, Lightning Gulch Formation, Moonridge Quartzite, Green Spot Formation, Delamar Mountain Formation.

Following the informal usage of Cameron (1981), metasedimentary rocks preserved in roof pendants in the Big Bear area of the San Bernardino Mountains in California are here named the Big Bear Group. Rocks of the Big Bear Group have previously been included with the Sargossa Quartzite, Furnace Limestone, Chicopee Formation, and Chicopee Canyon Formation. The group is divided into (ascending) the Wildhorse Meadows Quartzite, Lightning Gulch Formation, Moonridge Quartzite, Green Spot Formation, and Delamar Mountain Formation (all new names). Unconformably overlies an older Precambrian gneiss complex; conformably underlies the uppermost Precambrian and Lower Cambrian Wood Canyon Formation, except in the Sugarloaf Mountain area where the contact is a fault or intrusive contact. Age is late Precambrian.

Big Bend Ridge Rhyolite

Pleistocene
Idaho
Snake River basin

Christiansen, R.L., 1982, Late Cenozoic volcanism of the Island Park area, eastern Idaho, *in* Bonnichsen, Bill, and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 345–368.

Type area: Caldera scarp at the base of Bishop Mountain, Big Bend Ridge caldera segment, Island Park area, Fremont County, Idaho.

The Big Bend Ridge Rhyolite is here named and includes four lava flows, named the Bishop Mountain, Green Canyon, Blue Creek, and Headquarters flows, located on the rim and outer flank of Island Park between Big Bend and Thurmon Ridges in Fremont County, Idaho. Consists of rhyolite containing phenocrysts of quartz, sanidine, and plagioclase. Overlies the Huckleberry Ridge Tuff; underlies the Mesa Falls Tuff. The rhyolite may represent Pleistocene postcollapse flows of the first volcanic cycle (2.0 Ma) or precollapse flows of the second volcanic cycle (1.3 Ma) or both.

Big Cotton Indian Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Exposures near Big Cotton Indian Creek and its tributaries, Jonesboro quadrangle, Clayton County, Ga.

The Big Cotton Indian Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga. Consists of biotite-plagioclase gneiss, hornblende-plagioclase amphibolite, and biotite-muscovite schist. Gradationally overlies the Clarkston Formation (new name); gradationally underlies the Camp Creek Formation (new name), both of the Atlanta Group. Thickness is as much as 4,000 m. Age is Late Proterozoic and (or) early Paleozoic.

Big Goose Member of the **Madison Limestone**

Early Mississippian (Osagean)
Wyoming, Montana
Powder River basin

Sando, W.J., 1982, New members of the Madison Limestone (Devonian and Mississippian), north-central Wyoming and southern Montana: U.S. Geological Survey Bulletin 1529–H, p. H125–H130.

Type section: Little Tongue River section, NE¼ sec. 27, T. 56 N., R. 87 W., Sheridan County, Wyo. Named for exposures on Big Goose Creek, NW¼ sec. 2, T. 54 N., R. 86 W.

The informal cherty dolomite member of Sando (1972) is here named the Big Goose Member, one of six members of the Madison Limestone in the Powder River basin in north-central Wyoming and southern Montana. Is also recognized in the subsurface in the Bighorn, Wind River, and Powder River basins. Consists of predominantly fine-grained, thin- to medium-bedded, cherty dolomite and dolomitic limestone. Autobrecciation and shattering are distinctive features. Conformably overlies the Woodhurst Member of the Madison; conformably underlies the Little Tongue Member (new name) of the Madison. Thickness is 55.5 m at the type section and ranges from 38 to 100 m. Age is Early Mississippian (Osagean) based on corals and brachiopods.

Big Island Formation

Miocene
Idaho, Nevada
Great Basin province

Coats, R.R., 1985, The Big Island Formation, a Miocene formation in northern Elko County, Nevada, and adjacent Idaho, including a consideration of its composition and petrographic character: U.S. Geological Survey Bulletin 1605–A, p. A7–A13.

Type section: West wall of the Jarbidge River Canyon, about 122 m west-northwest of the confluence of Buck Creek and the Jarbidge River, center N½ sec. 28, T. 16 S., R. 9 E., Dishpan quadrangle, Owyhee County, Idaho. Named for Big Island, a plateau on the east and west sides of the Jarbidge River, in Elko County, Nev., and Owyhee County, Idaho.

A sequence of nonmarine sedimentary and volcanic rocks exposed on the western part of Big Island, a plateau between the Jarbidge River and its East Fork, and on the east and west sides of the river in Elko County, Nev., and Owyhee and Twin Falls Counties, Idaho, is here named the Big Island Formation. Consists of three lenticular units, a lower boulder gravel about 100 m thick, a middle weathered dacitic tuff 6 m thick, and an upper gray tholeiitic olivine basalt 60 m thick. Much of the basalt was originally included in the Banbury Volcanics. Discrepancies in the age of that unit, renamed the Banbury Basalt, led to the conclusion that the Banbury does not represent a formation of limited stratigraphic position or age range. The Banbury of the type locality is not continuous with the basalts of the Big Island plateau, therefore they are assigned to the Big Island Formation, and the name Banbury is excluded from this area. Overlies the Cougar Point Welded Tuff; discontinuously underlies unconsolidated Quaternary deposits. Age is late Miocene based on stratigraphic position and potassium-argon ages of basalt.

Big Valley Formation of the Three Forks Group

Late Devonian
Alberta, Saskatchewan, Montana
Williston basin

Christopher, J.E., 1961, Transitional Devonian-Mississippian formations of southern Saskatchewan: Saskatchewan Department of Mineral Resources Report 66, 103 p.

Type section: Gulf Rumsey no. 6–30 (Lsd. 6–30–33–21w4) well, depth interval 5,250–5,295 ft, Stettler area, Alberta, Canada (Wonfor and Andrichuck, 1956).

The Big Valley Member of the Three Forks Formation, named by Wonfor and Andrichuck (1956), is here revised as the Big Valley Formation of the Three Forks Group in Saskatchewan and the southwest-trending erosional edge of the Big Valley is extended in the subsurface into Montana at R. 13 W. of the Third Meridian. Consists of green shale laminated with shale containing thin layers of pyrite. Overlies the Torquay Formation; underlies and interfingers with the lower member of the Bakken Formation. Thickness ranges from 115 ft in Saskatchewan to 25 ft in Montana. In many areas of Montana only erosional remnants are found. Age is Late Devonian.

Bill Arp Formation of the Sandy Springs Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: Exposures near the town of Bill Arp, Winston 7.5-minute quadrangle, Carroll County, Ga.

The Bill Arp Formation, used informally by Crawford and Medlin (1974) and here named, is in the Austell-Frolona antiform in west-central Georgia. Includes the informal Union Grove Church schist of Crawford and Medlin (1974) and is assigned to the informal Roosterville group. Consists of interlayered mica schist and metagraywacke. Stratigraphically overlies but, because of refolding, structurally underlies the New Georgia Group (new name) and the Andy Mountain Formation (new name). Is intruded by the Austell Gneiss. Age is Proterozoic.

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

The Bill Arp Formation is here assigned to the Sandy Springs Group (western belt) in the Austell-Frolona antiform. Age is Late Proterozoic and (or) early Paleozoic.

Bitter Ridge Limestone Member of the **Horse Spring Formation**

Miocene
Nevada
Great Basin province

Bohannon, R.G., 1984, Nonmarine sedimentary rocks of Tertiary age in the Lake Mead region, southeastern Nevada and northwestern Arizona: U.S. Geological Survey Professional Paper 1259, 72 p.

Type section: Exposures at Bitter Ridge in the Muddy Mountains, lat 36°18′30″ N., long 114°35′ W., Muddy Peak 15-minute quadrangle, Clark County, Nev.

Lacustrine limestone that composes the hogback of Bitter Ridge between Bitter Spring Valley and White Basin in the Muddy Mountains in Clark County, Nev., is here named the Bitter Ridge Limestone Member of the Horse Spring Formation. Consists of uniform light-brown, yellow, and pale-pink crystalline limestone, chiefly stromatolitic, and is divided into wavy-bedded and stromatolitic mound subfacies. Contains some locally gypsiferous red and yellow sandstone beds. Unconformably overlies Paleozoic rocks or conformably overlies the here revised Thumb Member of the Horse Spring where the base is defined at the top of the stratigraphically highest sandstone bed of the Thumb Member. Conformably underlies the Lovell Wash Member (new name) of the Horse Spring where the top of the Bitter Ridge is defined at the top of the uppermost resistant limestone bed below the tuffaceous beds of the Lovell Wash Member. Thickness at the type section is 375 m and ranges from 300 to 400 m. Age is Miocene based on potassium-argon and fission-track dates.

Black Knob Chert Member of the Tenmile Creek Formation of the Stanley Group

Late Mississippian
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type locality: Outcrop on the east side of Black Knob Ridge, T. 1 S., R. 12 E., Atoka County, Okla.

The Black Knob Chert Member, here named, is in the lower part of the Tenmile Creek Formation of the Stanley Group in the Ouachita Mountains in Atoka County, southeastern Oklahoma. Consists of a bed of fossiliferous siliceous shale near the base of the Tenmile Creek. Thickness is about 20 ft. Age is Late Mississippian.

Blackoak Coal Member of the Kalo Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Atokan)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures along an intermittent tributary of Cedar Creek in an abandoned rock quarry in NW1/4SE1/4, sec. 31, T. 75 N., R. 17 W., Mahaska County, Iowa. Named for Blackoak Township.

The Blackoak Coal Member, here named, is the lower of two members of the Kalo Formation (new name) of the Cherokee Group in south-central Iowa. Unit extends over a significant portion of the study area, and, to the south and west, splits into two or more closely spaced beds. The names Manbeck and Hastie were applied to coal beds in Polk County by Landis and Van Eck (1965) and may refer at least in part to the Blackoak. Contains abundant pyrite nodules and fusain. Is the biostratigraphic equivalent of the Pope Creek Coal Member of the Abbott Formation. Overlies the Kilbourn Formation (new name); underlies silty, carbonaceous shale below the Cliffland Coal Member (new name). Thickness is highly variable, ranging from 4.5 in. at the type section to 5.7 ft. Age is Middle Pennsylvanian (late Atokan).

Blair Creek Formation of the **Marquette Range Supergroup**

Early Proterozoic
Michigan
Wisconsin arch

Sims, P.K., Peterman, Z.E., Prinz, W.C., and Benedict, F.C., 1984, Geology, geochemistry, and age of Archean and Early Proterozoic rocks in the Marenisco-Watersmeet area, northern Michigan: U.S. Geological Survey Professional Paper 1292–A, p. A1–A41.

Type area: Exposures in the vicinity of Blair Creek, T. 46 N., R. 40–41 W., Gogebic County, Mich.

The basal volcanic unit of the Marquette Range Supergroup on the southeast limb of the Copps syncline east of the Gogebic Range in Michigan is here named the Blair Creek Formation. Is divided into five map units: basal conglomerate, grit, and wacke; mafic volcanic rocks; iron-formation; volcanic rocks; and an unexposed magnetic unit at the top. Unconformably overlies Archean gneiss and greenstone-granite basement terranes; subconformably underlies the Copps and Michigamme Formations of the Baraga Group of the Marquette Range Supergroup. Is intruded by Early Proterozoic metadiabase dikes. Maximum thickness is 2,000 m. Age is Early Proterozoic.

Blankenship Member of the **Otuk Formation** of the **Etivluk Group**

Early and Middle Jurassic (Sinemurian to Bajocian)
Alaska
Arctic Foothills province

Mull, C.G., Tailleur, I.L., Mayfield, C.F., Ellersieck, Inyo, and Curtis, S., 1982, New upper Paleozoic and lower Mesozoic stratigraphic units, central and western Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, v. 66, no. 3, p. 348–362.

Type section: Cutbanks along a west-flowing tributary of Blankenship Creek, a tributary of the Ipnavik River, on the south side of Lisburne Ridge, NE¼ sec. 36, T. 9 S., R. 21 W., Howard Pass quadrangle, Alaska. Principal reference section designated.

The Blankenship Member, here named, is locally present in the uppermost part of the Otuk Formation (new name) of the Etivluk Group (new name) in the Etivluk River area of the Howard Pass and Killik River quadrangles of the Brooks Range, Alaska. Consists of rhythmically interbedded black fissile oil shale, dark-gray chert, and minor amounts of dolomitic limestone. Lower and upper contacts of the Blankenship represent disconformities or nondepositional hiatuses with the lower part of the allochthonous Otuk Formation and with Lower Cretaceous claystone and shale. Thickness is 7 m at the type section. Age is middle Early Jurassic through early Middle Jurassic (Sinemurian through middle Bajocian) based on fossils.

Blue Canyon Tuff of the Datil Group

Oligocene
New Mexico
Basin and Range province

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Northwest side of Main Canyon near its junction with Blue Canyon, 7 mi north of Datil, 1.1 mi northeast of the junction of Cibola National Forest road 14 and the road into Blue Canyon, NE¼SE¼ sec. 1, T. 1 S., R. 10 W., Datil Mountains, Cal Ship Mesa 7.5-minute quadrangle, Catron County, N. Mex.

The Blue Canyon Tuff of the Datil Group, here named, is in the Datil Mountains and northwest Gallinas Mountains in southwestern New Mexico. Thins to the east and is absent in the Socorro-Magdalena area. Consists of brown- to purple-gray, unwelded to poorly welded, moderately crystal-rich quartz-latite ash-flow tuff. Is interbedded with the Rincon Windmill Member (new name) of the Spears Formation of the

Datil Group and locally splits the Rincon Windmill Member into two tongues. Overlies the Rock House Canyon Tuff (new name) of the Datil Group; underlies the Hells Mesa Tuff. Thickness at the type section is 40 ft and attains 100 ft. Age is Oligocene based on a potassium-argon biotite date of 33.3 Ma and a zircon fission-track date of 33.2 Ma.

Blue Gulch Mudstone Member of the **Hornbrook Formation**

Late Cretaceous (Campanian to Maastrichtian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Composite of five localities near Blue Gulch, Rancheria Gulch, and Hilt, secs. 20, 21, 27, 33, and 34, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif. Named for Blue Gulch, southeast of the Klamath River, 4 km south of Hornbrook. *Subunits:* **Rancheria Gulch Sandstone Beds, Hilt Bed.**

The Blue Gulch Mudstone Member is here named the uppermost member of the Hornbrook Formation along the northeast margin of the Klamath Mountains in Siskiyou County, Calif., and Jackson County, Oreg. Includes a lower part consisting of interbedded gray siltstone and sandstone; the Rancheria Gulch Sandstone Beds (new name) consisting of fine-grained gray sandstone; a middle part consisting of interbedded gray mudstone, siltstone, and sandstone and the Hilt Bed (new name); an upper middle part consisting of interbedded gray mudstone and sandstone; and an upper part consisting of gray mudstone and siltstone. Conformably and gradationally overlies the Rocky Gulch Sandstone Member (new name), or locally, the Ditch Creek Siltstone Member (new name), both of the Hornbrook; unconformably underlies Tertiary nonmarine gravels and volcanic rocks. Thickness is 912.5 m at the type section. Age is Late Cretaceous (early Campanian to early Maastrichtian) based on foraminifera and ammonites from the part of the Blue Gulch above the Rancheria Gulch Sandstone Beds.

Blue Mound Shale Member of the Shale Hill Formation of the Pleasanton Group

Late Pennsylvanian (Missourian)
Missouri
Forest City basin

Howe, W.B., 1982, Stratigraphy of the Pleasanton Group, Pennsylvanian System in Missouri: Missouri Department of Natural Resources, Open File Report Series OFR–82–10–GI, 99 p.

Type section: Exposure in roadcut through hill, 3 mi northwest of Blue Mound, NW1/4SW1/4 sec. 28, T. 56 N., R. 24 W., Livingston County, Mo.

The Blue Mound Shale Member is here named the uppermost of three members of the Shale Hill Formation (new name) of the Pleasanton Group in the Forest City basin in northwestern Missouri. The lower part of the Blue Mound Shale Member contains the Locust Creek coal, called the Ovid coal in earlier reports. The Locust Creek coal is a bed or zone of thin impure coal beds of variable thickness ranging from a thin streak to 2.5 ft and including clay partings and is of generally poor quality. Recognition in western Missouri is tentative. The upper part of the Blue Mound Member consists of silty, micaceous, sparsely fossiliferous, gray to drab shale that is silty and maroon or gray-green in the uppermost part and sandstone, called upper Knobtown by drillers, that occupies channels cut through the Knobtown Limestone Member of the Shale Hill Formation. Conformably overlies the Weldon River Sandstone Member (new name) or the Knobtown Limestone Member, both of the Shale Hill; disconformably underlies the Critzer Limestone Member of the Hertha Formation of the Kansas City Group. Thickness is 18 ft at the type section and averages 25 ft. Age is Late Pennsylvanian (early Missourian).

Bobcaygeon Formation

Middle Ordovician
Ontario, Pennsylvania
Appalachian basin

Wagner, W.R., 1966, Stratigraphy of the Cambrian to Middle Ordovician rocks of central and western Pennsylvania: Pennsylvania Geological Survey Bulletin G 49, 156 p.

Type section: Composite of Nogies Creek road cut, Little Bob quarry, and Number 36 highway road cut south of the town of Bobcaygeon, Ontario, Canada. (Liberty, 1969).

The Bobcaygeon Formation of Liberty (1964) is here extended from Ontario, Canada, to northwestern Pennsylvania in the subsurface along Lake Erie in Erie County. Consists of interbedded calcarenite, calcilutite, and calcisiltite and occupies the position of the Benner Formation to the east. As in Ontario, the Bobcaygeon overlies the Gull River Formation and underlies the Verulam Formation, which grades into the Nealmont Formation in northwestern Pennsylvania. Age is Middle Ordovician.

Bog River Member of the Lost Pond Marble

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Exposures along Bog River, Tupper Lake 15-minute quadrangle, St. Lawrence County, N.Y.

The Bog River Member of the Lost Pond Marble (new name), here named, is in the Loon Pond syncline in the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y., where it is the basal member of the Lost Pond. Consists of calcite-quartz-clinopyroxene marble. Overlies the Bear Pond Gneiss (new name). Is intruded by the Otter Pond Dioritic Gneiss (new name). Thickness is 300 m. Age is Precambrian.

Boil Mountain Complex

Cambrian(?) and Early Ordovician(?)
Maine
New England province

Boudette, E.L., 1982, Ophiolite assemblage of early Paleozoic age in central-western Maine, *in* St-Julien, P., and Beland, J., eds., Major structural zones and faults of the northern Appalachians: Geological Association of Canada Special Paper 24, p. 209–230.

Type section: Composite of the two east-west elongate contiguous parts of the complex, 15 km north of Kennebago Lake, Franklin County, Maine. Named for Boil Mountain, 14 km north of Kennebago Lake.

Plutonic rocks of the ophiolite sequence in central-western Maine are here named the Boil Mountain Complex. Consists of serpentinite, pyroxenite, gabbro, epidiorite, and tonalite, all extensively altered by tectonism and metamorphism, especially in the southwest where segments of serpentinite have been remobilized to form diapiric serpentinite. At the base, epidiorite, gabbro, and serpentinite are in sharp, concordant contact with the Chain Lakes massif. Along the southeastern edge, probably the stratigraphic top, tonalite is in undisturbed contact with greenstone of the Jim Pond Formation (new name). Age is Cambrian(?) and Early Ordovician(?).

Bone Island Formation

Early Cretaceous (Coahuilan)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies Transactions, October, v. 31 (supplement), p. 447–453.

Type section: Mobil-Phillips Number 1 Seminole well P–565B, depth interval 13,750–15,100 ft, sec. 28, T. 48 S., R. 33 E., Hendry County, Fla. Named for Bone Island in the Big Cypress Swamp.

The Bone Island Formation, here named, occurs in the subsurface of the South Florida basin, where it is one of four regionally persistent anhydrite units below the Punta Gorda Anhydrite of the Glades Group. Consists of anhydrite and buff to cream oolitic limestone containing some micritic limestone or dolomite. Overlies the Wood River Formation (new name); underlies the Pumpkin Bay Formation (new name); the contact is at the top of a regionally persistent 200-ft anhydrite bed. Thickness at the type well is 1,350 ft. Age is Early Cretaceous (early Coahuilan) based on stratigraphic position.

Boney Spring Formation

Pleistocene (Wisconsinan)
Missouri
Ozark uplift

Haynes, C.V., Jr., 1985, Mastodon-bearing springs and late Quaternary geochronology of the lower Pomme de Terre valley, Missouri: Geological Society of America Special Paper 204, 35 p.

Type locality: Boney Spring, 3.2 km northwest of Breshears Valley near Avery, sec. 29, T. 39 N., R. 22 W., Fristoe 15-minute quadrangle, Benton County, Mo.

Alluvium deposits in the T–1 terrace of the Breshears Valley, Benton and Hickory Counties, Mo., are here named the Boney Spring Formation, following the informal usage of Brakenridge (1981). Consists of 5 to 7 m of gray to olive interbedded organic clay, clayey silt, and peat overlying 1 to 3 m of chert pebble gravel; also has intrusions of spring-laid granular tufa and clay containing spruce logs and bones of mastodon, giant beaver, ground sloth, and smaller animals. Unconformably overlies the Breshears Valley Formation (new name) and the Trolinger Spring Formation (new name) with an erosional hiatus of 2,000 to 3,000 years; unconformably underlies the Rodgers Shelter Formation (new name) with an erosional hiatus. Age is late Pleistocene (late Wisconsinan) based on pollen and bones.

Bonnerton Member of the **Pungo River Formation**

Miocene
North Carolina
Atlantic Coast basin

Gibson, T.G., 1983, Stratigraphy of Miocene through lower Pleistocene strata of the United States central Atlantic Coastal Plain, *in* Ray, C.E., ed., Geology and paleontology of the Lee Creek Mine, North Carolina, I: Smithsonian Contributions to Paleobiology, no. 53, p. 35–80.

Type section: AU–1–GRL core hole, depth interval 120–152 ft, near Aurora, Aurora 7.5-minute quadrangle, Beaufort County, N.C. Named for the town of Bonnerton, Beaufort County.

The Bonnerton Member of the Pungo River Formation, here named, occurs in the southern part of the Albemarle embayment, North Carolina. Consists of white to light-gray-green phosphatic limestone and sand, calcareous clay, and coquina. Conformably overlies the Belhaven Phosphatic Sand Member (new name) of the Pungo River; unconformably underlies the Yorktown Formation. Thickness is 32 ft at the type section. Age is middle Miocene.

Boqueron Basalt

Late Cretaceous (Campanian)
Puerto Rico

Volckmann, R.P., 1984, Upper Cretaceous stratigraphy of southwest Puerto Rico: A revision: U.S. Geological Survey Bulletin 1537–A, p. A73–A83.

Type locality: None designated. Crops out from Morales Diaz on the eastern border of the Puerto Real 7.5-minute quadrangle to the town of Boqueron on the Bahia de Boqueron in the west, Puerto Rico.

Basaltic lava in the Puerto Real quadrangle in southwestern Puerto Rico, previously mapped by Mattson (1960) as part of the now abandoned San German Formation or undifferentiated Cretaceous(?) volcanic rocks, is here named the Boqueron Basalt. Consists of dark-gray-brown to greenish-brown or dark-gray porphyritic, locally amygdular, pyroxene-olivine-oxyhornblende basaltic lava and minor amounts of breccia and tuff that have poorly developed flow banding overlain by a line of 5- to 10-m-thick limestone lenses. Coarse-grained, medium-bedded volcanic wacke as much as 150 m thick occurs at the top of the Boqueron. Lack of pillows suggests subaerial deposition of lava; the limestone lenses and volcanic wacke represent local submergence following deposition of the basalt. Is interbedded with identical volcanic wacke at the base of the Lajas Formation (new name) and appears to underlie the Lajas with minor disconformity. Age is Late Cretaceous (middle Campanian or older) based on fossils in the overlying Cotui Limestone.

Border Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Sinha, A.K., and Bartholomew, M.J., 1984, Evolution of the Grenville terrane in the central Virginia Appalachians: Geological Society of America Special Paper 194, p. 175–186.

Type locality: Outcrops on the Tye River, 650 m north of the junction with Virginia Highways 151 and 56, Horseshoe Mountain 7.5-minute quadrangle, Nelson County, Va. Derivation of name not stated.

The informal Border Gneiss of Hillhouse (1960), here formally named, occurs in the Lovingston massif in the central Blue Ridge, Va. Consists of feldspathic and garnet graphite gneisses and separates the Roseland Anorthosite from the other units of the massif. Age is Middle Proterozoic.

Bottom Creek Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: None designated. Named for Bottom Creek, lat 37°08′ N., long 80° W., Elliston quadrangle, Montgomery County, Va.

The Bottom Creek Suite, here named, occurs in the Pedlar massif in the Blue Ridge of Virginia and is a charnockite suite that contains mesocharnockite, megaporphyry, and porphyroblastic gneiss rock types. Age is Middle Proterozoic.

Bow River Quartzite of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type locality: None designated. Well exposed throughout the northern Medicine Bow Mountains, Carbon County, Wyo. Derivation of name not stated.

The Bow River Quartzite, here named, of the Phantom Lake Metamorphic Suite, defines the limbs of French Joes anticlinorium in the northern Medicine Bow Mountains, Wyo. Consists of fine-grained muscovitic quartzite, local conglomerate, local biotite and hornblende schist and phyllite, and local quartz-rich carbonates. Abundant planar crossbeds and ripple marks indicate the direction of the stratigraphic top. Gradationally or sharply and conformably overlies the Rock Mountain Conglomerate (new name) of the Phantom Lake; underlies the Colberg Metavolcanic Rocks and the Conical Peak Quartzite (both new names) of the Phantom Lake. Thickness ranges from 200 to 580 m and averages 350 m. Age is Archean.

Box Canyon Member of the Tiger Formation

Eocene, Oligocene, Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Road and stream cuts northwest and west of the Box Canyon Dam on the Pend Oreille River, SE¼SE¼SW¼ sec. 18 and N½NW¼ sec. 19, T. 38 N., R. 43 E., and E½ sec. 13, T. 38 N., R. 42 E., Pend Oreille County, Wash.

The Box Canyon Member, here named, is in the revised Tiger Formation in the area northwest and southwest of Ione and west to southwest of Tiger in northeastern Washington. Consists of massive to horizontally and planar crossbedded conglomerate and minor amounts of sandstone, siltstone, shale, and coal. Clast lithology varies laterally. Overlies Paleozoic strata and possibly overlies Precambrian greenstone and Cretaceous granite; pinches out below the Lost Creek Member (new name) of the Tiger Formation south of Tiger. Thickness is at least 600 m at the type section and may be more than 1,500 m. Age ranges from early middle Eocene, based on inclusions of late early to early middle Eocene volcanic rock clasts, through middle Miocene, although the age determination of middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, is less definite.

Brady Member of the Gower Formation

Silurian (Wenlockian and Ludlovian)
Iowa
Iowa shelf

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

Type locality: Outcrops in the Brady (McGuire) quarry, SE¼SE¼ sec. 14, T. 80 N., R. 3 W., Cedar County, Iowa.

The informal Brady facies of Philcox (1970) is here named the Brady Member of the Gower Formation and is restricted to areas in Jones, Cedar, and Linn Counties, Iowa. Consists of mounded sequences of fossil-moldic and fossil-replaced dolomites that have wackestone, packstone, and boundstone fabrics and abundant brachiopods and rugose corals. Overlies the Palisades-Kepler Member (new name) of the Scotch Grove Formation (new name); is laterally equivalent to the Anamosa Member of the Gower and to the LeClair Member of the Gower in Scott County; unconformably underlies Devonian strata. The Brady represents a second stage of carbonate mound building above the older Palisades-Kepler mounds and is surrounded by laminated dolomites of the Anamosa Member. Age is Silurian (late Wenlockian and Ludlovian).

Branch River Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Greenleaf Quarry, on the north side of Highway 96, 0.7 km east of Greenleaf, SE¼SW¼ sec. 4, T. 21 N., R. 20 E., Greenleaf 7.5-minute quadrangle, Brown County, Wis. Named for the Branch River in Morrison Township, Denmark 15-minute quadrangle.

The lowest of three members of the Kewaunee Formation (new name) in the Green Bay Lobe east of an arbitrary vertical cutoff at the Fox River is named the Branch River Member, following the informal usage of McCartney and Mickelson (1982). Consists of brown sandy silty, clay till. Overlies dolomite bedrock or till and gravel of the Horicon Formation (new name); underlies the Chilton Member (new name) of the Kewaunee or is the surface unit. Is equivalent to the Silver Cliff Member (new name) of the Kewaunee west of the Fox River in the Green Bay Lobe and to the Ozaukee Member (new name) of the Kewaunee in the Lake Michigan Lobe. Average thickness is 2 m. Age is late Pleistocene (late Wisconsinan).

Breshears Valley Formation

Pleistocene (pre-Sangamonian)
Missouri
Ozark uplift

Haynes, C.V., Jr., 1985, Mastodon-bearing springs and late Quaternary geochronology of the lower Pomme de Terre valley, Missouri: Geological Society of America Special Paper 204, 35 p.

Type locality: Breshears Valley, near Avery, sec. 4, T. 38 N., R. 22 W., Fristoe 15-minute quadrangle, Benton County, Mo.

Alluvial deposits of the lowest T–3 terrace in the Breshears Valley, an abandoned meander of the Pomme de Terre River, in Benton and Hickory Counties, Mo., called the informal Breshears formation by Brakenridge (1981), are here named the Breshears Valley Formation. Consists of a strath of oxidized chert gravels with a strong red, relict soil. Unconformably overlies Paleozoic dolomite and sandstone; unconformably underlies alluvial terrace deposits named the Trolinger Spring, Boney Spring, Rodgers Shelter, and Pippins Cemetery Formations (all new names). Age is Pleistocene (possibly pre-Sangamonian), based on a Sangamonian age for basal peat of the overlying Trolinger Spring Formation.

Bristol Hill Coal Member of the Bond Formation

Late Pennsylvanian (Missourian)
Illinois
Illinois basin

Nance, R.B., and Treworgy, C.G., 1981, Strippable coal resources of Illinois: Part 8—Central and southeastern counties: Illinois Geological Survey Circular 515, 32 p.

Type section: Exposure along Bristol Hill, center NE¼NE¼ sec. 12, T. 6 N., R. 11 W., Heathsville 7.5-minute quadrangle, Crawford County, Ill.

The Bristol Hill Coal Member of the Bond Formation of the McLeansboro Group, here named, occurs in the area of Flat Rock, Crawford County, Ill. Local informal name is Flat Rock Coal. At the type area the coal underlies marine limestone tentatively correlated with the lower portion of the Livingston Limestone Member of the Bond. Lies 35 to 40 ft above a black shale and thin coal correlated with the Witt Coal Member of the Bond and 280 ft above the West Franklin Limestone Member of the Modesto Formation. Thickness is 10 in. at the type section. Age is Late Pennsylvanian (Missourian).

Browns Ferry Member of the Rhems Formation of the Black Mingo Group

Paleocene (Danian, Midwayan)
South Carolina
Atlantic Coast basin

Van Nieuwenhuise, D.S., and Colquhoun, D.J., 1982, The Paleocene-lower Eocene Black Mingo Group of the east central Coastal Plain of South Carolina: South Carolina Geology, v. 26, no. 2, p. 47–67.

Type section: Composite of outcrops at Browns Ferry on the Black River and underlying strata revealed by auger hole CV2, 15 ft (4.6 m) away from the outcrop, Georgetown County, S.C.

The Browns Ferry Member, here named, is the lower member of the Rhems Formation of the Black Mingo Group in the Coastal Plain of South Carolina. The here revised Black Mingo Group includes all strata from the base of the Paleocene to the unconformity at the top of the Eocene Ypresian Stage and is divided into the Rhems Formation of the Danian Stage, the Williamsburg Formation of the Thanetian Stage, and unnamed Ypresian strata. [Of the Clubhouse Crossroads corehole Number 1, Gohn and others (1978) assigned the entire Paleocene section to the Black Mingo Formation, and Gohn and others (1983) named the Ypresian strata the Fishburne Formation (new name).] The Browns Ferry Member consists of indurated, fossiliferous, clayey sand beds. Unconformably overlies the Peedee Formation; unconformably underlies the Perkins Bluff Member (new name) of the Rhems with sharp, erosional contact. Thickness is 37 ft at the composite type section and 135 ft in the Clubhouse Crossroads corehole Number 1. Age is Paleocene (late Danian; middle Midwayan) based on ostracodes and pollen.

Browns Pond Formation

Early Cambrian
New York
New England province

Rowley, D.B., Kidd, W.S.F., and Delano, L.L., 1979, Detailed stratigraphic and structural features of the Giddings Brook slice of the Taconic allochthon in the Granville area, *in* Friedman, G.M., ed., Guidebook: New England Intercollegiate Geological Conference, 71st Annual Meeting, p. 186–242.

Type locality: Along Holcombville Road near Browns Pond, at the Granville-Thorn Hill 7.5-minute quadrangle boundary, Washington County, N.Y. (Jacobi, 1977).

The Browns Pond Formation, informally named by Jacobi (1977) and here described, is in the Giddings Brook slice of the Taconic allochthon in the Granville area, New York. Consists of a heterogeneous assemblage of lithologic types, including limestone, limestone conglomerate, limestone breccia, quartz wacke, dolomitic calcarenite, and quartz arenite in a matrix of black finely cleaved, fissile slate. The informal Mudd Pond quartzite, a distinctive lithologic marker, is found in the lower part of the Browns Pond. Sharply overlies the Truthville Slate or Formation (new name) where the color changes from gray-green to black; gradationally underlies the Mettawee Slate. Thickness is typically 80 m but ranges from 25 to 130 m. Age is Early Cambrian based on fossils. [Although this name has not been formally proposed, it is included here because of its continued usage.]

Bruggers Formation

Middle Ordovician (Whiterock or Chazyan)
Michigan
Michigan basin

Fisher, J.H., and Barratt, M.W., 1985, Exploration in the Ordovician of central Michigan basin: American Association of Petroleum Geologists Bulletin, v. 69, no. 12, p. 2065–1076.

Type section: JEM Bruggers 3–7 well, depth interval 10,152–11,322 ft, sec. 7, T. 24 N., R. 6 W., Missaukee County, Mich.

The Bruggers Formation, here named, occurs in the subsurface of the central Michigan basin. Consists of clear to white, massive, partly crossbedded, bioturbated, clean quartz sandstone that has silica cement. Porosity indicates a potential for significant gas production. Gradationally overlies the Foster Formation (new name)—the contact arbitrarily is placed below the lowest thick sandstone; unconformably underlies thin, lenticular interbeds of dolostone, limestone, and sandstone, which are here termed lower Glenwood because they underlie typical Glenwood Formation. Thickness is 1,170 ft at the type section. Age is Middle Ordovician (Whiterock or Chazyan) based on conodonts.

Bryan Meadow Granodiorite

Late Cretaceous
California
Sierra Nevada province

John, D.A., Armin, R.A., and Moore, W.J., Quaternary geology by J.C. Dohrenwend, 1981, Geologic map of the Freel and Dardanelles further planning areas, Alpine and El Dorado Counties, California: U.S. Geological Survey Miscellaneous Field Studies Map MF–1322–A, scale 1:62,500.

Type locality: Exposures north of Elbert Lake, sec. 19, T. 11 N., R. 18 E., El Dorado County, Calif. [Named for Bryan Meadow, sec. 24, T. 11 N., R. 17 E.]

The Bryan Meadow Granodiorite, named informally by Loomis (1981) and here named, occurs in the central Sierra Nevada of California. Consists of light-gray medium-grained, locally porphyritic hornblende biotite granodiorite and potassium feldspar phenocrysts. Intrudes the Echo Lake Granodiorite, Burnside Lake Adamellite, informal Lovers Leap granodiorite of Loomis (1981), Freel Peak Granodiorite (new name), and quartz diorite of Jobs Canyon. Age is Late Cretaceous based on a potassium-argon age of 87 Ma.

Buck Creek Quarry Member of the Scotch Grove Formation

Early Silurian (Wenlockian)
Iowa
Iowa shelf

Johnson, M.E., 1983, New member names for the Lower Silurian Hopkinton Dolomite of eastern Iowa: Iowa Academy of Science Proceedings, v. 90, no. 1, p. 13–18.

Type section: Buck Creek quarry, east edge of the village of Buck Creek, NE¼NW¼ sec. 20, T. 87 N., R. 4 W., Delaware County, Iowa.

Previously divided on the basis of paleontologic units, the Hopkinton Dolomite is here divided into lithologic members to facilitate interregional correlations based on sea-level curves. Rocks formerly called the *Pentameroides* Beds, as well as the problematical *Goniophyllum* and *Callipentamerus* Beds, of the Hopkinton, are here named the Buck Creek Quarry Member, the uppermost member of the Hopkinton Dolomite in eastern Iowa. Consists of mottled-gray to light-brown thick-bedded to massive, finely crystalline dolomite containing numerous white chert horizons. The brachiopod *Pentameroides* is abundant throughout the member. Overlies the Welton Member (new name); underlies the Gower Formation. Thickness at the type section is 16.5 m. Age is Early Silurian (Wenlockian).

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

The Johns Creek Quarry, Welton, and Buck Creek Quarry Members, all new names of Johnson (1983), are here reassigned from the upper part of the Hopkinton Dolomite to the lower part of the Scotch Grove Formation (new name), a unit defined between the Hopkinton and the Gower Formation, for the purpose of preserving the original definitions of these units. Underlies and extends laterally into the Fawn Creek, Waubeek, and Palisades-Kepler Members (all new names) of the Scotch Grove. Age is Early Silurian (Wenlockian).

Buck Mountain Shut-ins Formation of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: SE1/4 sec. 33, T. 34 N., R. 3 E., St. Francois Mountains, Ironton quadrangle, Iron County, Mo. Named for Buck Mountain Shut-ins, Iron County.

The Buck Mountain andesite flows and tuffs of Anderson (1962), the tuffs of Mill Creek and Lake Springs, and Unit A, the base of the tuff of Stouts Creek of Anderson (1970), are here named the Buck Mountain Shut-ins Formation in the western St. Francois Mountains, Mo. Consists of black andesitic lava flows containing white plagioclase phenocrysts interbedded with rhyolitic air-fall tuff and ash-flow tuff. Overlies the Pond Ridge Rhyolite (new name); underlies the Ironton Rhyolite (new name). Thickness ranges from 80 to 1,000 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Buck Mountain Shut-ins Formation.

Burleigh Hill Member of the Rochester Shale

Middle Silurian (Wenlockian)
Ontario, New York
Appalachian basin

Brett, C.E., 1983, Stratigraphy and facies relationships of the Silurian Rochester Shale (Wenlockian; Clinton Group) in New York State and Ontario: Rochester Academy of Science Proceedings, Centennial Colloquium Issue, v. 15, no. 2, p. 118–141.

Type locality: Road cuts on both sides of Burleigh Hill Drive, Thorold, Ontario, Canada.

The Burleigh Hill Member of the Rochester Shale, here named, is in the area from Grimsby, Ontario, Canada, to Lockport, N.Y. Consists of sparsely fosssiliferous gray, weathering to white, platy, well-laminated shale containing thin micritic limestone interbeds. Comprises the upper calcareous portion of the Rochester Shale and sharply overlies the bryozoa beds or unit E of the Lewiston Member (new name); gradationally underlies the DeCew Dolostone or grades laterally into the transitional Gates Member (of Chadwick, 1918) of the Rochester in Moore County, N.Y. Thickness is 11.2 m at the type locality. Age is Middle Silurian (Wenlockian).

Butlers Bluff Member of the **Nassawadox Formation**

Pleistocene
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Chesapeake Bay cliffs at Butlers Bluff between Picketts Harbor and Penn Central Railroad ferry landing, southern tip of Delmarva Peninsula, Northampton County, Va. Principal reference section: Borehole Ch-11, Nassawadox Formation type section.

The Butlers Bluff Member is here named the middle member of the Nassawadox Formation (new name) in the southern Delmarva upland in Virginia. Consists of pale-gray to yellowish-gray fossiliferous, fine to coarse, pebbly, clean, crossbedded sand. Conformably to disconformably overlies the Stumptown Member (new name) of the Nassawadox; extends westward in the subsurface beneath the Franktown plain where it conformably to disconformably underlies the Occohannock Member (new name) of the Nassawadox; forms the upper part of the Nassawadox in the southern Delmarva upland. May be equivalent in age to or may be truncated by the Joynes Neck Sand (new name). Thickness at the type section ranges from 25 to 30 ft. Age is Pleistocene.

Calispell Lake Member of the Tiger Formation

Eocene, Oligocene, Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Exposures in north-facing roadcut, NE¼SE¼ sec. 2, T. 32 N., R. 42 E., Pend Oreille County, Wash. Reference locality: Exposures along the West Calispell Lake Road, SW¼SW¼ sec. 1 and W½NW¼ sec. 12, T. 32 N., R. 42 E., Pend Oreille County.

The Calispell Lake Member, here named, is in the revised Tiger Formation in the Cusick region, northeastern Washington. Consists of polymictic conglomerate interbedded with rippled and laminated fine-grained sandstone, siltstone, and clay. Conformably and unconformably overlies the Winchester Creek Member (new name) of the Tiger. Correlates with the Jared Member (new name) and records erosion of older Tiger strata. Thickness is 350 m. Age ranges from early middle Eocene, based on inclusions of late early to early middle Eocene volcanic rock clasts, through middle Miocene based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Camp Creek Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Roadcut outcrops along the Fairburn-Jonesboro Road (Georgia Highway 138) on both sides of Camp Creek, Riverdale 7.5-minute quadrangle, Clayton County, Ga.

The Camp Creek Formation, here named, is the youngest unit of the Atlanta Group (new name) in the Newnan-Tucker synform near Atlanta, Ga. Consists of massive granite gneisses interlayered with thin fine-grained, dark-green hornblende-plagioclase amphibolites. Gradationally overlies the Big Cotton Indian Formation (new name) of the Atlanta; sharply and conformably overlies the Clarkston and Intrenchment Creek Formations (new names) of the Atlanta. Is intruded by the Union City Complex (new name) and Palmetto Granite. Thickness ranges from 600 to 3,000 m. Age is Late Proterozoic and (or) early Paleozoic.

Canada Pilares Member of the Zia Sand

Miocene (Hemingfordian)
New Mexico
San Juan basin

Gawne, C.E., 1981, Sedimentology and stratigraphy of the Miocene Zia Sand of New Mexico: Summary: Geological Society of America Bulletin, v. 92, no. 12, pt. I, p. 999–1007.

Type section: North side of Canada Pilares, sec. 12, T. 12 N., R. 1 W., and sec. 7, T. 12 N., R. 1 E., Sky Village and Sky Village SE 7.5-minute quadrangles, Sandoval County, N. Mex.

The Canada Pilares Member, here named, is the upper member of the Zia Sand in the San Juan basin, New Mexico. Consists of interbedded red clay and pink sandstone and represents a flood-plain deposit. Unconformably overlies the reddish silt, sand, and clay of the Chamisa Mesa Member of the Zia; underlies pink sand of beds equivalent to the Pojoaque Member of the Tesuque Formation. Thickness is 29 m at the type section. Age is Miocene (early Hemingfordian).

Cando Formation of the Coleharbor Group

Pleistocene (pre-Wisconsinan or Wisconsinan)
North Dakota
Williston basin

Bluemle, J.P., 1984, Geology of Towner County, North Dakota: North Dakota Geological Survey Bulletin 79, pt. I, p. 1–44.

Type locality: None designated. Named for the town of Cando, Towner County, N. Dak.

The Cando Formation of the Coleharbor Group, here named, was informally named by Howard Hobbs in an unpublished study of the glacial stratigraphy of northeastern North Dakota. Is the lowermost of five glacial till formations representing separate advances of glacial ice in Towner County and is widely preserved in the subsurface. Consists of till; stratified silt, sand, and gravel; and shale breccia. Is olive gray where unoxidized and buff to olive brown where oxidized. Unconformably overlies the Cretaceous Pierre Formation or older Pleistocene glacial sediments; underlies the Vang Formation (new name) or the Gardar and Dahlen Formations, all of the Coleharbor. Thickness of the till is less than 20 ft. Age is Pleistocene (pre- or early Wisconsinan).

Canyon Creek Drift

Pleistocene
Washington
Western Columbia basin

Mundorff, M.J., 1984, Glaciation in the lower Lewis River basin, southwestern Cascade Range, Washington: Northwest Science, v. 58, no. 4, p. 269–281.

Type area: Canyon Creek valley, Clark County, Wash.

Drift and till deposits at altitudes ranging down to about 460 m in the valleys of Canyon Creek and Siouxon Creek and their tributaries, Clark County, Wash., are here named the Canyon Creek Drift. Consists of moraine and cobbly and bouldery till that has a gray sandy and clayey matrix. Probably represents an early event during the Fraser glaciation. Age is late Pleistocene (60 ka)—much younger than the Amboy Drift (new name).

Canyon Range Formation

Cretaceous and Tertiary
Utah
Great Basin province

Holladay, J.C., 1984, Geology of the northern Canyon Range, Millard and Juab Counties, Utah: Brigham Young University Geology Studies, v. 31, pt. 1, p. 1–28.

Type section: Spur north of Cow Canyon extending from N½SW¼ sec. 24, T. 16 S., R. 2 W., west into unsurveyed Fishlake National Forest, northern Canyon Range, Juab County, Utah.

Rocks formerly assigned to the Indianola Group by Christiansen (1952), and later called the informal Canyon Range formation by Stolle (1978), are here named the Canyon Range Formation and are subdivided into informal lower, middle, and upper members, as defined by Christiansen (1952). The lower member, equivalent to the lower part of Stolle's unit A, consists of coarse conglomerate that has Paleozoic limestone clasts in a red matrix, and ranges from 265 to 414 m in thickness. The middle member, equivalent to the upper part of Stolle's unit A, consists of a resistant quartzite clast conglomerate that has a red sand matrix, and ranges from 125 to 600 m in thickness. The upper member, equivalent to Stolle's unit B, consists of more than 1,200 m of cobble and pebble conglomerate, coarse sandstone, siltstone, shale, and nonmarine limestone. Unconformably overlies Late(?) Cambrian carbonates; unconformably underlies the Tertiary red beds of Wide Canyon. Age is Cretaceous and Tertiary.

Carruthers Coal Member of the Floris Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Road cut in the NW¼NW¼SE¼ sec. 3, T. 73 N., R. 20 W., Lucas County, Iowa. Named for Carruthers Creek in northeastern Lucas County.

The uppermost coal of the Floris Formation (new name) of the Cherokee Group is here named the Carruthers Coal Member. Overlies mudstone of the Floris; underlies dark-gray clay shale containing brachiopods and pelecypods. Has been correlated with the Wiley coal of

Illinois, but an unnamed coal below the Carruthers is probably equivalent to the Wiley; the Carruthers may instead be equivalent to the Greenbush-Dekovan coals of Illinois. Thickness at the type section is 1.4 ft and ranges from a smut to 2.8 ft. Age is Middle Pennsylvanian (early Desmoinesian).

Carson Desert Formation

Pleistocene and Holocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type area: Carson Desert, Churchill County, Nev.
Subunits: Upsal Hogback Bed, Soda Lake Bed.

The Carson Desert Formation, here named, comprises the deposits of two vents in the Carson Desert northwest of Fallon in the Lake Lahontan area, Nevada. The older vent, Upsal Hogback, consists of at least five cinder cones or tuff rings, and the younger vent, Soda Lake, is a classic tuff ring that has a lake in its center. Tephra from these vents are named the Upsal Hogback and Soda Lake Beds (new names). Age is Pleistocene and Holocene, 35 to 6 ka.

Carson Sink Bed of the Mono Basin Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 3 of Morrison (1964), west bank of Carson River at the south edge of Carson Sink, NE¼NW¼ sec. 30, T. 21 N., R. 30 E., Churchill County, Nev.

The Carson Sink Bed, here named, is found as an ashy parting in the Mono Basin Formation (new name) in the Carson Desert of the Lake Lahontan area, Nevada. Tephra contains glass-encased biotite phenocrysts and is similar to the Salt Wells Member (new name) of the Mono Basin Formation but is much older. Interfingers with the lower member of the Sehoo Formation. Overlies the Pelican Island Bed (new name) of the Pyramid Lake Member (new name) of the Mount Mazama Formation and the Marble Bluff Bed (new name); underlies the Timber Lake Bed (new name) of the Pyramid Lake. Age is Pleistocene, 35 to 11.5 ka.

Carthage Member of the **Tres Hermanos Formation**

Late Cretaceous (Turonian)
New Mexico
Orogrande basin

Hook, S.C., Molenaar, C.M., and Cobban, W.A., 1983, Stratigraphy and revision of nomenclature of upper Cenomanian to Turonian (Upper Cretaceous) rocks of west-central New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 185, p. 7–28.

Type section: SE¼SE¼ sec. 8 and NE¼NE¼ sec. 17, T. 5 S., R. 2 E., San Antonio quadrangle, Socorro County, N. Mex. Named for the town of Carthage, 16 mi southeast of Socorro.

The Carthage Member, here named, is the middle member of the Tres Hermanos Formation, which is raised in stratigraphic rank in the Orogrande basin, New Mexico. Consists of gray to buff fine- to very fine grained, calcareous sandstone and dark-gray partly carbonaceous shale and siltstone. Sandstones are paludal-lacustrine or crevasse-splay bay-fill types, deposited on a broad, low-relief coastal or delta plain. Overlies the Atarque Sandstone Member (formerly assigned to the Mesaverde Formation) and underlies the Fite Ranch Sandstone Member (new name), both of the Tres Hermanos. Intertongues with the Mancos Shale. Thickness at the type section is 116 ft and ranges from 100 to 225 ft. Age is Late Cretaceous (late middle and earliest late Turonian) based on the ages of underlying and overlying rock.

Carvers Gap Granulite Gneiss

Middle Proterozoic
North Carolina, Tennessee
Piedmont-Blue Ridge province

Gulley, G.L., 1985, A Proterozoic granulite-facies terrane on Roan Mountain, western Blue Ridge belt, North Carolina-Tennessee: Geological Society of America Bulletin, v. 96, no. 11, p. 1428–1439.

Type locality: Exposures along an access road at its intersection with Tennessee State Highway 143 and North Carolina State Highway 261 at Carvers Gap, Carvers Gap 7.5-minute quadrangle, Mitchell County, N.C.

The Carvers Gap Granulite Gneiss is here named for outcrops at Carvers Gap on Roan Mountain in the Elk River massif in the Blue Ridge of North Carolina and Tennessee. Consists of four intergradational units: layered granulite gneiss, massive granulite gneiss, layered amphibolite gneiss, and nonlayered amphibolite gneiss as well as granitoid segregations and pyroxenite nodules. Is intruded by dikes of Late Proterozoic Bakersville Gabbro. Age is Middle Proterozoic based on rubidium-strontium ages.

Cazier Canyon Agglomerate

Oligocene
Utah
Great Basin province

Meibos, L.C., 1983, Structure and stratigraphy of the Nephi NW 7.5-minute quadrangle, Juab County, Utah: Brigham Young University Geology Studies, v. 30, pt. 1, p. 37–58.

Type section: Exposures in Cazier Canyon, NE¼ sec. 23, T. 12 S., R. 1 W., Nephi NW 7.5-minute quadrangle, Juab County, Utah.

The Cazier Canyon Agglomerate, here named, is in the Great Basin province, Utah. Consists of dark-red and light- to grayish-pink angular to subangular, poorly sorted, poorly bedded, volcanic clasts of andesite and latite and minor amounts of quartzite clasts. Forms steep ledges and cliffs. Unconformably overlies the Copperopolis Latite; underlies Quaternary alluvium or colluvium. Thickness is 230 m at the type section. Age is Oligocene.

Cedar Bluff Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: NE¼NW¼ sec. 3, T. 33 N., R. 3 E., western St. Francois Mountains, Ironton quadrangle, Iron County, Mo. Named for Cedar Bluff School, near exposures 2 mi west of Ironton.

Rocks called Cedar Bluff rhyolite and undifferentiated felsite by Anderson (1962, 1970) are here named the Cedar Bluff Rhyolite in the western St. Francois Mountains, Mo. Consists of brownish-maroon to grayish ash-flow tuff containing white plagioclase phenocrysts. Overlies the Shepherd Mountain Rhyolite (new name); underlies the Pond Ridge Rhyolite (new name). Thickness is 580 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Cedar Bluff Rhyolite.

Cedar Lake Quartzite Member of the Mud Creek Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: Exposures at Cedar Lake, northwest of Winston, Winston 7.5-minute quadrangle, Douglas County, Ga.

The Cedar Lake Quartzite Member of the Mud Creek Formation (new name) of the New Georgia Group (new name), here named, is in the Villa Rica antiform on the northwest flank of the Austell-Frolona antiform in west-central Georgia. Consists of quartzite interlayered with amphibolite as well as layers and disseminated grains of magnetite and specular hematite representing a metamorphosed banded iron formation. Thickness ranges from 1 to 4 m. Interfingers with the Villa Rica Gneiss Member (new name) of the Mud Creek. Grades into the stratigraphically overlying but structurally underlying Andy Mountain Formation (new name) and Bill Arp Formation (new name) of the informal Roosterville group. Age is Proterozoic(?).

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Age of the New Georgia Group is Late Proterozoic and (or) early Paleozoic.

Cereza Peak Shale Member of the Peace Valley Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Exposure at the base of Cherry Peak, east of California Highway 99, about 17 km north of Castaic, Los Angeles County, Calif. Cereza is Spanish for cherry and is used because the name Cherry Peak is preoccupied as a stratigraphic name.

The Cereza Peak Shale Member, here named, is in the Peace Valley Formation, redefined, of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif., where clastic tongues of the Ridge

Route Formation divide the Peace Valley into five members. Consists of dark-gray shale and blue-gray mudstone containing minor amounts of sandstone interbeds as well as plant, ostracode, and fish fossils. A floral assemblage from the Cereza Peak is representative of a semiarid to subhumid climate. Lateral extent of the unit is 5,540 m. Interfingers with the Ridge Route Formation undivided to the northeast and the Violin Breccia to the southwest. Conformably overlies the Frenchman Flat Sandstone Member (new name) and conformably underlies the Piru Gorge Sandstone Member, redefined, both of the Ridge Route. Thickness at the type section is 914 m and attains 940 m. Age is late Miocene based on fossils.

Chandler Bridge Formation

Oligocene (Chattian)
South Carolina
Atlantic Coast basin

Sanders, A.E., Weems, R.E., and Lemon, E.M., Jr., 1982, Chandler Bridge Formation—A new Oligocene stratigraphic unit in the lower coastal plain of South Carolina: U.S. Geological Survey Bulletin 1529–H, p. H105–H124.

Type section: Charleston Museum paleontologic excavation site 0.7 km northwest of the confluence of Chandler Bridge Creek and Eagle Creek, Stallsville quadrangle, Dorchester County, S.C.

A thin sequence of noncalcareous arenaceous beds in Dorchester, Berkeley, and Charleston Counties, S.C., is here named the Chandler Bridge Formation. Includes three conformable beds: a basal yellowish-brown clayey, quartz-phosphate sand; a middle gray clayey, poorly compacted, quartz-phosphate sand; and an upper gray clayey, well-compacted, quartz-phosphate sand. Disconformably overlies the Ashley Member of the Cooper Formation; disconformably underlies surficial Pleistocene deposits. Thickness is 5 m. Age is late Oligocene (Chattian) based on cetacean fauna.

Chapel Branch Member of the Santee Limestone

Eocene
South Carolina
Atlantic Coast basin

Powell, R.J., 1984, Lithostratigraphy, depositional environment, and sequence framework of the middle Eocene Santee Limestone, South Carolina Coastal Plain: Southeastern Geology, v. 25, no. 2, p. 79–100.

Type section: South shore of Lake Marion, 1.5 mi northwest of U.S. Highway 301 crossing, Santee State Park; access by unnumbered paved road, 1.5 mi east of crossing of County Roads 105 and 82, Orangeburg County, S.C. Named for nearby stream called Chapel Branch.

The Chapel Branch Member of the Santee Limestone, a foraminiferal biomicrite lithofacies, is here named for outcrops along the south shore of Lake Marion in Orangeburg and Calhoun Counties, S.C. Consists of yellowish-gray homogeneous matrix-supported foraminifera, ostracodes, echinoids, and mollusks and has traces of bryozoa. Is laterally equivalent to other lithofacies in the Santee; grades down-dip into bryozoan biosparrudite-biomicrudite facies. Stratigraphically underlies the Caw Caw Member of the Santee, a molluskan-mold mudstone facies. Thickness at the type section is 7.5 ft. Age is middle Eocene.

Chatsworth Formation

Late Cretaceous (Campanian to Maastrichtian)
California
Los Angeles basin, Ventura basin

Colburn, I.P., Saul, L.E.R., and Almgren, A.A., 1981, The Chatsworth Formation: A new formation name for the Upper Cretaceous strata of the Simi Hills, California, *in* Link, M.H., Squires, R.L., and Colburn, I.P., eds., Simi Hills Cretaceous turbidites, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, p. 9–16.

Type section: Exposures along Woolsey Canyon Road and Black Canyon Road from Valley Circle Boulevard to the base of the Simi Conglomerate in Santa Susana Knolls, eastern Simi Hills, Los Angeles and Ventura Counties, Calif. Named for the community of Chatsworth, Los Angeles County.

Beds in the Simi Hills previously referred to as the Chico Formation, a name originally applied to all the Upper Cretaceous strata in California, are here named the Chatsworth Formation. Consists of four principal lithosomes composed of turbidite sandstone and interbedded hemipelagic mudstone described by Colburn (1973) as Descriptive Facies I, II, III, and IV. Deposition under shallow, littoral conditions is suggested by meager faunas. Base of the unit is not exposed; older beds unconformably underlie Miocene strata; younger beds concordantly or unconformably underlie the lower(?) Tertiary Simi Conglomerate. Thickness is more than 1,830 m. Age is Late Cretaceous (middle Campanian to early Maastrichtian) based on mollusks.

Chavez Canyon Member of the Spears Formation of the Datil Group

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Chavez Canyon, 17 mi northeast of Datil, 0.6 mi north of Chavez well, S½ sec. 27, T. 2 N., R. 8 W., northwest Gallinas Mountains, Dog Springs 7.5-minute quadrangle, Socorro County, N. Mex.

The Chavez Canyon Member, here named, is the middle member of the Spears Formation of the Datil Group in the northwest Gallinas Mountains, southwestern New Mexico. Consists of a lower feldspathic sandstone unit and an overlying volcaniclastic conglomerate unit containing a few debris flows. Overlies the Dog Springs Member (new name) of the Spears Formation; underlies the Rock House Canyon Tuff (new name) of the Datil Group. Is split locally into two parts by the interbedded Datil Well Tuff (new name) of the Datil Group. Thickness at the type section is 416 ft and attains 1,000 ft. Age is Oligocene.

Cheeneetnuk Limestone

Early(?) and Middle Devonian
Alaska
Holitna basin

Blodgett, R.B., and Gilbert, W.G., 1983, The Cheeneetnuk Limestone, a new Early(?) to Middle Devonian formation in the McGrath A–4 and A–5 quadrangles, west-central Alaska: Alaska Division of Geological and Geophysical Surveys, Professional Report 85, p. 1–6.

Type section: Exposures along the northwest bank of the southwest-flowing Cheeneetnuk River, secs. 16 and 21, T. 23 N., R. 32 W., Seward Meridian, McGrath A–5 quadrangle, Alaska.

The Cheeneetnuk Limestone, here named, is equivalent to unit mDlc of Gilbert (1981) and forms the uppermost horizon within an Ordovician to Middle Devonian carbonate-platform sequence exposed on the north side of the Farewell fault in the McGrath A–4 and A–5 quadrangles, Alaska. Consists of dark-gray well-bedded, argillaceous, micritic limestone. Conformably overlies unnamed dolomite of unit lDd of Gilbert (1981); conformably underlies unnamed argillite and chert of unit uPzac of Gilbert (1981). Thickness is 457 m at the type section. Fossils in the upper part of the formation are early Middle Devonian (Eifelian); the lack of fossils in the lower part makes a positive age determination impossible, but the relative total thickness suggests that the base of the formation extends into the Lower Devonian.

Chenoweth Formation of the Dalles Group

Miocene and Pliocene(?)
Oregon
Eastern Columbia basin

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C., Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, v. 43, no. 10, p. 131–140.

Reference sections: Badger Creek and Chenoweth Rim section, NE¼ sec. 30, T. 2 N., R. 13 E.; Government Flat section, NE¼ sec. 10, T. 1 N., R. 12 E., Wasco County, Oreg. Named for Chenoweth Creek, west of The Dalles, T. 2 N., R. 13 E.

Volcaniclastic debris fan deposits consisting of interbedded agglomerate, tuff breccia, tuff, lahars, and clastics in The Dalles basin are here named the Chenoweth Formation of the Dalles Group. Overlies the Priest Rapids and Frenchman Springs Members of the Wanapum Basalt; underlies Quaternary rocks. Age is late Miocene and early Pliocene(?) based on potassium-argon and vertebrate fossil dates.

Chestatee Member of the Canton Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

German, J.M., 1985, The geology of the northeastern portion of the Dahlonega gold belt: Georgia Geologic Survey Bulletin 100, p. 1–41.

Type locality: Exposures along Chestatee River in Murrayville quadrangle, Lumpkin County, Ga.

The Chestatee Member of the Canton Formation, here named, is in the Dahlonega area in Georgia and was previously mapped as the Roan Gneiss by Keith (1909). Consists of amphibolite, hornblende-plagioclase gneiss, muscovite-biotite-quartz-plagioclase gneiss, and muscovite-pyrite-plagioclase-quartz gneiss. Lies in sharp contact with metagraywacke of the Helen Member (new name) of the Canton to the southeast and in fault contact with biotite-quartz schist of the Palmer Creek Member (new name) of the Canton to the northwest. Age is Late Proterozoic and (or) early Paleozoic.

Chestnut Hill Formation

Late Proterozoic
Pennsylvania, New Jersey
Appalachian basin

Drake, A.A., Jr., 1984, The Reading Prong of New Jersey and eastern Pennsylvania—An appraisal of rock relations and chemistry of a major Proterozoic terrane in the Appalachians: Geological Society of America Special Paper 194, p. 75–126.

Type locality: Exposures on Chestnut Hill along the west bank of the Delaware River, Easton 7.5-minute quadrangle, Northampton County, Pa.

The Chestnut Hill Formation, here named, is a poorly exposed sequence of arkose, ferruginous quartzite, quartzite, conglomerate, metarhyolite, and metasaprolite along the north border of the Reading Prong on Chestnut Hill, Pa., and Marble Mountain, N.J. Was previously included in the Pickering Gneiss by Bayley (1941) and in the Moravian Heights Formation by Fraser (1939). Overlies other metasedimentary and metavolcanic rocks of the Reading Prong and differs from them in that bedding can be recognized and it is of lower metamorphic grade. Age is probably Late Proterozoic.

Chicken Ridge Sandstone Member of the **Kanawha Formation**

Middle Pennsylvanian
Virginia
Appalachian basin

Englund, K.J., 1981, Geologic map of the Jewell Ridge quadrangle, Virginia: U.S. Geological Survey Geologic Quadrangle Map GQ–1550, scale 1:24,000.

Type locality: Exposures on State Route 636 at the head of Jewell Branch, Jewell Ridge quadrangle, Buchanan County, southwestern Virginia.

The Chicken Ridge Sandstone Member of the Kanawha Formation, here named, is in the Jewell Ridge quadrangle in Buchanan and Tazewell Counties, Va. Occurs near the base of the Kanawha and underlies 4 ft of shale and underclay beneath the Bearwallow coal bed. Thickness is 20 ft. Age is Middle Pennsylvanian.

Chicora Member of the Williamsburg Formation of the Black Mingo Group

Paleocene (Thanetian)
South Carolina
Atlantic Coast basin

Van Nieuwenhuise, D.S., and Colquhoun, D.J., 1982, The Paleocene-lower Eocene Black Mingo Group of the east central Coastal Plain of South Carolina: South Carolina Geology, v. 26, no. 2, p. 47–67.

Type section: Outcrops along the south bank of the Santee River just downstream from Wilsons Landing, Chicora 7.5-minute quadrangle, Berkeley County, S.C.

The Chicora Member, here named, is the upper member of the Williamsburg Formation of the Black Mingo Group in the South Carolina Coastal Plain. As revised, the Black Mingo Group includes all the strata from the base of the Paleocene to the top of the Ypresian Stage of the Eocene and is divided into the Rhems Formation of the Danian Stage, the Williamsburg Formation of the Thanetian Stage, and unnamed Ypresian strata. [Of the Clubhouse Crossroads corehole Number 1, Gohn and others (1978) assigned the entire Paleocene section to the Black Mingo Formation, and Gohn and others (1983) named the Ypresian strata the Fishburne Formation (new name).] The Chicora Member consists of glauconitic, argillaceous, fossiliferous sand and indurated mollusk-rich limestone. Gradationally overlies the Lower Bridge Member (new name) of the Williamsburg; unconformably underlies unnamed Ypresian strata of the Black Mingo Group. Thickness at the type section is 8 ft. Age is late Paleocene (Thanetian).

Chilton Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: DePere Site, gravel pit north of Brown County Highway X near the top of the Silurian escarpment, southeast corner of sec. 38, T. 23 N., R. 20 E., DePere 7.5-minute quadrangle, Brown County, Wis. Named for the city of Chilton, Calumet County.

Following the informal usage of McCartney and Mickelson (1982), the Chilton Member of the Kewaunee Formation (new name), here named, is on the east side of the Green Bay Lobe in Wisconsin. Consists of reddish-brown sand, silt, and clay till. Distinctly overlies the Branch River Member (new name) of the Kewaunee or the Horicon Formation (new name); abruptly underlies the Glenmore Member (new name) of the Kewaunee or lies at the surface. The contact with the equivalent Kirby Lake Member (new name) of the Kewaunee on the west side of the Green Bay Lobe is an arbitrarily drawn vertical cutoff at the Fox River. Is also equivalent to the Haven Member (new name) and Valders Member of the Kewaunee in the Lake Michigan Lobe. Thickness ranges from 1 to 3 m. Age is late Pleistocene (late Wisconsinan).

Chowan River Formation of the **Chesapeake Group**

Pliocene
North Carolina, Virginia
Atlantic Coast basin

Blackwelder, B.W., 1981, Stratigraphy of upper Pliocene and lower Pleistocene marine and estuarine deposits of northeastern North Carolina: U.S. Geological Survey Bulletin 1502–B, 16 p.

Type section: Bluffs on the Chowan River 250 m downstream from Colerain Beach, Bertie County, N.C.
Subunits: **Edenhouse Member** (North Carolina, Virginia), **Colerain Beach Member** (North Carolina).

Sand and silt deposits previously mapped as the upper Pliocene Chowan River beds of the Yorktown Formation and the upper Pliocene part of the Croatan Formation, here abandoned, are here named the Chowan River Formation of the Chesapeake Group. Extends north from the Pamlico River near Aurora, N.C., to near Norfolk, Va., and represents an unconformity bounded late Pliocene marine transgression and regression in the Coastal Plain. Consists of marine shelly, silty sand and estuarine-laminated and trough-crossbedded clayey, silty sand. Is divided into the lower Edenhouse Member (new name) in North Carolina and Virginia and the upper Colerain Beach Member (new name) in North Carolina. Transitionally to unconformably overlies the Morgarts Beach Member of the Yorktown Formation; unconformably underlies the James City Formation or sand and gravel deposits assigned to the Windsor Formation(?) of Coch (1968). Thickness is 4.2 m at the type section. Age is late Pliocene based on corals.

Chumstick Formation

Eocene
Washington
Northern Cascade Range-Okanogan province

Gresens, R.L., Naeser, C.W., and Whetten, J.W., 1981, Stratigraphy and age of the Chumstick and Wenatchee Formations: Tertiary fluvial and lacustrine rocks, Chiwaukum graben, Washington: Geological Society of America Bulletin, v. 92, no. 5, pt. I, p. 233–236; pt. II, p. 841–876.

Type section: Exposures along Eagle Creek beginning at its confluence with Chumstick Creek, sec. 31, T. 25 N., R. 18 E., and extending northeast to sec. 20, T. 25 N., R. 19 E., north of Leavenworth, Chelan County, Wash.
Subunit: **Nahahum Canyon Member.**

Previously called the informal Camas sandstone, an upper sedimentary unit of the Swauk Formation, by Russell (1900), the Chumstick Formation is here named following the informal usage of Buza (1976). Occurs in the Chiwaukum graben in the central Cascade Range of Washington. Consists of whitish to buff-gray crossbedded to massive, feldspathic and pebbly sandstone of fluvial origin interbedded with conglomerate, shale, and minor amounts of tuff. Fanglomerates occur at the base and along the margins. Includes the fine-grained lacustrine Nahahum Canyon Member (new name) in the upper part. Lies in the Chiwaukum graben and is bounded by the Leavenworth and Entiat faults, both active during the deposition of the Chumstick. Unconformably overlies weathered crystalline basement Swakane Biotite Gneiss; unconformably underlies the Wenatchee Formation (new name). Thickness at the type section is 5,800 m but is extremely variable elsewhere. Age is middle Eocene based on a fission-track age of 45 Ma from zircon in tuff.

Clairmont Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Exposures at the intersection of Clairmont Road and Interstate Highway I–85, Northeast Atlanta 7.5-minute quadrangle, De Kalb County, Ga.

The Clairmont Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga., and consists of well-foliated, contorted, porphyroblastic, biotite-plagioclase gneiss interlayered with amphibolite. Contacts with the underlying Norcross Gneiss (new name) and overlying Wahoo Creek Formation (new name), both of the Atlanta, are conformable and gradational. Is in sharp contact with the Wolf Creek and Promised Land Formations (both new names) of the Atlanta. Correlates with part of the Senoia Formation (new name) of the Atlanta. Thickness ranges from 500 to 1,500 m. Age is late Late Proterozoic and (or) Paleozoic.

Clarkston Formation of the **Atlanta Group**

Late Proterozoic and (or) early Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type section: Outcrops along the Georgia Railroad and East Ponce de Leon Avenue (Stone Mountain Highway) from Clarkston to Mountain Industrial Boulevard, Clarkston, Stone Mountain 7.5-minute quadrangle, Fulton County, Ga.
Subunits: **Fairburn Member, Tar Creek Member.**

The Clarkston Formation of the Atlanta Group (new name) is here named. On the northwest limb of the Newnan-Tucker synform near Atlanta, Ga., it is divided into the lower Fairburn Member (new name) and the upper Tar Creek Member (new name). Consists of interlayered purple-pink-weathering muscovite schist and ocher-weathering hornblende-plagioclase amphibolite. Overlies the Wahoo Creek Formation or Stonewall Formation (both new names) of the Atlanta with sharp and probably conformable contact. Gradationally underlies the Big Cotton Indian Formation (new name) of the Atlanta in the northeast; elsewhere underlies the Intrenchment Creek Formation and Camp Creek Formation (both new names) of the Atlanta with sharp and conformable contact. Thickness ranges from 800 to 2,500 m. Age is Late Proterozoic and (or) early Paleozoic.

Cliffland Coal Member of the Kalo Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Abandoned railroad cut in NE¼NE¼SE¼, sec. 18, T. 71 N., R. 12 W., Wapello County, Iowa. Named for the town of Cliffland.

The Cliffland Coal Member, here named, is the upper of two coal members of the Kalo Formation (new name) of the Cherokee Group in south-central Iowa. At the type section and to the west, consists of two coal beds separated by about 15 ft of silty shale. Combined thickness of the two beds at the type section is 4.8 ft. Where a single bed is present, thickness varies from 2 in. to 6.3 ft. Overlies a sequence of thinly interbedded shale, siltstone, and sandstone above the Blackoak Coal Member (new name). Underlies a similar sequence below the Floris Formation (new name). Age is Middle Pennsylvanian (early Desmoinesian).

Cliff Ridge Member of the Tiger Formation

Eocene, Oligocene, Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Exposures along Nofs Creek Road on the south flank of Cliff Ridge, SE¼ sec. 25, T. 34 N., R. 40 E., and SW¼SW¼ sec. 30, and N½NW¼ sec. 31, T. 34 N., R. 41 E., Pend Oreille County, Wash.

The Cliff Ridge Member, here named, is in the revised Tiger Formation in the Cliff Ridge region, northeastern Washington. Consists of coarse, massive conglomerate composed of greenstone, granite, dolomite, and volcanic rock. Boulder conglomerates are common. Overlies Precambrian greenstone and possibly Cretaceous granite, but has no stratigraphic relationship to other members of the Tiger Formation. Thickness is 400 m at the type section, but may be as much as 1,700 m. Age ranges from early middle Eocene, based on inclusions of late early to early middle Eocene volcanic rock clasts, through middle Miocene, based on middle Miocene faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Clifton Creek Limestone

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Hillside on the east bank of Clifton Creek, 1.8 km northeast of Snow Flake, Looneys Gap quadrangle, Hawkins County, Tenn. Reference section: 1 km northeast of intersection of Laurel Branch Road and State Highway 94, Camelot quadrangle, Hawkins County.

The Clifton Creek Limestone, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., were previously named the Newman Limestone by Hardeman and others (1966) but are isolated from the type Newman Limestone in the Newman Ridge syncline. Consists of gray thick-bedded, finely crystalline limestone and fine-grained oolitic calcarenite. Sharply overlies the Snow Flake Formation (new name); underlies the Gilliam Creek Limestone (new name). Correlates, in part, with the St. Louis Limestone. Thickness is 39 m. Age is Mississippian.

Clinton Member of the Walworth Formation

Pleistocene (Wisconsinan)
Wisconsin, Illinois
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut and test hole along Highway 15 (Beloit-Milwaukee Road), 3.2 km northeast of Clinton, NE¼SW¼ sec. 3, T. 1 N., R. 14 E., Clinton 7.5-minute quadrangle, Rock County, Wis. Named for the village of Clinton.

The Clinton Member, here named, is the upper member of the Walworth Formation (new name), following the informal usage of Fricke (1976), in south-central Wisconsin and northern Illinois. Consists of pebbly, sandy, yellowish-brown till containing little clay. Sharply to gradationally overlies the Allens Grove Member (new name) of the Walworth; sharply underlies the Capron Member of the Zenda Formation (new name) or is exposed at the surface in eastern Rock and western Walworth Counties, Wis. Thickness ranges from less than 1 m to more than 12 m. Age is late Pleistocene (early Wisconsinan or older).

Cloudland Granulite Gneiss

Middle Proterozoic
North Carolina, Tennessee
Piedmont-Blue Ridge province

Gulley, G.L., Jr., 1985, A Proterozoic granulite-facies terrane on Roan Mountain, western Blue Ridge belt, North Carolina-Tennessee: Geological Society of America Bulletin, v. 96, no. 11, p. 1428–1439.

Type locality: Exposures near a parking lot off the access road at the intersection of Tennessee State Highway 143 and North Carolina State Highway 261, from Carvers Gap to the top of Roan Mountain, Bakersville 7.5-minute quadrangle, Mitchell County, N.C. Named for Cloudland resort on Roan Mountain.

The Cloudland Granulite Gneiss, here named, is on Roan Mountain in the Blue Ridge of North Carolina and Tennessee. Consists of granulite gneiss characterized by garnet and aluminum silicate as primary granulite-facies minerals. Is intruded by the Bakersville Gabbro. Age is Middle Proterozoic based on rubidium-strontium ages.

Coal Mine Brook Formation

Middle Pennsylvanian
Massachusetts
New England province

Goldsmith, Richard, Grew, E.S., Hepburn, J.C., and Robinson, G.R., Jr., 1982, Formation names in the Worcester area, Massachusetts: U.S. Geological Survey Bulletin 1529–H, p. H43–H56.

Type locality: Composite of exposures near Franklin and Shrewsbury Streets and at the Worcester coal mine on the property of Notre Dame Institute, Worcester, Worcester County, Mass. Named for Coal Mine Brook, which is near the mine.

Fossiliferous slate and phyllite and garnetiferous phyllite, arkose, and conglomerate at the Worcester coal mine, Worcester, Mass., are here named the Coal Mine Brook Formation. Separated by faulting and unconformity from the underlying Worcester Formation. Thicknesses at the composite type locality are 330 m of phyllite, arkose, and conglomerate and 50 m of slate and phyllite. Age is Middle Pennsylvanian based on flora found in the coal.

Colberg Metavolcanic Rocks of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type locality: None designated. Derivation of name not stated.

A unit here named the Colberg Metavolcanic Rocks of the Phantom Lake Metamorphic Suite crops out in large areas of the northern Medicine Bow Mountains and in the core of the Arrastre anticline in the central Medicine Bow Mountains, Wyo. Consists of a heterogeneous assemblage of metabasalt, metatuff, metagraywacke, paraconglomerate, and quartzite. Deposition may have taken place in alluvial or submarine channels and fans adjacent to fault scarps. Overlies the Bow River Quartzite (new name), underlies the Conical Peak Quartzite (new name), both of the Phantom Lake. Thickness ranges from 100 m to 2,500 m. Age is Archean.

Colerain Beach Member of the **Chowan River Formation** of the **Chesapeake Group**

Pliocene
North Carolina
Atlantic Coast basin

Blackwelder, B.W., 1981, Stratigraphy of upper Pliocene and lower Pleistocene marine and estuarine deposits of northeastern North Carolina: U.S. Geological Survey Bulletin 1502–B, 16 p.

Type section: Bluffs on the Chowan River 250 m downstream from Colerain Beach, Bertie County, N.C.

Upper regressive beds of the Chowan River Formation (new name) of the Chesapeake Group in the Coastal Plain of northeastern North Carolina are here named the Colerain Beach Member. Consists of trough-crossbedded, thickly bedded and thinly laminated sand and silt containing lenses of fossils indicative of estuarine deposition. Transitionally to unconformably overlies the Edenhouse Member (new name) of the Chowan River; sharply and unconformably underlies sand and gravel deposits tentatively assigned to the Windsor Formation(?) of Coch (1968). Thickness is 2.7 m at the type section. Age is late Pliocene based on corals.

Collins Till

Pleistocene (Wisconsinan)
New York
Appalachian basin

Calkin, P.E., Muller, E.H., and Barnes, J.H., 1982, The Gowanda Hospital Interstadial Site, New York: American Journal of Science, v. 282, p. 1110–1142.

Type section: Gowanda Hospital Section, along the left bank of the South Branch, Clear Creek, at the edge of the Gowanda State Hospital grounds, west of U.S. Highway 62 and 4 km north of the village of Gowanda, Erie County, N.Y.

The Collins Till, here named, is in Erie County, N.Y. Consists of red, compact, homogeneous, sparsely pebbly, silty clay till separated from underlying Devonian shale by a reddish-gray till facies modified by assimilated shale. An upper weathered zone, designated the Gowanda Paleosol, is overlain by silt, sand, and gravel. Thickness at the type section is 2.7 m. Age is late Pleistocene (early Wisconsinan).

Comanche Point Member of the Dox Formation of the Unkar Group

Middle Proterozoic
Arizona
Plateau sedimentary province

Stevenson, G.M., and Beus, S.S., 1982, Stratigraphy and depositional setting of the upper Precambrian Dox Formation in Grand Canyon: Geological Society of America Bulletin, v. 93, no. 2, p. 163–173.

Type section: Exposures in the bed of an unnamed creek tributary to Tanner Canyon, 1.6 km west of Comanche Point, a promontory on the southeast side of the Colorado River, eastern Grand Canyon, Vishnu Temple quadrangle, Coconino County, Ariz.

The Comanche Point Member of the Dox Formation of the Unkar Group, here named, is in the eastern Grand Canyon, Arizona. Contains five laterally continuous marker units, each 3 to 12 m thick, consisting of white to greenish-white and lavender interbedded sandstone and mudstone in an otherwise predominantly red-brown slope-forming siltstone that has ripple marks, mudcracks, and salt crystal casts. A dolomitic stromatolite bed occurs directly above the lowest marker unit. Was deposited as a tidal flat complex. Overlies the Solomon Temple Member (new name), and gradationally underlies the Ochoa Point Member (new name), both of the Dox Formation. Thickness at the type section is 155 m. Age is Middle Proterozoic based on the age of the overlying Cardenas Lavas (1.1 Ma).

Conconully Granodiorite

Late Cretaceous
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Society of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Exposures in the West Fork of Salmon Creek basin southwest of Conconully, T. 35 N., R. 24 E., Okanogan County, Wash.

The Conconully Granodiorite, here named, is a postmetamorphic, orthomagmatic pluton of batholithic dimensions in the Okanogan Range, Wash. Consists predominantly of granodiorite but composition ranges from quartz diorite to quartz monzonite. Is subdivided into three mappable phases on the basis of texture and composition: the main phase contains plagioclase, quartz, and pinkish potash feldspar, locally subporphyritic, and is the most widespread variety of rock; the Mineral Hill phase contains potash feldspar megacrysts, as much as 5 cm in diameter, and local green hornblende in a main phase-type groundmass; the Ritchie Ridge phase is similar to the main phase but is finer grained. Weathered nature of the granodiorite distinguishes it from local felsic plutonic rocks except for the Pogue Mountain Quartz Monzonite and the Leader Mountain Granodioritic Gneiss. Intrudes the Salmon Creek Schists and Gneisses, Summit-Frazer Trondhjemitic Gneiss (new name), Leader Mountain Granodioritic Gneiss, and Windy Hill Quartz Dioritic Orthogneiss (new name). Is intruded by the Leader Lake Quartz Monzonite (new name), which may be a later differentiate of the same parent magma. Age is Late Cretaceous.

Conical Peak Quartzite of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt., 2, p. 197–399.

Type area: Conical Peak area, northern Medicine Bow Mountains, T. 18–19 N., R. 79 W., Carbon County, Wyo.

The Conical Peak Quartzite of the Phantom Lake Metamorphic Suite, here named, is in the core of the Foote Creek synclinorium in the northern Medicine Bow Mountains, Wyo. Consists of white, foliated, fine-grained muscovitic subarkose and calcareous quartzite. Large-scale planar crossbeds and bimodal paleocurrents suggest a shallow marine depositional environment. Overlies the Bow River Quartzite (new name) and Colberg Metavolcanic Rocks (new name), both of the Phantom Lake; unconformably underlies the Magnolia Formation of the Deep Lake Group. Exposed stratigraphic thickness is about 800 m. Age is Archean.

Conover Ranch Formation of the **Snowcrest Range Group**

Late Mississippian (Chesterian) and Early Pennsylvanian (Morrowan)
Montana
Montana folded belt province

Wardlaw, B.R., and Pecora, W.C., 1985, New Mississippian-Pennsylvanian stratigraphic units in southwest Montana and adjacent Idaho, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–B, p. B1–B9.

Type section: Exposure 122 m uphill from the northwest bank of Sheep Creek, Conover Ranch, Blacktail Mountains, NE1/4NW1/4 sec. 18, T. 9 S., R. 8 W., Gallagher Mountain 7.5-minute quadrangle, Beaverhead County, Mont.

Rocks previously assigned to the Amsden Formation in southwest Montana are here named the Conover Ranch Formation, the upper formation of the Snowcrest Range Group (new name), in the Tendoy Mountains, Blacktail Mountains, Snowcrest Range, Elkhorn-Boulder Mountains, Tobacco Root Range, and parts of the Gravelly Range and Pioneer Mountains, Mont. Consists of pale-reddish-brown to pale-reddish-purple mudstone containing thin-bedded marine limestone, calcareous sandstone and siltstone, and, locally, carbonate conglomerate, phosphatic claystone, mottled or nodular calcareous mudstone, and recrystallized grainstone. Overlies the Lombard Limestone (new name) of the Snowcrest Range Group; underlies and intertongues with the Quadrant Sandstone. Is equivalent to part of the Tyler Formation, part of the Alaska Bench Limestone of the Amsden Group in central Montana, and part of the Bluebird Mountain Formation in east-central Idaho. Is laterally equivalent to the uppermost part of the Lombard and the lowermost part of the Quadrant. Thickness at the type section is 30.6 m and ranges from 0 to 33 m. Age is commonly Late Mississippian (late Chesterian) (Mamet Foraminifer Zone 19, Sando and Bamber Coral Zone VI), but is Early Pennsylvanian (early Morrowan) along the Jefferson River, where it includes the Mississippian-Pennsylvanian boundary.

Continental Divide Metavolcanic Rocks

Archean
Wyoming
Green River basin

Flurkey, A.J., Houston, R.S., Karlstrom, K.E., and Kratochvil, T.L., 1981, The geology of Archean and Early Proterozoic terranes of the Sierra Madre, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 3, p. 401–541.

Type area: Headwaters of South Spring Creek, North Spring Creek, and Jack Creek, Sierra Madre, Carbon County, Wyo. Derivation of name not stated.

The Continental Divide Metavolcanic Rocks, here named, are in the Sierra Madre, Wyo., and consist of fine-grained amphibolite, metabasalt, and hornblende gneiss containing local quartzite, schist, and marble. Overlies older Archean metasedimentary and metavolcanic rocks; unconformably underlies the Phantom Lake Metamorphic Suite. Thickness is about 360 m. Age is Archean.

Cookson Formation

Early Ordovician
New Brunswick, Maine
New England province

Ruitenberg, A.A., 1967, Stratigraphy, structure and metallization Piskahegan-Rolling Dam area (northern Appalachians, New Brunswick, Canada): Leidse Geologische Mededelingen, v. 40, p. 79–120.

Type locality: Exposures on the north side of Cookson Island in Oak Bay of the St. Croix River, Charlotte County, New Brunswick, Canada.

The Cookson Formation, here named, occurs in the St. David Dome in the Piskahegan-Rolling Dam area of New Brunswick and to the southwest in Maine. Rocks of the Cookson were previously named the Dennis Formation by MacKenzie (1940), but that name is not retained because the quartzitic, intensely metamorphosed Dennis section is not typical of the unit. The Cookson has also been mapped as part of the Dark Argillite Division of the Charlotte Group of MacKenzie and Alcock (1960). Consists of thinly laminated black slate, silty slate, and phyllite containing minor amounts of interbedded quartzite and the metamorphic equivalents of the slates and phyllite. Well-developed slaty cleavage and spotted slates are typical. Separated from the overlying Oak Bay Formation by an erosional unconformity. Age is Early Ordovician based on graptolites.

Cooney Canyon Member of the **Cooney Tuff**

Oligocene
New Mexico
Basin and Range province

Ratte, J.C., 1981, Geologic map of the Mogollon quadrangle, Catron County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ–1557, scale 1:24,000.

Type section: Cooney Canyon of Mineral Creek, S½ sec. 20, T. 10 S., R. 19 W., Mogollon quadrangle, Catron County, N. Mex.

Rocks formerly mapped as the Cooney Quartz Latite by Ferguson (1927) and the upper quartz latitic member of the Cooney Tuff by Ratte and Finnell (1978) are here named the Cooney Canyon Member, the upper member of the Cooney Tuff in Catron County, N. Mex. Consists of rhyolitic to quartz-latitic ash-flow tuff that has multiple simple and compound cooling units, some separated by volcaniclastic sandstone. Tuffs vary from partially welded to densely welded and are petrographically variable, containing phenocrysts of oligoclase-andesine, minor amounts of biotite and opaque oxide, and rare clinopyroxene, zircon, and oxyhornblende in a devitrified cryptocrystalline matrix. Overlies the Whitewater Creek Member of the Cooney Tuff; underlies unnamed volcanic rocks. Thickness is 200 m in Cooney Canyon and ranges from

400 to 500 m on the north side of Whitewater Creek. Age is Oligocene based on a potassium-argon biotite age of 32 Ma.

Cope Hollow Formation of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: Exposures north of the swimming area of Johnson Shut-ins State Park, SW¼NW¼ sec. 16, T. 33 N., R. 2 E., St. Francois Mountains, Johnson Shut-ins quadrangle, Reynolds County, Mo. Named for Cope Hollow.

Rocks described as the upper part of the tuff of Johnson Shut-ins by Anderson (1970) are here named the Cope Hollow Formation in the Taum Sauk Caldera in the western St. Francois Mountains, Mo. Consists of four informal cooling units: (A), black, crossbedded air-fall tuff, 9 m thick; (B), deep-maroon ash-flow tuff, 5 m thick; (C), dark-gray, crossbedded air-fall tuff, 28 m thick; (D), maroon ash-flow tuff, thickness unknown. Overlies the Johnson Shut-ins Rhyolite (new name); is the youngest volcanic unit. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Cope Hollow Formation.

Copper Falls Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84-1, p. 1–15.

Type section: Cutbank on west side of Bad River, 0.8 km northwest of Copper Falls, in Copper Falls State Park, SW¼SE¼NW¼ sec. 17, T. 45 N., R. 2 W., Mellen 15-minute quadrangle, Ashland County, Wis.

Subunit: Nashville Member.

The Copper Falls Formation, here named, is in a broad area of northern Wisconsin and includes till derived from the Superior Lobe, Chippewa Sublobe, Wisconsin Valley Lobe, and the Langlade Lobe in the Lake Superior basin. Includes the Nashville Member (new name) in the Chippewa Sublobe in Forest, Langlade, and Oneida Counties. Consists of reddish-brown, mostly fluvial sand, gravel, and till. Unconformably overlies pre-Pleistocene or older Pleistocene units; unconformably underlies the Miller Creek Formation (new name) or lies at the surface. Thickness at the type section is 45 m. Age is late Pleistocene (late Wisconsinan and possibly early Wisconsinan).

Copperton Formation of the Libby Creek Group

Early Proterozoic
Wyoming
Green River basin

Flurkey, A.J., Houston, R.S., Karlstrom, K.E., and Kratochvil, T.L., 1981, The geology of Archean and Early Proterozoic terranes of the Sierra Madre, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 3, p. 401–541.

Type area: Exposures in the Sierra Madre, T. 14 N., R. 84–87 W., Carbon County, Wyo. May be named for the old town site of Copperton.

The informal Copperton quartzite of Graff (1978) is here named the Copperton Formation in the lower Libby Creek Group in the Sierra Madre and is correlated with the Medicine Peak Quartzite, Lookout Schist, and Sugarloaf Quartzite in the Medicine Bow Mountains, Wyo. Consists of white, brecciated, coarse-grained, highly sheared kyanitic quartzite containing minor amounts of phyllite. Is in thrust fault contact with the underlying Vagner Formation of the Deep Lake Group along the Quartzite Peak fault; in thrust fault contact with the Slaughterhouse Formation of the upper Libby Creek Group along the Hidden Treasure fault. Is intruded by the Gaps Trondhjemite (new name). Thickness is 1,070 m. Age is Early Proterozoic.

Cornell Dam Member of the Valentine Formation of the Ogallala Group

Miocene
Nebraska
Chadron arch

Skinner, M.F., and Johnson, F.W., 1984, Tertiary stratigraphy and the Frick Collection of fossil vertebrates from north-central Nebraska: American Museum of Natural History Bulletin, v. 178, art. 3, p. 215–368.

Type section: Outcrop west of the original mouth of Minnechaduza Creek and its junction with the Niobrara River, SE¼ sec. 22, T. 34 N., R. 27 W., Sparks quadrangle, Cherry County, Nebr. Named for Cornell Dam on the Niobrara River, 0.25 mi above the mouth of Minnechaduza Creek.

The Cornell Dam Member of the Valentine Formation, here named, is in north-central Nebraska. Consists of gray, whitish-weathering, firm, silty sandstone and clay containing manganese stained nodules, glass shards, and vertebrate fossil beds. Unconformably overlies the Rosebud Formation; unconformably underlies the Crookston Bridge Member of the Valentine. Thickness at the type section is 42 ft. Age is Miocene based on an age of 11.6 Ma for the Hurlbut ash in the Cornell Dam Member.

Coronado Hills Conglomerate of the Thunderbird Group

Middle Proterozoic
Texas
Orogrande basin

Thomann, W.F., 1981, Ignimbrites, trachytes, and sedimentary rocks of the Precambrian Thunderbird Group, Franklin Mountains, El Paso, Texas: Geological Society of America Bulletin, v. 92, no. 2, pt. I, p. 94–100.

Type section: Exposure 3,000 ft northeast of Smugglers Pass in Fusselman Canyon, Franklin Mountains, lat 31°53′06″ N., long 106°29′34″ W., El Paso County, Tex. Derivation of name not stated.

The Coronado Hills Conglomerate is here named the lowest of three formations in the Thunderbird Group (new name) in the Franklin Mountains, Tex. Consists of well-rounded cobbles and pebbles of quartzite, quartz-sericite siltstone, shale, chert, jasper, ignimbrite, porphyritic trachyte, and rare marble and granite in a recrystallized matrix of quartz, feldspar, pumice, and glass shards. Horizontal bedding, scour fills, and crossbedding are visible. Unconformably overlies the Lanoria Quartzite; underlies the Smugglers Pass Formation (new name) of the Thunderbird Group. Thickness at the type section is about 75 ft and ranges from 35 to 90 ft. Age is late Precambrian [Middle Proterozoic] (950 Ma).

Cossatot Formation of the Trinity Group

Early Cretaceous
Arkansas
Ouachita tectonic belt province

Darling, B.K., and Lock, B.E., 1984, The surface formations of the Trinity Group in southwestern Arkansas, and a proposed revision of stratigraphic rank for the three lower units: Gulf Coast Association of Geological Societies Transactions, 34th Annual Meeting, p. 321–327.

Type section: Exposures approximately 4 mi north of the settlement of Provo, sec. 4, T. 8 S., R. 29 W., Sevier County, Ark. Named for the Cossatot River, which flows west of the type locality.
Subunits: Pike Gravel Member, Delight Sand Member, Dierks Limestone Member.

The Cossatot Formation is here named as the lowermost formation of the Trinity Group in Sevier, Howard, and Pike Counties, southwestern Arkansas. Was previously informally named the Provo formation by Nichols (1956), consisting of rocks constituting a single transgression, the Pike Gravel, Delight Sand, and Dierks Limestone, the three lower units of the Trinity Group in southwestern Arkansas. These names are retained, reduced in rank, and designated as members of the Cossatot. The basal Pike Gravel Member, composed of rounded to subrounded loose gravels, boulders, and conglomerate, is 25 to 100 ft thick; the Delight Sand Member, a fine-grained, crossbedded quartz sand containing chert fragments and claystone beds, is 10 to 110 ft thick; and the uppermost Dierks Limestone Member, consisting of hard gray limestone that has thin layers of green shale, is 10 to 25 ft thick. Unconformably overlies the Jackfork Group; conformably underlies the Holly Creek Formation of the Trinity Group. Thickness ranges from 85 to 90 ft at the type section. Age is Early Cretaceous.

Cow Ridge Member of the **Green River Formation**

Eocene
Colorado
Piceance basin

Johnson, R.B., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado: U.S. Geological Survey Bulletin 1529–I, 20 p.

Type section: South side of Cow Ridge, sec. 31, T. 7 S., R. 98 W., Long Point quadrangle, Garfield County, Colo. Reference sections: Yellow Creek, secs. 9 and 10, T. 2 N., R. 93 W., and Fletcher Gulch, secs. 3, 10, 11, 14, T. 1 N., R. 100 W., Garfield County, Colo.

The Cow Ridge Member, here named, is the oldest member of the Green River Formation in the Piceance Creek basin of western Colorado. Formerly mapped as part of the Douglas Creek Member of the Green River and as part of the Wasatch Formation. Consists of brown ostracodal clay shale, carbonaceous shale, thin persistent sandstones, siltstones, and ostracodal limestones. Contains ostracode, mollusk, turtle, crocodile, bird, and fish fossils and palynomorphs. At Fletcher Gulch, the lower part of the Cow Ridge consists of low-grade, clay-rich oil shale and the upper part consists of claystone, mudstone, and conglomeratic sandstone. Deposited in the early stage of Lake Uinta as a freshwater, lacustrine unit. Overlies the Wasatch Formation;

underlies the Garden Gulch Member at Fletcher Gulch and elsewhere underlies the tongue of the Wasatch. Thickness is 63 m at the type section, 149 m at Yellow Creek, and 216 m at Fletcher Gulch. Age is early and early middle Eocene based on palynomorphs.

Craigmont Member of the Saddle Mountains Basalt of the Columbia River Basalt Group

Miocene
Idaho
Eastern Columbia basin

Camp, V.E., 1981, Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho: Geological Society of America Bulletin, v. 92, no. 9, pt. I, p. 669–678.

Type locality: Craigmont, Lewis County, Idaho.

The Craigmont Member of the Saddle Mountains Basalt of the Columbia River Basalt Group, here named, is in the Nez Percé plateau of the Clearwater embayment in Idaho. Consists of fine- to medium-grained basalt and rare olivine. Overlies the Icicle Flat Member (new name) and Grangeville Member (new name) of the Saddle Mountains Basalt. Age is late Miocene.

Cranberry Lake Formation of the Oswegatchie Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Exposures at the base of Indian Mountain near the south end of Cranberry Lake, St. Lawrence County, N.Y.

The informal Cranberry Lake formation of Leavell (1977) is here named the Cranberry Lake Formation of the Oswegatchie Group in the western Adirondack Highlands, N.Y. Consists of layered gneiss and marble in the lower part and quartzite, granulite, marble, and gneiss in the upper part. Correlates with the Gouverneur Marble of the Oswegatchie Group and the Paradox Lake Formation of the Lake George Group (both new names); overlies rocks correlated with the Poplar Hill Gneiss (new name) or Baldface Hill Gneiss (new name), and underlies rocks correlated with the Pleasant Lake Gneiss (new name), all of the Oswegatchie Group in the Northwest Lowlands. Age is Proterozoic.

Cranberry-Mine Layered Gneiss

Middle Proterozoic
North Carolina
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Cranberry iron mine, near the town of Cranberry, lat 36°08′ N., long 81°58′ W., Elk Park 7.5-minute quadrangle, Avery County, N.C. Reference locality: Outcrop on North Carolina State Road 194, 1/4 mi east of its junction with U.S. Highway 19E, 1 mi northeast of the Cranberry mine.

Older layered country rocks in the Elk River massif in North Carolina, here named the Cranberry-Mine Layered Gneiss, were previously mapped by Keith (1903) as part of the Cranberry Granite, which is revised as the Cranberry Suite and restricted to the plutonic rocks of the Elk River massif. Is equivalent to the Shoals Gneiss in Virginia. Age is Middle Proterozoic.

Crater Tuff Breccia Member of the Colter Formation

Miocene
Wyoming
Yellowstone province

Barnosky, A.D., 1984, The Colter Formation—Evidence for Miocene volcanism in Jackson Hole, Teton County, Wyoming: Wyoming Geological Association, Earth Science Bulletin, v. 17, p. 49–97.

Type section: Exposures along East Pilgrim Creek (the lower part of the Colter Formation type section), Two Ocean Lake 7.5-minute quadrangle, Teton County, Wyo. Named for Crater Mountain.

The Crater Tuff Breccia Member, here named, is the lower member of the Colter Formation in the area of Crater Mountain, Two Ocean Lake, and Emerald Lake, Teton County, Wyo. Source area for the member is northwest of Pilgrim Mountain adjacent to the northern part of the Teton fault. Consists of andesitic, trachytic, and latitic tuff and ignimbrite, and is distinguished by its abundant tuff breccia and tuff, bright-green or drab-gray color, angular to subangular lithic clasts, and rare rounded quartz cobbles. Overlies unnamed pre-Colter rocks, Paleocene Pinyon Conglomerate, or Oligocene White River Formation; underlies the Pilgrim Conglomerate Member (new name) of the Colter. Thickness is 500 m. Was deposited between 24 and 18 Ma during early Miocene andesitic volcanism.

Crossing Knob Gneiss

Middle Proterozoic
North Carolina
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Along Bethel Church Road 0.5 mi south of its junction with U.S. Highway 321, on the west flank of Crossing Knob, lat 36°18′ N., long 81°52′30″ W., Sherwood quadrangle, Watauga County, N.C.

The Crossing Knob Gneiss, here named, is in the Watauga massif in the Blue Ridge in North Carolina, where it appears to be a roof pendant in the Watauga River Gneiss (new name) of the Forge Creek Suite (new name). Age is Middle Proterozoic.

Crossnore Plutonic-Volcanic Complex

Late Proterozoic
North Carolina, Tennessee, Virginia
Piedmont-Blue Ridge province

Rankin, D.W., Stern, T.W., McLelland, James, Zartman, R.E., and Odom, A.L., 1983, Correlation chart for Precambrian rocks of the eastern United States: U.S. Geological Survey Professional Paper 1241–E, p. E1–E18.

Type locality: None designated. Named for the town of Crossnore, Avery County, N.C.

Subunits: **Grandfather Mountain Formation** (Tennessee, North Carolina), **Mount Rogers Formation** (Virginia, North Carolina, Tennessee), **Catoctin Formation** (Virginia).

The informal Crossnore plutonic-volcanic group of Rankin and others (1973) is here named the Crossnore Plutonic-Volcanic Complex. Consists of volcanic rocks and consanguineous mafic and felsic dikes, sills, and plutons intrusive into the basement crystalline rocks of the Blue Ridge anticlinorium. Includes, from southwest to northeast, the volcanic and sedimentary Grandfather Mountain Formation in North Carolina, the Mount Rogers Formation in Virginia, North Carolina, and Tennessee, and the Catoctin Formation [unintentionally included here]. Also includes intrusive Beech Granite in North Carolina and Tennessee, Striped Rock Granite in Virginia, an unnamed aegirien-augite granite gneiss near Crossnore, N.C., Bakersville Gabbro in North Carolina and Tennessee, Brown Mountain Granite in North Carolina, and Linville Metadiabase in North Carolina. Age is Late Proterozoic based on discordia intercept ages of 810 Ma for zircons from rhyolite and 824 Ma for zircons from granite plutons.

Crowders Creek Metaconglomerate Member of the **Battleground Formation**

Late Proterozoic
North Carolina
Piedmont-Blue Ridge province

Horton, J.W., Jr., 1984, Stratigraphic nomenclature in the Kings Mountain belt, North Carolina and South Carolina: U.S. Geological Survey Bulletin 1537–A, p. A59–A67.

Type locality: Cliff exposures at a bend in Crowders Creek, 180 m N. 60° W. of its junction with Squirrel Branch, midway between Crowders Mountain and the town of Kings Mountain, lat 35°13′58″ N., long 81°18′25″ W., Gaston County, N.C.

The Crowders Creek Metaconglomerate Member of the Battleground Formation, here named, is in the Kings Mountain belt, North Carolina. Was previously mapped as part of the Draytonville Conglomerate Member of the Battleground by Keith and Sterrett (1931), as schistose conglomerate by Espenshade and Potter (1960), and as informal bed E by France and Brown (1981). Is the highest of three beds of quartz-pebble metaconglomerate in the Battleground and is separated from the underlying Draytonville Metaconglomerate Member by an unnamed unit of micaceous quartzite. Age is Late Proterozoic.

Culpeper Group

Late Triassic and Early Jurassic
Virginia, Maryland
Piedmont-Blue Ridge province

Lindholm, R.C., 1979, Geologic history and stratigraphy of the Triassic-Jurassic Culpeper basin, Virginia: Geological Society of America Bulletin, v. 90, no. 11, pt. I, p. 995–997; pt. II, p. 1702–1736.

Type locality: None designated. Named for the Culpeper basin, Virginia and Maryland.
Subunits: Reston Formation; Manassas Sandstone; Bull Run Formation and its Leesburg, Goose Creek, Cedar Mountain, and Barboursville Conglomerate Members; Buckland Formation; Waterfall Formation.

The sedimentary and extrusive igneous rocks of the Culpeper basin in Virginia and Maryland are here named the Culpeper Group. The name was used informally by Cornet (1977), who designated informal formations K through A of the Culpeper. Includes the Reston Formation; Manassas Sandstone; Bull Run Formation and its Leesburg, Goose Creek, Cedar Mountain, and Barboursville Conglomerate Members; Buckland Formation; and Waterfall Formation. Age is Late Triassic and Early Jurassic.

Datil Well Tuff of the Datil Group

Oligocene
New Mexico
Basin and Range province

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Northeast side of White House Canyon across U.S. Highway 60 from the Datil Well Campground, 1.2 mi northwest of the junction of U.S. Highways 60 and 12 in the town of Datil, NW¼SW¼ sec. 2, T. 2 S., R. 10 W., Datil 7.5-minute quadrangle, Catron County, N. Mex.

The Datil Well Tuff of the Datil Group, here named, is in the Datil Mountains and northern Jornada del Muerto, southwestern New Mexico. Consists of purple to pink, densely welded, moderately crystal-rich, rhyolite ash-flow tuff. Overlies the andesite of White House Canyon, an informal member of the Spears Formation, or the Dog Springs Member (new name) of the Spears; splits and is interbedded with the Chavez Canyon Member (new name) of the Spears; underlies the Rock House Canyon Tuff (new name) of the Datil Group. Thickness at the type section is 31.5 ft. Age is Oligocene based on fission-track and potassium-argon dates (36.7 Ma).

Davis Canyon Tuff

Oligocene
New Mexico
Basin and Range province

Ratte, J.C., 1981, Geologic map of the Mogollon quadrangle, Catron County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ–1557, scale 1:24,000.

Type section: S½ sec. 11, T. 13 S., R. 17 W., Shelley Peak quadrangle, Catron County, N. Mex. Reference sections: S½ sec. 31, and N½ sec. 15, T. 8 S., R. 20 W., Saliz Pass quadrangle. Named for Davis Canyon, south flank of Shelley Peak, Shelley Peak quadrangle.

The Davis Canyon Tuff, here named in Catron County, N. Mex., was formerly mapped as the lower part of the Pacific Quartz Latite of Ferguson (1927). Consists of light-gray, phenocryst-poor, high-silica rhyolite ash-flow tuff containing 1 to 10 percent phenocrysts and microphenocrysts of sanidine, quartz, and sodic plagioclase in a devitrified granophyric to vitroclastic matrix. Overlies the Cranktown Sandstone or unnamed volcanic rocks; underlies the Shelley Peak Tuff (new name) or unnamed volcanic rocks. Thickness ranges from 60 to 150 m at the type section and from 0 to 50 m in the Mogollon quadrangle. Age is Oligocene based on potassium-argon ages of 28.9 Ma on sanidine and 30.7 Ma on biotite.

Davis Spring Formation

Early Mississippian (Kinderhookian or Osagean(?))
Nevada
Great Basin province

Hose, R.K., Armstrong, A.K., Harris, A.G., and Mamet, B.L., 1982, Devonian and Mississippian rocks of the northern Antelope Range, Eureka County, Nevada: U.S. Geological Survey Professional Paper 1182, 19 p.

Type section: Outcrops in the SE¼ sec. 20, T. 16 N., R. 51 E., northern Antelope Range, Eureka County, Nev. Named for Upper Davis Spring, which is 3 km southeast of the type section.

The Davis Spring Formation, here named, is in the northern Antelope Range, Nevada. Consists of pale-brown, very fine grained, siliceous, dolomitic siltstone and finely laminated chert that has a translucent pale-brown organic pigment in the matrix. Conodonts occur 20 m above the base and are mostly redeposited Devonian and Mississippian species. Abundance of organic material and lack of bioturbation suggest deposition in euxinic bottom waters and oxygenated upper levels. Contact with the underlying Fenstermaker Wash Formation (new name) is sharp and represents an unconformity of considerable magnitude; conformably and sharply underlies the Kinkead Spring Limestone (new name) or unconformably underlies the Antelope Range Formation (new name). Thickness is 125 m at the type section. Age is Early Mississippian (no older than late Kinderhookian but possibly Osagean) based on conodonts.

Delamar Mountain Formation of the Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., ed., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type section: Delamar Mountain, SE¼ sec. 1 and SW¼ sec. 6, T. 2 N., R. 1 E., Fawnskin 7.5-minute quadrangle, San Bernardino County, Calif.

The uppermost unit of the Big Bear Group (new name) in the area of Delamar Mountain and Sugarloaf Mountain in the San Bernardino Mountains, California, is here named the Delamar Mountain Formation, following the informal usage of Cameron (1981). Contains two informal members: lower member D1, which consists of a heterogeneous sequence of calc-silicate rock, quartzite, schist, and marble; and upper member D2, which consists of conformably overlying quartzite. Gradationally overlies the Green Spot Formation (new name) of the Big Bear Group; conformably underlies the late Precambrian and Early Cambrian Wood River Formation. Thickness at the type section is 217 m. Age is late Precambrian.

Delle Phosphatic Member of the **Woodman Formation, Chainman Shale, Deseret Limestone, Deep Creek Formation, Little Flat Formation, Aspen Range Formation,** or **Brazer Dolomite**

Mississippian (Osagean and Meramecian)
Utah, Idaho, Nevada, Wyoming
Great Basin province, Green River basin, Snake River basin, Wasatch uplift

Sandberg, C.A., and Gutschick, R.C., 1984, Distribution, microfauna, and source-rock potential of Mississippian Delle Phosphatic Member of Woodman Formation and equivalents, Utah and adjacent states, *in* Woodward, Jane, Meissner, F.F., and Clayton, J.L., eds., Hydrocarbon source rocks of the greater Rocky Mountain region: Denver, Rocky Mountain Association of Geologists, p. 135–178.

Type section: Exposures along a low ridge in the South Lakeside Mountains, SE¼SE¼SW¼ sec. 6, T. 1 N., R. 8 W., Delle quadrangle, Tooele County, Utah. Named for the town of Delle, Utah.

The widespread Delle Phosphatic Member, here named, is the basal member of seven formations in an area extending for 750 km along a northeast-trending axis from southeastern Nevada through western Utah and extreme southwestern Wyoming to southeastern Idaho. Replaces the informal phosphatic member of Sandberg and Gutschick (1979, 1980). At the type section in the South Lakeside Mountains and in the Deep Creek Mountains of Utah, it is assigned to the Woodman Formation; in the Needle Range, Utah and Nevada, to the Chainman Shale; in Ophir Canyon, Oquirrh Mountains, Utah, to the Deseret Limestone; at Hunter Canyon, Deep Creek Mountains, Idaho, to the Deep Creek Formation; at Little Flat Canyon, Chesterfield Range, Idaho, to the Little Flat Formation; at North Georgetown Canyon in the Aspen Range, Idaho and Wyoming, to the Aspen Range Formation; and in Brazer Canyon, Crawford Mountains, Utah and Wyoming, to the Brazer Dolomite. Includes two informally named discrete lithologic units, a lower 9.1-m-thick cherty unit consisting mainly of bedded black radiolarian chert (lydite) and a 5.8-m or thicker micritic limestone unit, which caps the member. The remainder of the Delle consists of thin-bedded gray to black organic-rich phosphatic claystone, mudstone, shale, siltstone, peloidal phosphorite, cherty micrite, red siltstone, brown prodeltaic siltstone, and thin interbeds of sandstone and coarse debris-flow encrinite. Contains conodonts, radiolarians, foraminifers, planktonic to benthic animals, and floating marine and transported land plants. Overlies the Joana, Lodgepole, Mission Canyon, or Gardison Limestones; underlies the Needle Siltstone Member, Tetro Member, or equivalents. Thickness is 59 m at the type section. Age is Mississippian (Osagean and Meramecian).

Devils Bridge Clay

Miocene(?) and Pliocene(?)
Massachusetts
Atlantic Coast basin

Kaye, C.A., 1983, The autochthonous and allochthonous Coastal Plain deposits of Martha's Vineyard and the Marshfield-Scituate area, southeastern Massachusetts: Atlantic Coastal Plain Geological Association field trip guidebook, 34 p.

Type locality: Devils Bridge, a bouldery shoal that juts out about 2 km from the north end of Gay Head Cliff, Martha's Vineyard, Mass.

The Devils Bridge Clay, here named, is part of the Gay Head moraine in Martha's Vineyard, Mass., and is composed of thrust plates made up of remnants of Coastal Plain sediments that were stacked up during Pleistocene glaciation. Consists of black, massive, organic-poor, ferruginous clay that oxidizes rapidly to brown goethite. Overlies the Gay Head Greensand (new name) with erosional contact; underlies the Lobsterville Sand (new name) or Pleistocene deposits. Thickness is 2.6 m. Age is late Miocene(?) and early Pliocene(?) based on a restricted pollen assemblage.

Devil's Graveyard Formation of the **Buck Hill Group**

Eocene and Oligocene
Texas
Permian basin

Stevens, J.B., Stevens, M.S., and Wilson, J.A., 1984, Devil's Graveyard Formation (new), Eocene and Oligocene age, Trans-Pecos Texas: Texas Memorial Museum Bulletin 32, p. 1–21.

Type area: Devil's Graveyard, along Alamo de Cesario Creek and the south face of Bandera Mesa, Agua Fria and Tascotal Mesa quadrangles, Brewster and Presidio Counties, Tex. Reference sections and boundary stratotypes are designated.
Subunit: **Bandera Mesa Member.**

The Devil's Graveyard Formation of the Buck Hill Group, here named, is in the Agua Fria-Green Valley area of Trans-Pecos, Tex. Consists of volcaniclastic tuff, bentonitic tuff, mudstone, and sandstone and is divided into informal lower and middle members and the upper Bandera Mesa Member (new name). Marker beds useful for correlation are informally named the Junction facies, Variegated beds, Lunch

Locality sandstone, Northeast facies, Car Park conglomerate, Strawberry tuff, Titanothere channels, Purple Bench tuff, Skyline channels, Cotter channels, and Upper breccia-conglomerate. Unconformably overlies Cretaceous rocks; underlies the Mitchell Mesa Rhyolite or the informal Yellow conglomerate. Thickness is 1,635 ft. Age is Eocene and Oligocene based on vertebrate fauna.

Devil's Pass Member of the Virginian Ridge Formation

Cretaceous (Albian to Cenomanian)
Washington
Northern Cascade Range-Okanogan province

Trexler, J.H., Jr., 1985, Sedimentology and stratigraphy of the Cretaceous Virginian Ridge Formation, Methow Basin, Washington: Canadian Journal of Earth Sciences, v. 22, no. 9, p. 1274–1285.

Type section: Exposures along Jackita Ridge, south of Devil's Pass, western side of the Methow Basin, Okanogan County, Wash.

The Devil's Pass Member of the Virginian Ridge Formation, here named, is in the Methow Basin, the southernmost of a series of Mesozoic basins that rest with angular unconformity on older rocks in the Cascades, north-central Washington. Consists of a thick sequence of chert-pebble conglomerate and chert-volcanic-lithic sandstone. Represents an amalgamated, prograding fan-delta system. Interfingers with and gradationally overlies the Slate Peak Member (new name) of the Virginian Ridge; underlies the Winthrop Formation in the south and is truncated by modern erosion in the north. Thickness at the type section is greater than 1,000 m. Age is Cretaceous (Albian to Cenomanian).

Dibekulewe Bed

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Road cut on the west side of South Curry Street, Stewart, south of Carson City, center N½SW¼NW¼ sec. 20, T. 15 N., R. 20 E., Carson City 7.5-minute quadrangle, Lyon County, Nev. Dibekulewe is the Washo Indian name for the cove in the hills to the west, where the Carson City "C" is painted.

The Dibekulewe Bed, here named, occurs west of Stewart, in the Lake Lahontan area, Nevada. Consists of corroded, phenocryst-poor tephra particles enclosed in fine sand and silt. Underlies the Mexican Dam Bed (new name). Age is Pleistocene.

Digdeguash Formation

Silurian
New Brunswick, Maine
New England province

Ruitenberg, A.A., 1967, Stratigraphy, structure and metallization Piskahegan-Rolling Dam area (northern Appalachians, New Brunswick, Canada): Leidse Geologische Mededelingen, v. 40, p. 79–120.

Type locality: Exposures along the Digdeguash River at Tryon, Charlotte County, New Brunswick, Canada.

Rocks in the Pleasant Ridge and St. David Dome areas in Charlotte County, N.B., previously named the Canoose Formation by MacKenzie (1940), are here named the Digdequash [sic] Formation. Consists of dark-gray and olive-green quartz wacke, silty slate, and slate. Grades laterally into the facies equivalent Waweig Formation (new name). Age is Late Silurian and Early Devonian.

Ruitenberg, A.A., and Ludman, Allan, 1978, Stratigraphy and tectonic setting of early Paleozoic sedimentary rocks of the Wirral-Big Lake area, southwestern New Brunswick and southeastern Maine: Canadian Journal of Earth Science, v. 15, p. 22–32.

The Digdeguash Formation is here extended from Pleasant Ridge, New Brunswick, to Third Chain Lake, Maine. Interfingers with the Silurian Waweig Formation (new name), to which it is partly equivalent; grades upward into the Flume Ridge Formation (new name). Age is Silurian.

Ditch Creek Siltstone Member of the **Hornbrook Formation**

Late Cretaceous (Turonian and Coniacian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Roadcuts along the northbound lane of Interstate Highway I–5, 3 km south of Hornbrook, NE¼NE¼ sec. 32, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif. Named for Ditch Creek, 3 km west of Hornbrook.

The Ditch Creek Siltstone Member of the Hornbrook Formation, here named, occurs along the northeast margin of the Klamath Mountains in Siskiyou County, Calif., and Jackson County, Oreg. Consists of gray siltstone and fine-grained, silty sandstone and represents outer shelf deposits. Conformably overlies the Osburger Gulch Sandstone Member (new name), erosionally or gradationally underlies the Rocky Gulch Sandstone Member (new name), and conformably or gradationally locally underlies the Blue Gulch Mudstone Member (new name), all of the Hornbrook. Thickness is 61.6 m at the type section and ranges from 20 to 80 m. Age is Late Cretaceous (Turonian and Coniacian) based on mollusks and foraminifera.

Dixon Gap Metaconglomerate Member of the **Battleground Formation**

Late Proterozoic
North Carolina, South Carolina
Piedmont-Blue Ridge province

Horton, J.W., Jr., 1984, Stratigraphic nomenclature in the Kings Mountain belt, North Carolina and South Carolina: U.S. Geological Survey Bulletin 1537–A, p. A59–A67.

Type locality: Exposures at the ridge crest of Kings Mountain at Dixon Gap, where secondary road 2245 crosses the ridge, lat 35°10′27″ N., long 81°21′46″ W., Cleveland County, N.C.

Rocks previously included in the Draytonville Conglomerate Member of Keith and Sterrett (1931) and described as bed C by France and Brown (1981) are here named the Dixon Gap Metaconglomerate Member of the Battleground Formation in the Kings Mountain belt, North Carolina and South Carolina. Consists of quartz-pebble metaconglomerate. Overlies quartz-sericite schist and underlies the Jumping Branch Manganiferous Member (new name) of the Battleground. Age is Late Proterozoic.

Dobbins Alaskite

Tertiary
Arizona
Basin and Range province

Reynolds, S.J., 1985, Geology of the South Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 195, 61 p.

Type locality: North flank of Dobbins Lookout, eastern Main Ridge of the South Mountains, Maricopa County, Ariz.

The Dobbins Alaskite, here named, occurs in the South Mountains near Phoenix, Ariz., at Dobbins Lookout and Mount Suppoa in the Main Ridge, and in the Boundary Hills and other parts of the Southern Foothills. Consists of white to cream, fine-grained, mylonitic alaskitic granite, quartz porphyry, and felsite that are contemporaneous and comagmatic. The last of three phases of a composite pluton that occupies the eastern half of the South Mountains, it is found along border zones of the second phase Telegraph Pass Granite (new name), and in places it overlies the first phase mylonitic South Mountains Granodiorite (new name). Age is middle Tertiary.

Dog River Formation of the Sandy Springs Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures near and along Dog River, northeast Douglas County, Ga.

The unnamed lower unit on the northwest limb of the Austell-Frolona antiform, lying gradationally above the Mud Creek Formation (new name) of the New Georgia Group (new name), is here named the Dog River Formation of the Sandy Springs Group (western belt). Consists of an intercalated sequence of muscovite-biotite-quartz-feldspar gneiss (metagraywacke), garnet-muscovite schist, amphibolite, and thin layers of banded iron formation. Conformably underlies the Andy Mountain Formation (new name) of the Sandy Springs Group (western belt). Is equivalent to the Powers Ferry Formation of the Sandy Springs Group (eastern belt). Age is Late Proterozoic and (or) early Paleozoic.

Dog Springs Member of the Spears Formation of the Datil Group

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type area: Dog Springs, Chavez, and Old Canyons, 20 mi northeast of Datil, S½ T. 2 N., R. 8 W., and the north edge of T. 1 N., R. 8 W., northern Gallinas Mountains, D Cross and Dog Springs 7.5-minute quadrangles, Socorro County, N. Mex.

The Dog Springs Member is here named the basal member of the Spears Formation of the Datil Group in the Gallinas and Datil Mountains, southwestern New Mexico. Consists of light-tan to brown, crystal-rich, nonpumiceous, quartz-latite breccias containing, in the Dog Springs area, large exotic blocks of limestone and autobrecciated volcanic rocks as much as 0.5 mi long and 250 ft thick, probably deposited by mudflows. A few large areas of autobrecciated rocks appear to be intrusives. Well-stratified, tuffaceous pond deposits are interbedded in the mudflow breccias. Bedding in the breccias is highly contorted and chaotic, probably resulting from penecontemporaneous soft-sediment deformation. Overlies the Baca Formation; underlies the

Chavez Canyon Member (new name) of the Spears or the Datil Well Tuff (new name) of the Datil Group. Thickness ranges from 0 to 3,000 ft. Age is Oligocene based on a potassium-argon date (39.6 Ma) and a zircon fission-track date (38.6 Ma).

Dollarhide Formation

Early Permian
Idaho
Snake River basin

Hall, W.E., 1985, Stratigraphy and mineral deposits in middle and upper Paleozoic rocks of the black-shale mineral belt, central Idaho, *in* McIntyre, D.H., ed., Symposium on the geology and mineral deposits of the Challis 1° × 2° quadrangle, Idaho: U.S. Geological Survey Bulletin 1658 A–S, p. 117–131.

Type locality: Exposures along the ridge between Dollarhide Summit and Dollarhide Mountain, 32 km west of Ketchum, Dollarhide Mountain 7.5-minute quadrangle, Blaine County, Idaho.

Rocks formerly mapped as part of the Wood River Formation are here named the Dollarhide Formation. Crops out over an area of 100 km^2 on the eastern side of the Idaho batholith in the central Idaho black-shale mineral belt. Consists of dark-gray, carbonaceous limestone, fine-grained limy sandstone, dark-gray and brown banded siltite, and quartzite. Graded bedding and convolute structures are common. Is intruded by the Idaho batholith. Thickness of partial measured section is 653 m. Age is probably Early Permian based on fusulinids.

Dort Granite

Mississippian(?)
North Carolina, Virginia
Atlantic Coast basin

Becker, S.W., 1981, Petrography of the granitic basement beneath the Coastal Plain, Gates County, North Carolina: Southeastern Geology, v. 22, no. 1, p. 39–44.

Type locality: Drill hole DO–1, depth interval 323–410 m, near Dort, Gates County, N.C.

Crystalline basement rock located in the center of a large gravity anomaly at the North Carolina-Virginia border, is here named the Dort Granite. Consists of gray, coarse-grained amphibole-biotite granite containing small pegmatite and aplite dikes and mafic clots, fractured by two episodes of brittle deformation. First episode fractures are filled with calcite-epidote-chlorite-fluorite veins; second episode fractures are filled with calcite. Petrographically resembles the Petersburg Granite of Mississippian age.

Douglas Member of the Miller Creek Formation

Holocene
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Exposures in bluff, 1.5 km west of the mouth of Hanson Creek, SE¼SW¼SW¼ sec. 27, T. 49 N., R. 12 W., Poplar NE 7.5-minute quadrangle, Douglas County, Wis. Named for Douglas County.

Following the informal usage of Need (1980), the Douglas Member of the Miller Creek Formation (new name), here named, is in the Superior Lobe west of the Bayfield Peninsula in Wisconsin. Consists of reddish-brown till. Overlies pre-Pleistocene rock or tills of the Copper Falls Formation (new name) and Hanson Creek Member (new name) of the Miller Creek Formation; underlies silt and clay of the Miller Creek or lies at the surface. Thickness ranges from 1 to 15 m. Age is earliest Holocene.

Dreibelbis Member of the **Windsor Township Formation**

Middle Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures along the west bank of Maiden Creek north of Dreibelbis, Hamburg 7.5-minute quadrangle, Berks County, Pa.

Rocks in the Greenwich slice of the Hamburg klippe in east-central Pennsylvania, mapped as the Martinsburg Formation by Willard (1943), are here named the Dreibelbis Member of the Windsor Township Formation (new name). Contains three main intercalated rock types which may be lens-shaped bodies: laminated to thick-bedded calcareous graywacke and greenish-gray shale interbedded with graywacke, siltstone, and mudstone; ripple laminated, locally conglomeratic, calcareous graywacke sandstone interbedded with siltstone and mudstone; and medium- to thick-bedded locally calcareous sandstone interbedded with siltstone, mudstone, and claystone-shale. Was deposited as turbidite and grain-flow channel facies incised into the underlying levee and open-fan sediments of the Weisenberg Member (new name) of the Windsor Township. Apparent thickness is 3,660 m. Age is Middle Ordovician based on graptolites in the graywacke.

Drowning Creek Formation of the **Crab Orchard Group**

Early and Middle Silurian (Llandoverian)
Kentucky
Cincinnati arch

McDowell, R.C., 1983, Stratigraphy of the Silurian outcrop belt on the east side of the Cincinnati arch in Kentucky, with revisions in the nomenclature: U.S. Geological Survey Professional Paper 1151-F, 27 p.

Type section: Exposures along Kentucky Highway 52, east of Drowning Creek, near Winston, Panola quadrangle, Estill County, Ky. Reference section: Along Kentucky Highway 10, lower part southwest of Cabin Creek and upper part northeast of Cabin Creek, Tollesboro quadrangle, Lewis County, Ky.
Subunits: In Bath County, Ky., and south: **Brassfield Member, Plum Creek Shale Member, Oldham Member**. North of Bath County: **Brassfield Member, Dayton Dolomite Member.**

A sequence of beds, predominantly dolomite, is here named the Drowning Creek Formation of the Crab Orchard Group, revised and raised in rank from formation. In Bath County, Ky., and to the south, the Drowning Creek is divided into three members, the Brassfield, reduced in rank from formation, and the Plum Creek Shale and Oldham Members, formerly of the Crab Orchard Formation. The Brassfield consists of dolomite or limestone beds containing minor amounts of interbedded shale and chert nodules and lenses, 9 to 28 ft thick. The Plum Creek Shale consists of greenish-gray, poorly fissile clay shale that has beds and lenses of dolomite, about 5.5 ft thick. The Oldham consists of interbedded gray, fossiliferous dolomite and greenish-gray, poorly fissile shale, 3 to 15 ft thick. Overlies the Preachersville Member of the Drakes Formation; underlies the Lulbegrud Shale Member of the Alger Shale. Thickness ranges from 20 to 50 ft. North of Bath County the Drowning Creek is divided into the Brassfield Member, undifferentiated beds where the Plum Creek Shale and Oldham become indistinguishable, and the Dayton Dolomite Member, reduced in rank from Dayton Limestone. Overlies the Preachersville Member of the Drakes Formation and underlies the Estill Shale, raised in rank from Estill Shale Member of the Alger Shale. North of Bath County, thickness ranges from 40 to 60 ft. Age is Early and Middle Silurian (Llandoverian).

Eagle Lake Gneiss of the Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Exposures on the north shore of Eagle Lake, Paradox Lake 15-minute quadrangle, Essex County, N.Y.

Rocks called the older paragneiss by Walton and deWaard (1963) are here named the Eagle Lake Gneiss, the basal unit of the Lake George Group (new name) in the eastern Adirondack Mountains of New York. Consists of thin, discontinuous exposures of biotite-quartz-plagioclase gneiss containing granitic layers and veins, and quartzite and quartz-sillimanite gneiss. Unconformably overlies the Piseco Group (new name). Correlates with the Baldface Hill Gneiss (new name) and the Poplar Hill Gneiss (new name), both of the Oswegatchie Group, in the Northwest Lowlands of the Adirondacks. Age is Proterozoic.

Ear Peak Member of the **Kanayut Conglomerate**

Late Devonian
Alaska
Norton basin

Nilsen, T.H., and Moore, T.E., 1984, Stratigraphic nomenclature for the Upper Devonian and Lower Mississippian(?) Kanayut Conglomerate, Brooks Range, Alaska: U.S. Geological Survey Bulletin 1529–A, p. A1–A64.

Type section: Southernmost spur of an east-facing ridge 1.8 km southeast of Ear Peak, east-southeast of Shainin Lake, secs. 13 and 24, T. 13 S., R. 5 E., and sec. 18, T. 13 S., R. 6 E., Chandler Lake quadrangle, Alaska.

The Ear Peak Member, here named, is the lowermost of three members of the revised Kanayut Conglomerate in the central and eastern Brooks Range, Alaska. Was previously mapped as the informal lower shale member, lower member, or lower part of the middle conglomerate member of the Kanayut. Consists of a sequence of red-brown-weathering, fining-upward, stream-channel conglomerate, sandstone, and siltstone cycles, averaging 15 m in thickness, alternating with flood-plain deposits of shale and siltstone. Paleosols and oxidized intervals are common at the tops of the stream-channel cycles. Gradationally overlies and interfingers with the Hunt Fork Shale or the Noatak Sandstone; gradationally underlies the Shainin Lake Member (new name) of the Kanayut Conglomerate. Thickness at the type section is 510 m. Age is Late Devonian based on flora in the Ear Peak and on fauna in the underlying units.

East Charley Pond Gneiss

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Outcrops in ridges on high hills near East Charley Pond, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.

Granitic igneous basement rock in the Loon Pond syncline in the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y., is here named the East Charley Pond Gneiss. Consists of massive, poorly jointed, homogeneous biotite-magnetite-plagioclase-hornblende-quartz-perthite gneiss of uniform texture. White- or pink-weathering pink perthite forms nearly half of the rock. Pegmatite veins and lenses are parallel to foliation. Unconformably underlies the Little Charley Pond Formation (new name); is intruded by the Otter Pond Dioritic Gneiss (new name). Thickness has not been determined. Age is Precambrian.

East Fork Hills Formation

Early Ordovician to Middle Devonian
Alaska
Holitna basin

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic formations in the northern Kuskokwim Mountains, west-central Alaska: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Type locality: Crest of the East Fork Hills, sec. 14, T. 27 S., R. 25 E., Medfra (A–3) quadrangle, Alaska.

The East Fork Hills Formation, here named, is in the East Fork terrane and is mapped along the North Fork of the Kuskokwim River, Alaska. Consists of alternating thin bands of gray laminated limestone and orange-weathering dolomitic limestone, locally sheared and foliated, and subordinate laminated dolomite, chert, and siliceous siltstone. Is interpreted as a deep-water facies, equivalent to the entire shallow-water carbonate sequence of the Nixon Fork terrane, including the Novi Mountain, Telsitna, Paradise Fork, and Whirlwind Creek Formations (all new names). Is in fault contact with the Whirlwind Creek Formation and Telsitna Formation along the northwest edge of the outcrop belt. Thickness is several hundred meters. Age is Early Ordovician to Middle Devonian based on conodonts.

East Kingston Member of the Port Ewen Formation of the Helderberg Group

Early Devonian
New York
Appalachian basin

Mazzo, C.R., and LaFleur, R.G., 1984, Stratigraphy of the Port Ewen Formation (Lower Devonian), eastern New York: Northeastern Geology, v. 6, no. 2, p. 71–82.

Type section: Roadcut on New York Route 199, 1.02 km west of the Kingston-Rhinecliff Bridge across the Hudson River, Kingston, Ulster County, N.Y.

The East Kingston Member is here named the upper of two members of the Port Ewen Formation of the Helderberg Group in the Silurian-Devonian outcrop belt in eastern New York. Consists of medium-gray- to buff-weathering, hackly to massive, laminated, silty, cherty claystone containing brachiopod and bryozoan wackestone stringers and bedded nodular chert. Overlies the Lake Katrine Member (new name) of the Port Ewen Formation; transitionally underlies the Glenerie Formation. Thickness at the type section is 21.2 m. Age is Early Devonian.

Edenhouse Member of the **Chowan River Formation** of the **Chesapeake Group**

Pliocene
North Carolina, Virginia
Atlantic Coast basin

Blackwelder, B.W., 1981, Stratigraphy of upper Pliocene and lower Pleistocene marine and estuarine deposits of northeastern North Carolina: U.S. Geological Survey Bulletin 1502–B, 16 p.

Type section: Section 1.4 km upstream from the U.S. Highway 17 bridge over the Chowan River above Edenhouse, Bertie County, N.C.

Lower transgressive beds of the Chowan River Formation (new name) of the Chesapeake Group in the Coastal Plain of northeastern North Carolina and southeastern Virginia are here named the Edenhouse Member. Consists of shallow marine, locally bioturbated, shelly, silty sands. Unconformably overlies the Morgarts Beach Member of the Yorktown Formation; transitionally to unconformably underlies the Colerain Beach Member (new name) of the Chowan River Formation or unconformably underlies the James City Formation. Thickness is 3.0 m at the type section. Age is late Pliocene based on coral ages.

Edgar Member of the Marathon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Chicago and Northwestern Railroad cut on south side of Highway N, NW¼NE¼NW¼ sec. 24, T. 28 N., R. 4 E., Edgar 7.5-minute quadrangle, Marathon County, Wis. Named for the village of Edgar.

The upper member of the Marathon Formation (new name) in the Chippewa Sublobe in southwestern Marathon, northern Wood, and eastern Clark Counties, Wis., is here named the Edgar Member, following the informal usage of Mode (1976). Consists of yellowish- to reddish-brown, calcareous, silty, pebbly loam to clay and silt loam. Overlies Precambrian bedrock or the Wausau Member (new name) of the Marathon; underlies the Bakerville Member (new name) of the Lincoln Formation (new name) or is exposed at the surface. Thickness ranges from less than 3 m to 10 m. Age is late Pleistocene (early Wisconsinan or older).

Elkmont Formation

Middle and Late Ordovician
Alabama
Piedmont-Blue Ridge province

Neathery, T.L., and Drahovzal, J.A., 1985, Lithostratigraphy of Upper Ordovician strata in Alabama: Alabama Geological Survey Circular 124, 55 p.

Type section: Elkmont Quarry, SE¼SE¼ sec. 31, T. 1 S., R. 4 W., Elkmont 7.5-minute quadrangle, Limestone County, Ala.

The Elkmont Formation, here named, is in the Cumberland Plateau area in northeastern Alabama. Where the characteristic lithology of the Inman Formation is missing, the overlying Leipers Limestone is indistinguishable from the underlying Catheys Limestone. In the subsurface these combine with the Cannon and Hermitage Formations to form one massive lithologic unit in which only the Hermitage is recognizable. The lithologic interval from the top of the Hermitage to the base of the Sequatchie Formation, where the intervening Cannon, Catheys, Inman, and Leipers cannot be separated either lithologically or geophysically, is here redefined as the Elkmont Formation. Thickness is 130 ft at the type section. Age is Middle and Late Ordovician.

Elk Park Plutonic Suite

Middle Proterozoic
North Carolina
Piedmont-Blue Ridge province

Rankin, D.W., Stern, T.W., McLelland, James, Zartman, R.E., and Odom, A.L, 1983, Correlation chart for Precambrian rocks of the eastern United States: U.S. Geological Survey Professional Paper 1241–E, p. E1–E18.

Type locality: None designated. Named for the village of Elk Park, Avery County, N.C. (Rankin and others, 1973).
Subunits: **Cranberry Gneiss**, **Blowing Rock Gneiss**, and **Wilson Creek Gneiss.**

Basement plutonic rocks in northwestern North Carolina, informally named the Elk Park plutonic group by Rankin and others (1973), are here named the Elk Park Plutonic Suite. Protoliths of this orogenic calc-alkaline suite were fine-grained to coarsely porphyritic diorites to quartz monzonites. Includes the Cranberry Gneiss of the Blue Ridge thrust sheet in northwestern North Carolina and the Blowing Rock and Wilson Creek Gneisses in the Grandfather Mountain window. Probably correlates with the Max Patch Granite of the Great Smoky Mountains and the Grayson Granodiorite Gneiss of Grayson County, Va. Age is Middle Proterozoic based on a zircon discordia intercept age of 1,079 Ma. [The term Elk Park Supersuite is used by Bartholomew and Lewis (1984).]

Ellicott Creek Breccia of the Bertie Group

Late Silurian
New York, Ontario
Appalachian basin

Ciurca, S.J., Jr., 1982, Eurypterids, stratigraphy, Late Silurian-Early Devonian of western New York State and Ontario, Canada: New York State Geological Association, 54th Annual Meeting, field trip guidebook, p. 99–120.

Type section: Exposures at Ellicott Creek, Williamsville, Erie County, N.Y.

The Ellicott Creek Breccia is here named as one of several waterlimes in the Bertie Group in New York and Ontario. Consists of varicolored, banded waterlime rich in eurypterid and cephalopod remains. Contains a massive middle unit that is probably the result of "reefy" algal masses; variability in thickness of the unit is probably due to variation in algal mound development. Overlies the Victor Dolostone or Phelps Waterlime; underlies the Scajaquada Formation, all of the Bertie Group. Thickness at the type section is 2.3 to 2.5 m. Age is Late Silurian.

Escalante Creek Member of the Dox Formation of the Unkar Group

Middle Proterozoic
Arizona
Plateau sedimentary province

Stevenson, G.M., and Beus, S.S., 1982, Stratigraphy and depositional setting of the upper Precambrian Dox Formation in Grand Canyon: Geological Society of America Bulletin, v. 93, no. 2, p. 163–173.

Type section: Exposures along Escalante Creek, eastern Grand Canyon, Vishnu Temple quadrangle, Coconino County, Ariz.

The Escalante Creek Member, here named, is the lowermost member of the Dox Formation of the Unkar Group in the eastern Grand Canyon, Ariz. Contains four distinct lithologic units that record transgression and regression of prodeltaic and deltaic basin deposits formed in a marginal-marine environment: unit 1, the lowermost, consists of 73 m of white to grayish-tan, friable, medium-grained quartz sandstone that has a basal dark-green to black shale; unit 2 consists of 80 m of green to brown shale, mudstone, and sandstone; unit 3 is a cliff-forming calcareous sandstone 96 m thick; unit 4, the uppermost, consists of 140 m of less resistant interbedded brown to grayish siltstone. Conformably overlies the Shinumo Quartzite; gradationally underlies the Solomon Temple Member (new name) of the Dox. Thickness at the type section is 390 m. Age is Middle Proterozoic based on the age of the overlying Cardenas Lavas (1.1 Ma).

Estrella Gneiss

Precambrian
Arizona
Basin and Range province

Reynolds, S.J., 1985, Geology of the South Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 195, 61 p.

Type locality: Exposures in the central Sierra Estrella, southwest of the South Mountains, Maricopa County, Ariz.

The Estrella Gneiss, here named, is in the Sierra Estrella, western South Mountains, Buckeye Hills, and White Tank Mountains, Ariz., and includes many exposures of high-grade metamorphic rocks south and west of Phoenix that are not easily correlated with other named Precambrian rocks of Arizona. Crops out as serrated ridges of dark-colored, blocky metamorphic rocks formed by mostly amphibolite-facies metamorphism of plutonic, volcanic, and metasedimentary protoliths, subsequently overprinted by Tertiary mylonitization. Consists of quartz-feldspathic gneiss, amphibolite, biotitic gneiss, granitic gneiss, migmatite, mica schist, and rare quartz-rich rocks that have crystalloblastic foliation. Is intruded by the Komatke Granite, South Mountains Granodiorite, and Telegraph Pass Granite (all new names). Age is Precambrian.

Etivluk Group

Pennsylvanian, Permian, Triassic, and Early and Middle Jurassic
Alaska
Arctic Foothills province

Mull, C.G., Tailleur, I.L., Mayfield, C.F., Ellersieck, Inyo, and Curtis, S., 1982, New upper Paleozoic and lower Mesozoic stratigraphic units, central and western Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, v. 66, no. 3, p. 348–362.

Type locality: Composite of the Siksikpuk Formation, secs. 21 and 23, T. 12 S., R. 1 E., and the Otuk Formation, sec. 31, T. 10 S., R. 16 W., Alaska. Named for the Etivluk River, a tributary of the Colville River, western Endicott Mountains, Howard Pass quadrangle.
Subunits: **Siksikpuk Formation, Otuk Formation** and its **Blankenship Member.**

The Etivluk Group, here named, is in the De Long and Endicott Mountains in the Brooks Range, and adjacent northern foothills, Alaska, where it is present only on allochthonous sheets. Includes the lower Siksikpuk Formation and the upper Otuk Formation (new name) and its Blankenship Member (new name). Formations are thin, are not well exposed, and consist of thin-bedded chert, shale, silicified shale, and limestone. Disconformably or gradationally overlies the Lisburne Group; disconformably underlies Lower Cretaceous shale, graywacke, and conglomerate. Age of the Siksikpuk is Pennsylvanian, Permian, and Early Triassic; the Otuk is Early Triassic to Middle Jurassic; the Blankenship is Early and Middle Jurassic based on fossils.

Etowah Formation of the Great Smoky Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures at the confluence of the Etowah and Little Rivers, South Canton 7.5-minute quadrangle, Cherokee County, Ga.

The basal and oldest unit of the Murphy synclinorium in the Greater Atlanta region is here named the Etowah Formation of the Great Smoky Group. Consists of interlayered metasandstones and meta-argillite containing lenses of calc-silicate granofels. Gradationally underlies the Sweetwater Creek Formation (new name) of the Great Smoky

Group; the boundary is placed where coarse clastics constitute less than 50 percent of the unit. Age is Late Proterozoic and (or) early Paleozoic.

Fairburn Member of the **Clarkston Formation** of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Outcrops in and around Fairburn, Fairburn quadrangle, Fulton County, Ga.

The Fairburn Member, here named, is the lower member of the Clarkston Formation (new name) of the Atlanta Group (new name) in the area from East Point to Palmetto, Ga., in the northwest limb of the Newnan-Tucker synform. Consists of crinkled garnet schist locally containing small red garnets. Sharply and conformably overlies the Stonewall Formation (new name) of the Atlanta Group; gradationally underlies the Tar Creek Member (new name) of the Clarkston. Thickness ranges from 400 to 1,000 m. Age is Late Proterozoic and (or) early Paleozoic.

Fairdale Till Member of the Glasford Formation

Pleistocene (Illinoian)
Illinois
Wisconsin arch

Kempton, J.P., and Berg, R.C., 1985, Stratigraphy of the Oregon Till Member silty facies and Fairdale Till Member: Illinois Geological Survey, Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 132–154.

Type section: Fairdale Quarry Section, on Fairdale Road 1.6 km south of Fairdale, center sec. 30, T. 42 N., R. 3 E., De Kalb County, Ill.

The recognition that the Esmond Till Member is a unit of the Illinoian Glasford Formation rather than of the Wisconsinan Wedron Formation has left three unnamed till members below the Esmond Member. The middle member, here named the Fairdale Till Member of the Glasford Formation, occurs in De Kalb, Boone, Ogle, and Kane Counties, Ill., and is a yellowish-brown, sandy loam diamicton. Overlies the Herbert Till Member (new name) and underlies the Oregon Till Member (new name), both of the Glasford Formation, in a stratigraphic relationship similar to that between the Argyle and Capron Till

Members of the Winnebago Formation, with which the diamictons were previously correlated. Thickness is less than 10 m. Age is middle Pleistocene (Illinoian).

Faith Chert Member of the Tenmile Creek Formation of the Stanley Group

Late Mississippian
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type locality: Outcrop 0.4 mi southeast of Black Knob Ridge on the north side of Oklahoma Highway 7, NW¼SE¼NW¼ sec. 24, T. 2 S., R. 11 E., Atoka County, Okla. Named for the Faith Tabernacle Church, 1,000 ft northwest of the outcrop.

The Faith Chert Member, here named, is in the lower part of the Tenmile Creek Formation of the Stanley Group in the Ouachita Mountains in Atoka County, southeastern Oklahoma. Consists of bedded chert and siliceous shale. Lies about 1,200 ft above the base of the Tenmile Creek and is considered to be slightly higher than the Albion Creek Chert Member (new name) of the Tenmile Creek in Pushmataha County. Thickness is 90 ft. Age is Late Mississippian.

Fall Brook Coral Bed of the Windom Shale Member of the Moscow Formation of the Hamilton Group

Middle Devonian
New York
Appalachian basin

Baird, G.C., and Brett, C.C., 1983, Regional variation and paleontology of two coral beds in the Middle Devonian Hamilton Group of western New York: Journal of Paleontology, v. 57, no. 3, p. 417–446.

Type section: Exposures along Fall Brook, 0.4 mi east of New York Route 20A–39 overpass, 1.4 mi south of Geneseo, Geneseo 7.5-minute quadrangle, Genesee County, N.Y.

The coral-rich unit in the upper part of the Windom Shale Member of the Moscow Formation of the Hamilton Group is here named the Fall Brook Coral Bed. Extends from eastern Genesee County to Seneca County, N.Y. In the Genesee Valley area the bed contains large corals and other invertebrate fossils densely packed in a soft mudstone matrix. To the east, the bed thickens and the fossil content lessens; east of Seneca Lake, the unit cannot be identified. Separated from the underlying Smoke Creek Bed (new name) by 2 to 5 m of gray to black shale, the *Ambocoelia? praeumbona* zone. Underlies the Spirifer-coralline zone of Stover (1956), here termed the Taunton Beds (new name). Maximum thickness is 1.5 m. Age is Middle Devonian.

Fall Canyon Tuff

Oligocene
New Mexico
Basin and Range province

Ratte, J.C., 1981, Geologic map of the Mogollon quadrangle, Catron County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ–1557, scale 1:24,000.

Type section: W½ sec. 23, T. 13 S., R. 17 W., Shelley Peak quadrangle, Grant County, N. Mex. Named for Fall Canyon, south flank of Shelley Peak, Shelley Peak quadrangle, Catron County.

The Fall Canyon Tuff, here named, is in the Basin and Range province in New Mexico. Consists of high-silica, phenocryst-rich rhyolite ash-flow tuff containing phenocrysts of sanidine cryptoperthite, quartz, and sodic plagioclase. Also contains biotite and accessory opaque oxide, zircon, sphene, oxyhornblende, and apatite. Overlies and underlies unnamed lava flows. Thickness at the type section is 150 m. Age is Oligocene based on a zircon fission-track age of 29.4 Ma.

Farmers Creek Member of the Hopkinton Dolomite

Early Silurian (Llandoverian)
Iowa
Iowa shelf

Johnson, M.E., 1983, New member names for the Lower Silurian Hopkinton Dolomite of eastern Iowa: Iowa Academy of Science Proceedings, v. 90, no. 1, p. 13–18.

Type section: Schwenker quarry, near the center of Farmers Creek Township, 4.75 km west-northwest of Fulton, NE¼SW¼ sec. 16, T. 85 N., R. 2 E., Jackson County, Iowa.

Previously divided on the basis of paleontologic units, the Hopkinton Dolomite is here divided into lithologic members to facilitate interregional correlations based on sea-level curves. The 12-m-thick rock unit corresponding to the *Cyclocrinites* Beds of the Hopkinton is here named the Farmers Creek Member in eastern Iowa and may also be traced to northwestern Illinois. Consists of tan, massive, very finely crystalline to micritic dolomite. The pentamerid brachiopod *Harpidium maquoketa* predominates the fauna of the upper two-thirds of the member; the green alga *Cyclocrinites* occurs throughout the entire unit. Overlies the Marcus Member of the Hopkinton; underlies the Picture Rock Member (new name) of the Hopkinton. Age is Early Silurian (Llandoverian).

Farmersville Member of the Pecan Gap Formation of the Taylor Group

Late Cretaceous (Campanian)
Texas
Ouachita tectonic belt province

McNulty, C.L., Brezina, J.L., Dawson, W.C., and Maluf, F.W., 1981, Emendation of the Pecan Gap Chalk (Campanian) in northeast Texas: Gulf Coast Association of Geological Societies Transactions, v. 31, p. 353–358.

Type locality: Hays Hills, an area of 1.0 sq mi located about 2 mi northwest of Farmersville, Collin County, Tex.

The Farmersville Member, here named, of the Pecan Gap Formation, revised, of the Taylor Group, was proposed informally by Brezina (1974) and published without formal definition by Dawson, Reaser, and Richardson (1978). Occurs only in the Hays Hills, Collin County, Tex., and is a lenticular body believed to be of storm-wave and tidal origin. Consists of thin-bedded glauconitic quartz sandstone alternating with bioclastic calcite. Disconformably overlies silty marl, possibly the Ozan Formation. Relationship to other units is uncertain; may correlate with the Wolfe City Formation or the Rockwall Member (new name) of the Pecan Gap. Thickness is 32 to 60 ft. Age is Late Cretaceous (Campanian).

Fawn Creek Member of the Scotch Grove Formation

Early Silurian (Wenlockian)
Iowa
Iowa shelf

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

Type locality: Exposures along both sides of Wapsipinicon River upstream from the mouth of Fawn Creek, Wapsipinicon State Park, N½SE¼ sec. 11, T. 84 N., R. 4 W., Jones County, Iowa. Reference core section: NW¼NW¼SW¼NE¼ sec. 20, T. 82 N., R. 8 W., Linn County, Iowa.

The informal Fawn Creek facies of Witzke (1981) is here named the Fawn Creek Member in the middle and upper Scotch Grove Formation (new name) in eastern Iowa. Consists of horizontally bedded, porous, noncherty, abundantly fossiliferous dolomite containing crinoid-moldic debris. Overlies and is replaced laterally to the east and west by the Buck Creek Quarry Member (new name) of the Scotch Grove, reassigned from the revised Hopkinton Formation; is replaced laterally to the north by the Palisades-Kepler Member (new name) of the Scotch Grove; underlies the Waubeek Member (new name) of the Scotch

Grove, or is a lateral facies equivalent of the Waubeek Member where it underlies the Anamosa Member of the Gower Formation. Thickness is commonly 60 ft but attains 97 ft. Age is Early Silurian (early and middle Wenlockian).

Fayetteville Phyllite of the Sylacauga Marble Group

Early and Middle Cambrian
Alabama
Piedmont-Blue Ridge province

Tull, J.F., 1985, Stratigraphy of the Sylacauga Marble Group, *in* Tull, J.F., and others, eds., Early evolution of the Appalachian miogeocline: upper Precambrian-lower Paleozoic stratigraphy of the Talladega Slate Belt: Alabama Geological Society guidebook, 22d annual field trip, Nov. 22–23, 1985, p. 21–26.

Type locality: Exposures near the village of Fayetteville, southwest Talladega County, Ala.

The Fayetteville Phyllite of the Sylacauga Marble Group, as revised by Tull (1982) and here named, is in the southwestern part of the Talladega slate belt, Alabama. Consists of tan to maroon, calcareous metasiltstone, in places finely laminated and interbedded with metasandstone, and bounded above and below by thick carbonate units with which it is gradational. Overlies the Jumbo Dolomite and underlies the Shelvin Rock Church Formation (new name), both of the Sylacauga Marble Group. Correlates with part of the Rome Formation of Early and Middle Cambrian age.

Fence Lake Formation

Miocene
New Mexico
San Juan basin

McLellan, Marguerite, Robinson, Laura, Haschke, Laura, Carter, M.D., and Medlin, Antoinette, 1982, Fence Lake Formation (Tertiary), west-central New Mexico: New Mexico Geology, v. 4, no. 4, p. 53–55.

Type section: Exposures in sec. 1, T. 4 N., R. 18 W., southwest Cibola County, N. Mex. Named for the community of Fence Lake, Cibola County.

The Fence Lake Formation, here named, is in west-central New Mexico and was formerly mapped as the upper member of the Bidahochi Formation by Repenning and Irwin (1954). Includes a lower unit, the informal Fence Lake gravel of Marr (1956), that contains a coarse conglomerate consisting of 41 ft of subrounded to subangular granules, pebbles, cobbles, and boulders of basalt, rhyolite, and other fine- to coarse-grained, poorly sorted volcanic rocks and an upper unit consisting of 180 ft of grayish-pink, poorly sorted, very fine- to coarse-grained, calcareous sandstone containing lenses of conglomerate. Unconformably overlies the Upper Cretaceous Moreno Hill Formation (new name); upper unit remains at the surface only where it has been protected from erosion by a lens of conglomerate that is partly concealed by eolian sand. Similarity of clasts in the Fence Lake conglomerates to the rocks of the Datil Group in the Datil Mountains to the southeast suggests that the Fence Lake is an alluvial fan derived from rocks of the Datil Mountains. Thickness ranges from 60 ft to 221 ft at the type section. Age is Miocene based on clasts of Oligocene basaltic andesites and rhyolites of the Datil-Mogollon area.

Fenstermaker Wash Formation

Middle and Late Devonian
Nevada
Great Basin province

Hose, R.K., Armstrong, A.K., Harris, A.G., and Mamet, B.L., 1982, Devonian and Mississippian rocks of the northern Antelope Range, Eureka County, Nevada: U.S. Geological Survey Professional Paper 1182, 19 p.

Measured sections: Lower part: SE1/4 sec. 16, T. 16 N., R. 51 E.; NE1/4NE1/4 sec. 21, T. 15 N., R. 51 E.; and NE1/4NE1/4 sec. 20, T. 15 N., R. 51 E. Middle and upper parts: NE1/4 sec. 20 and NW1/4 sec. 21, T. 15 N., R. 51 E., northern Antelope Range, Eureka County, Nev. Named for Fenstermaker Wash, northeast and east of the northern part of the Antelope Range.

The Fenstermaker Wash Formation, here named, is in the northern Antelope Range, Nev. Is divided into a lower part, 80 to 183 m thick, consisting of medium-gray to light-brownish-gray, massive, medium- to coarse-grained, peloid-echinoderm-coral, stromatoporoid-brachiopod packstone and wackestone; a middle part, 42 m thick, consisting of pale-yellowish-orange, siliceous, laminated siltstone and claystone; and an upper part, 60 m thick, consisting of medium-gray, crossbedded, peloid-mudlump packstone to grainstone that forms a massive cliff. Contains a fauna suggestive of intertidal, deep water, and subtidal deposition. Conformably and sharply overlies the Denay Formation; sharply underlies the Davis Spring Formation (new name), representing an unconformity of considerable magnitude. Correlates temporally with the Bay State Dolomite and Devils Gate Limestone in the southern Fish Creek Range, 10 km to the east. Age is Middle and Late Devonian based on conodonts.

Ferguson Hill Member of the Sunrise Formation of the Volcano Peak Group

Early Jurassic (Hettangian and Sinemurian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures on the east flank of Ferguson Hill, west side of Muller Canyon, Gabbs Valley Range, Mineral County, Nev. This section is proposed as the stratotype for the Triassic-Jurassic System boundary.

The lower two units, units 5 and 6, of Muller and Ferguson (1939) of the Sunrise Formation are here named the Ferguson Hill Member of the now revised Sunrise Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Includes three lithologies: a lower silty limestone unit consisting of 5 m of black to gray thin- to medium-bedded, silty to sandy limestone and siltstone; a cherty limestone unit consisting of 35 m of brown, bluish-gray, or gray medium- to thick-bedded chert-rich limestone; and an upper oolitic limestone unit consisting of 15 m of gray or orange-brown oolitic limestone and siltstone. Conformably overlies the Muller Canyon Member (new name) of the Gabbs Formation of the Volcano Peak Group; conformably underlies the Five Card Draw Member (new name) of the Sunrise Formation. Age is Early Jurassic (Hettangian and Sinemurian) based on fossils.

Fishburne Formation

Eocene (Ypresian)
South Carolina
Atlantic Coast province

Gohn, G.S., Hazel, J.E., Bybell, L.M., and Edwards, L.E., 1983, The Fishburne Formation (lower Eocene), a newly defined subsurface unit in the South Carolina Coastal Plain: U.S. Geological Survey Bulletin 1537–C, p. C1–C16.

Type section: Clubhouse Crossroads corehole Number 1 (CC1), depth interval 416–440 ft, Dorchester County, S.C. Named for Fishburne Creek in southern Dorchester County.

A thin, laterally persistent unit in the subsurface of the Coastal Plain southwest of the Charleston-Summerville area, South Carolina, assigned to the upper part of the Black Mingo Formation by Gohn and others (1977) and designated informal unit Te_1 by Gohn and others (1978), is here named the Fishburne Formation. [The Fishburne Formation at the type section is described as unnamed Ypresian strata of the Black Mingo Group by Van Nieuwenhuise and Colquhoun (1982).] Consists of greenish-gray to pale-olive, finely crystalline, nodular, glauconitic, clayey, microfossil-mollusk limestone that has an apparent lack of bedding due to bioturbation. Sharply overlies the Black Mingo Formation; sharply underlies the Moultrie Member of the Santee Limestone. Thickness at the type section is 24 ft. Age is early Eocene (Ypresian).

Fisher Creek Formation

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Along the east side of Fisher Creek near Fisher Creek School, south of Looneys Gap in Clinch Mountain, Looneys Gap quadrangle, Hawkins County, Tenn.

The Fisher Creek Formation, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., were previously named the Newman Limestone by Hardeman and others (1966) but are isolated from the type Newman Limestone in the Newman Ridge syncline. Consists of limestone and subordinate sandstone and is subdivided into a lower member, the informal Fisher Creek formation of Sanders (1952), a middle sandstone member, the informal Alumwell sandstone of Sanders (1952), and an upper member, the informal Marshall Creek formation of Sanders (1952). Sharply overlies the Gilliam Creek Limestone (new name); sharply underlies the Fido Sandstone. Thickness is 450 m. Age is Mississippian.

Fisher Spring Sandstone Member of the Ridge Route Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Outcrops adjacent to Fisher Spring along the east side of Interstate Highway I–5 between Paradise Ranch and Whitaker Peak road, about 12 km north of Castaic, Los Angeles County, Calif.

The Fisher Spring Sandstone Member, here named, is in the Ridge Route Formation of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif., and is one of five major clastic tongues of the Ridge Route Formation that cross the basin. Consists of light-brown medium-grained, arkosic sandstone interbedded with mudstone and conglomerate and contains freshwater mollusk, ostracode, and vertebrate fossils suggestive of nonmarine lacustrine-fluvial conditions. Conformably overlies the Paradise Ranch Shale Member (new name), and conformably underlies the Osito Canyon Shale Member (new name), both of the Peace Valley Formation, redefined. Interfingers with the Violin Breccia to the southwest and with the Ridge Route undivided to the northeast. Lateral extent is 4,310 m. Thickness is 740 m at the type section and ranges from 100 m to 1,300 m. Age is late Miocene based on stratigraphic position.

Fite Ranch Sandstone Member of the **Tres Hermanos Formation**

Late Cretaceous (Turonian)
New Mexico
Orogrande basin

Hook, S.C., Molenaar, C.M., and Cobban, W.A., 1983, Stratigraphy and revision of nomenclature of upper Cenomanian to Turonian (Upper Cretaceous) rocks of west-central New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 185, p. 7–28.

Type section: SE¼SE¼ sec. 8 and NE¼NE¼ sec. 17, T. 5 S., R. 2 E., San Antonio quadrangle, Socorro County, N. Mex. Named for Fite Ranch, 1 mi south of Carthage, Socorro County.

The Fite Ranch Sandstone Member, here named, is the upper member of the Tres Hermanos Formation, raised in stratigraphic rank, in the Orogrande basin, New Mexico. Consists of light-gray to brown fine-grained, fossiliferous sandstone and minor amounts of siltstone. Sandstone is poorly bedded, burrowed, bioturbated, moderately to well sorted, and flat bedded or ripple marked and represents coastal barrier deposits. Overlies the Carthage Member (new name) of the Tres Hermanos; underlies the D-Cross Tongue of the Mancos Shale. Equivalent to the Juana Lopez Member of the Mancos Shale. Locally absent, and thickness is 75 ft at the type section but is thin in most places. Age is Late Cretaceous (early late Turonian).

Five Card Draw Member of the Sunrise Formation of the Volcano Peak Group

Early Jurassic (Sinemurian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures along Five Card Draw, Gabbs Valley Range, Mineral County, Nev.

Unit 7 of Muller and Ferguson (1939) of the Sunrise Formation is here named the Five Card Draw Member of the now revised Sunrise Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Consists of fine-grained siliceous siltstone and mudstone in the lower part and dark-gray to black mudstone grading to calcareous siltstone in the upper part. Conformably overlies the Ferguson Hill Member (new name) of the Sunrise; conformably underlies the New York Canyon Member (new name) of the Sunrise. Thickness is 100 m. Age is Early Jurassic (Sinemurian) based on fossils.

Floris Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type locality: Exposures in a series of roadcuts along a north-south road on the east edge of sec. 29, T. 72 N., R. 13 W., east of Ottumwa, Wapello County, Iowa. Named for the community of Floris in northeastern Davis County.
Subunits: Laddsdale Member, Carruthers Coal Member.

The Floris Formation is one of four newly named formations in the Cherokee Group of the Des Moines Supergroup in southeastern and south-central Iowa. Consists of unfossiliferous shale and sandstone characterized by thick channel-fill sequences and the absence of widely traceable beds in the lower portion. Six coal beds in the lower Floris, named the Laddsdale Member (new name), are lenticular and discontinuous and range from 1 in to 2.2 ft in thickness. The Laddsdale Member is frequently overlain by a lenticular fossiliferous limestone historically referred to as the informal Laddsdale limestone in Iowa and correlated with the Seville Limestone of Illinois. The lenticular nature and lack of distinctive fauna make the correlation of the limestone with the Seville questionable, and it is given no formal name. The Carruthers Coal Member (new name), in the upper Floris, is a single thin, persistent coal, 1.4 ft thick. Contact with the underlying Kalo Formation (new name) of the Cherokee Group is placed at the base of the lowermost coal of the Laddsdale Member; underlies the Whitebreast Coal Member (new name) of the Swede Hollow Formation (new name) of the Cherokee. Thickness is 100 ft at the type section and ranges from 65 to 190 ft. Age is Middle Pennsylvanian (Desmoinesian).

Flume Ridge (Flume) Formation

Late Silurian and Early Devonian
New Brunswick, Maine
New England province

Ruitenberg, A.A., 1967, Stratigraphy, structure and metallization Piskahegan-Rolling Dam area (northern Appalachians, New Brunswick, Canada): Leidse Geologische Mededelingen, v. 40, p. 79–120.

Type locality: Exposures at Flume, along the Magaguadavic River, Charlotte County, New Brunswick, Canada.

Rocks named the Canoose Formation of MacKenzie (1940) and the Pale Argillite Division of the Charlotte Group of MacKenzie and Alcock (1960) are here named the Flume Formation. Occurs in Charlotte County, N.B., and westward into Maine. Consists of gray-green, sandy phyllite and slate. Interbedded with the underlying Waweig Formation (new name) and Digdeguash Formation (new name). Age is Late Silurian and Early Devonian based on fossils in the Waweig and pre-Mississippian deformation.

Ruitenberg, A.A., 1972, Metallization episodes related to tectonic evolution, Rolling Dam and Mascarene-Nerepis belts, New Brunswick: Economic Geology, v. 67, p. 434–444.

The Flume Formation of Ruitenberg (1967) is here mapped as the Flume Ridge Formation. [The name Flume Ridge is used in all subsequent references to the unit.]

Folsomville Member of the Petersburg Formation

Middle Pennsylvanian
Indiana
Illinois basin

Eggert, D.L., 1982, A fluvial channel contemporaneous with deposition of the Springfield Coal Member (V), Petersburg Formation, northern Warrick County, Indiana: Indiana Department of Natural Resources, Geological Survey, Special Report 28, p. 1–20.

Type section: Final cuts in former surface mines near Folsomville, SW¼NE¼ sec. 7, T. 5 S., R. 7 W., and NW¼SW¼ sec. 12, T. 5 S., R. 8 W., northern Warrick County, Ind.

Clastic beds that split the Springfield Coal Member (V) of the Petersburg Formation into two or more coal seams in northern Warrick County, Ind., are here named the Folsomville Member of the Petersburg. Represents a fluviochannel system that was partly contemporaneous with peat deposition. Consists of rash, gray mudstone, siltstone, and sandstone, which is crossbedded and coarser grained in the center of the channel. Where the upper seam of the coal is missing, the top of the Folsomville is the top of the Petersburg. Thickness attains 40 ft; width ranges from 1 to 4 mi. Age is Middle Pennsylvanian.

Ford Member of the Bell Canyon Formation of the Delaware Mountain Group

Late Permian (Guadalupian)
Texas, New Mexico
Permian basin

Winner, Phil, 1985, Type section for the uppermost Bell Canyon Formation in the central Delaware basin of West Texas: West Texas Geological Society Bulletin, v. 24, no. 7, p. 7–10.

Type section: Gulf J.R. Grandin Number 1 well, sonic-gamma ray log, SE¼ sec. 33, Block 29 PSL Survey, Loving County, Tex. [Possibly named for the Geraldine Ford field, Culberson and Reeves Counties, Tex.]

The Ford Member, here named, is in the upper Bell Canyon Formation of the Delaware Mountain Group in the central Delaware basin of Texas and New Mexico. Was previously designated the informal unranked Ford siltstone by Nottingham (1960) and the Ford shale member by Grauten (1965). Consists of silty, calcareous shale that has relatively tight porosity and is defined as the first significant shaley zone above the base of the Olds Member (new name) of the Bell Canyon. Is regionally extensive but is difficult to correlate on a regional basis, especially where the overlying informal R3 sand of the Ramsey Member (new name) of the Bell Canyon is tightly cemented. Thickness is about 10 ft. Age is Late Permian (Guadalupian).

Forge Creek Suite of the Elk Park Supersuite

Middle Proterozoic
Tennessee, North Carolina, Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: None designated. Named for Forge Creek, lat 36°28′ N., long 81°44′ W., Baldwin Gap 7.5-minute quadrangle, Johnson County, Tenn.
Subunits: Watauga River Gneiss (North Carolina, Tennessee), Comers Gneiss (Virginia), Grayson Gneiss (Virginia).

The Forge Creek Suite, here named, is in the Elk Park Supersuite as used by Bartholomew and Lewis (1984) in the Watauga massif in the Blue Ridge in Tennessee, North Carolina, and Virginia. Includes the Watauga River Gneiss (new name) in North Carolina and Tennessee and the Comers and Grayson Gneisses in Virginia. Biotite dioritoid forms the coarse-grained Grayson Gneiss core facies. Medium-grained biotite granitoid forms the marginal Comers Gneiss facies that is gradational into granitoid of the Watauga River Gneiss. Age is Middle Proterozoic based on a rubidium-strontium age of 1,175 Ma.

Foster Formation

Early and Middle Ordovician (Canadian, Whiterockian)
Michigan
Michigan basin

Fisher, J.H., and Barratt, M.W., 1985, Exploration in the Ordovician of the central Michigan basin: American Association of Petroleum Geologists Bulletin, v. 69, no. 12, p. 2065–1076.

Type section: Brazos-Sun-Superior State Foster Number 1 well, depth interval 11,478–12,996 ft, sec. 28, T. 23 N., R. 2 E., Ogemaw County, Mich.

The Foster Formation, here named, is in the subsurface of the central Michigan basin. Consists of dark-gray dolomitic siltstone, black shale, and dark-gray dolostone containing thinly interbedded sandstone, limestone, and anhydrite. Contorted bedding and bioturbation are common. Transitionally overlies the Cambrian Trempealeau Formation; gradationally underlies the Bruggers Formation (new name), and the contact is placed arbitrarily below the lowest thick sandstone. Thickness is 1,578 ft at the type section. Age is Early and Middle Ordovician (Canadian, Whiterockian) based on conodonts.

Four-Mile Village Member of the Intracoastal Formation

Pliocene
Florida
South Georgia-North Florida sedimentary province

Clark, M.W., and Schmidt, Walter, 1982, Shallow stratigraphy of Okaloosa County and vicinity, Florida: Florida Bureau of Geology, Report of Investigations, no. 92, 51 p.

Type section: Coffeen Number 1 (W–8865) core, depth interval 211–269 ft, NE¼NE¼ sec. 35, T. 2 S., R. 21 W., near the town of Four-Mile Village, southwest Walton County, Fla.

The Four-Mile Village Member of the Intracoastal Formation, here named, is in Walton and Okaloosa Counties, Fla. Consists of dark, weathered-looking, unconsolidated to indurated, massive bedded, calcareous, microfossiliferous, slightly arenaceous, glauconitic, phosphoritic sand or sandstone. Forms a low angle, wedge-shaped tongue in the center of the Intracoastal Formation. Thickness at the type section is 58 ft. Age is Pliocene based on planktonic foraminifera.

Foxhollow Member of the Walworth Formation

Pleistocene (Wisconsinan)
Wisconsin, Illinois
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Test hole Number 671 of Fricke (1976), 5 km east of Beloit on the east side of the country road north of old Highway 15, NE¼SE¼NE¼ sec. 33, T. 1 N., R. 13 E., Shopiere 7.5-minute quadrangle, Rock County, Wis. Named for the town of Foxhollow, Rock County.

The Foxhollow Member of the Walworth Formation (new name) is here named following the informal usage of Fricke (1976). Occurs in south-central Wisconsin east of Rock River and south of Turtle Creek and in part of northern Illinois. Consists of gray pebbly, silty, clayey till and contains wood fragments. Overlies pre-Pleistocene rocks; sharply underlies the Allens Grove Member (new name) of the Walworth. Age is Pleistocene (early Wisconsinan or older).

Foxtown Member of the **Buttermilk Falls Limestone**

Middle Devonian
Pennsylvania
Appalachian basin

Epstein, J.E., 1984, Onesquethawan stratigraphy (Lower and Middle Devonian) of northeastern Pennsylvania: U.S. Geological Survey Professional Paper 1337, 35 p.

Type section: Exposures in railroad cut of Erie-Lackawanna Railroad, nearly 1 mi south of the East Stroudsburg Post Office, Stroudsburg 7.5-minute quadrangle, Monroe County, Pa. Named for Foxtown Hill on Godfrey Ridge along U.S. Highway 611.

The Foxtown Member, here named, is the lower of three mappable members of the Buttermilk Falls Limestone on Godfrey Ridge, Monroe County, Pa. Consists of wavy, irregularly bedded and lenticular, medium-gray, fine-grained, fossiliferous, cherty limestone in 1-in.- to 2-ft-thick beds, interbedded with shale, siltstone, and chert. Fossils include crinoid columnals in the lower half of the member and brachiopods and ostracodes. Abruptly overlies the Schoharie Formation; transitionally underlies the McMichael Member (new name) of the Buttermilk Falls. Thickness is 82 ft. Age is Middle Devonian.

Freel Peak Granodiorite

Late Cretaceous
California, Nevada
Sierra Nevada province

Armin, R.A., and John, D.A., 1983, Geologic map of the Freel Peak 15-minute quadrangle, California and Nevada: U.S. Geological Survey Miscellaneous Investigation Series Map I–1424, scale 1:62,000.

Type locality: Exposures at Armstrong Pass, E½ sec. 1, T. 11 N., R. 18 E., Freel Peak 15-minute quadrangle, El Dorado and Alpine Counties, Calif. Named for Freel Peak, 2 mi north of Armstrong Pass, sec. 25, T. 12 N., R. 19 E.

Intrusive rocks exposed in the central part of the Freel Peak quadrangle, central Sierra Nevada, California and Nevada, are here named the Freel Peak Granodiorite. Consists of light-gray, medium-grained, biotite granodiorite containing distinctive quartz aggregates, potassium feldspar phenocrysts, and ragged biotite flakes. A pinkish-orange to gray porphyritic body exposed north of Jobs Peak is regarded as a variant of the Freel Peak Granodiorite. Intrudes the quartz diorite of Jobs Canyon; is intruded by the tonalite west of Waterhouse Peak, the Burnside Lake Adamellite, and the Bryan Meadow Granodiorite (new name). Age is Late Cretaceous based on potassium-argon ages of 93.2 and 82.9 Ma.

Frenchman Flat Sandstone Member of the Ridge Route Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Outcrop along California Highway 99 near Frenchman Flat, about 15 km north of Castaic, Los Angeles County, Calif.

The Frenchman Flat Sandstone Member, here named, is in the Ridge Route Formation of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif. Is a clastic tongue of the Ridge Route and consists of white, medium-grained, arkosic sandstone interbedded with mudstone and rare conglomerate. Contains freshwater mollusks, plant remains, ostracodes, and stromatolites. Extends laterally into the basin for 4,620 m. Interfingers with the Ridge Route undivided to the northeast and with the Violin Breccia to the southwest. Conformably overlies the Osito Canyon Shale Member (new name) and conformably underlies the Cereza Peak Shale Member (new name), both of the Peace Valley Formation, redefined. Thickness is 172 m at the type section and ranges from 50 m to more than 400 m. Age is late Miocene based on its stratigraphic position below the fossiliferous late Miocene Cereza Peak Shale Member.

Friendship Chert Member of the Tenmile Creek Formation of the Stanley Group

Late Mississippian
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type section: Exposure in SW¼SW¼NW¼ sec. 13, T. 2 N., R. 20 E., southern Potato Hills, Pushmataha County, Okla. Named for Friendship School, sec. 20, T. 2 N., R. 20 E.

The Friendship Chert Member, here named, is in the Tenmile Creek Formation of the Stanley Group in the Ouachita Mountains in Pushmataha County, southeastern Oklahoma. Consists of dark-gray to olive-gray to tan siliceous shale containing thin chert beds. At the type section, lies in the lower part of the Tenmile Creek about 300 ft above the Arkansas Novaculite and 1,700 ft below the Albion Creek Chert Member (new name) of the Tenmile Creek. Thickness is 65 ft at the type section. Age is Late Mississippian.

Galts Ferry Gneiss Member of the Pumpkinvine Creek Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures near Galts Ferry Landing on Lake Allatoona, Allatoona Dam 7.5-minute quadrangle, Bartow County, Ga.

The Galts Ferry Gneiss Member of the Pumpkinvine Creek Formation of the New Georgia Group (new name), here named, is in the Greater Atlanta region of northwest Georgia. Consists of banded hornblende-quartz-plagioclase gneiss interlayered with biotite-muscovite-plagioclase gneiss. Gradationally underlies amphibolite and garnet gneiss in the Pumpkinvine Creek. Age is Late Proterozoic and (or) early Paleozoic.

Gantts Quarry Formation of the Sylacauga Marble Group

Early Ordovician
Alabama
Piedmont-Blue Ridge province

Tull, J.F., 1985, Stratigraphy of the Sylacauga Marble Group, *in* Tull, J.F., and others, eds., Early evolution of the Appalachian miogeocline: upper Precambrian-lower Paleozoic: Alabama Geological Society Guidebook, 22d Annual Field Trip, November 22–23, 1985, p. 21–26.

Type locality: Exposures in the Gantts Quarry, southwest of Sylacauga, Talladega County, Ala.

The Gantts Quarry Formation of the Sylacauga Marble Group, as revised by Tull (1982) and here named, is in the Talladega slate belt, Alabama. Consists of white, cream, or gray micritic, fine-grained banded, calcite marble interlayered with dolomitic marble that has been quarried for dimension stone. Overlies the Gooch Branch Chert (new name) of the Sylacauga Marble Group; unconformably underlies the Lay Dam Formation. Age is Early Ordovician based on conodonts found near the base of the unit.

Gaps Trondhjemite

Early Proterozoic
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type area: Intrusive bodies near the Gap and other localities in the Medicine Bow Mountains and Sierra Madre, Carbon County, Wyo.

The Gaps Trondhjemite, informally called the Gaps granite by Houston and others (1968) and here named, is in the Medicine Bow Mountains and Sierra Madre in southern Wyoming. Consists of red, ferruginous, sheared igneous rock that ranges from tonalite to diorite but is called trondhjemite because most samples are plagioclase-rich leucocratic quartz diorite that does not have alkali feldspars. Is spatially associated with and genetically related to gabbroic dikes and sills that crosscut the lower Libby Creek Group in the Medicine Bow Mountains and the upper Deep Lake Group in the Sierra Madre. Uraninite has been found in fractures in the rock. Bodies range in size from a few meters to several hundred meters in diameter. Age is Early Proterozoic (2,000 Ma).

Gay Head Greensand

Miocene
Massachusetts
Atlantic Coast basin

Kaye, C.A., 1983, The autochthonous and allochthonous Coastal Plain deposits of Martha's Vineyard and the Marshfield-Scituate area, southeastern Massachusetts: Atlantic Coastal Plain Geological Association Field Trip Guidebook, 34 p.

Type locality: Exposure in Gay Head Cliff, at the west tip of Martha's Vineyard, Mass.

The Gay Head Greensand, here named, is part of the Gay Head moraine in Martha's Vineyard, Mass., composed of thrust plates made up of remnants of Coastal Plain sediments that were stacked up during Pleistocene glaciation. Is also found in borings and excavations in Marshfield and Duxbury. Consists of greenish-gray to bluish-gray thin, highly fossiliferous, silty, glauconitic sand that has authigenic quartz pebbles, phosphate nodules, and glauconite nodules containing fossils of mollusks, fish, and crustaceans. Overlies granite bedrock; underlies the Devils Bridge Clay (new name) with erosional contact. Thickness ranges from 0.3 to 3.5 m. Age is Miocene.

Georgian Bay Formation

Late Ordovician (Cincinnatian)
Ontario, Michigan
Michigan basin

Liberty, B.A., 1969, Paleozoic geology of the Lake Simcoe area, Ontario: Canada Geological Survey Memoir 355, p. 1–201.

Type locality: Along East Meaford Creek on the south shore of Nottawasaga Bay in Georgian Bay, Lake Simcoe district, Ontario, Canada.

Gray carbonate beds and blue and gray shale in the Lake Simcoe district, Ontario, are here named the Georgian Bay Formation of the Nottawasaga Group. Lower and upper informal members comprise the combined strata of the biostratigraphic Dundas and Meaford units. Overlies the Whitby Formation; underlies the Queenston Formation. Thickness is 130 m. Age is Late Ordovician (Cincinnatian).

Elias, R.J., 1982, Latest Ordovician solitary rugose corals of eastern North America: Bulletins of American Paleontology, v. 81, no. 314, p. 1–116.

The Georgian Bay Formation is geographically extended to Drummond Island, Chippewa County, Mich., where a lectotype section is designated.

Gerrit Basalt

Pleistocene
Idaho
Snake River basin

Christiansen, R.L., 1982, Late Cenozoic volcanism of the Island Park area, eastern Idaho, *in* Bonnichsen, Bill, and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 345–368.

Type area: Canyon of Henrys Fork of the Snake River, upstream for 5 km from Upper Mesa Falls, Fremont County, Idaho. Named for Gerrit railroad siding, 5 km east of Upper Mesa Falls.

Basalts younger than the Lava Creek Tuff on the floor of Island Park, Fremont County, Idaho, are here named the Gerrit Basalt. The basalt flows erupted from several separate small volcanoes. Both concordantly and discordantly overlies an erosional surface cut on the Lava Creek and Mesa Falls Tuffs; overlies domes of Island Park Rhyolite (new name); underlies upper Pleistocene loess and alluvium, and probably also underlies the Buffalo Lake rhyolite flow (150 ka). Age is Pleistocene based on a potassium-argon age of 200 ka for one of the younger flows.

Gibraltar Rock Member of the Tiger Formation

Eocene, Oligocene, and Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Exposures at Gibraltar Rock, from the top down an east-facing gully, SE¼NE¼NW¼ and SW¼NW¼NE¼ sec. 5, T. 34 N., R. 43 E., Pend Oreille County, Wash.

The Gibraltar Rock Member, here named, is in the revised Tiger Formation in the Cusick region of northeastern Washington. Consists of massive to horizontally and planar cross-stratified polymictic conglomerate and conglomeratic sandstone that has feldspar-rich clasts and matrix. Plant fossils are locally abundant in finer grained sandstone and siltstone. Unconformably overlies the Sanpoil Volcanics and O'Brien Creek Formation; is a facies equivalent of, intertongues with, and is separated by a vertical arbitrary boundary from the Locke Member (new name) and the Winchester Creek Member (new name), both of the Tiger. Thickness at the type section is 105 m; maximum thickness is

400 m. Age ranges from early middle Eocene, based on the inclusion of late early to early middle Eocene volcanic rock clasts, through middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Gilliam Creek Limestone

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Exposures southeast of Gilliam Cemetery and along both sides of Gilliam Creek where it cuts through Chestnut Ridge, southwest of Looneys Gap in Clinch Mountain, Looneys Gap quadrangle, Hawkins County, Tenn.

The Gilliam Creek Limestone, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., previously were named the Newman Limestone by Hardeman and others (1966) but are isolated from the type Newman Limestone in the Newman Ridge syncline. The Gilliam Creek consists of finely laminated argillaceous limestone and calcarenite containing chert lenses and nodules. Overlies the Clifton Creek Limestone (new name); sharply underlies the Fisher Creek Formation (new name). Correlates in part with the Ste. Genevieve Limestone. Age is Mississippian.

Glenmark Member of the Rochester Shale

Middle Silurian (Wenlockian)
New York
Appalachian basin

Brett, C.E., 1983, Stratigraphy and facies relationships of the Silurian Rochester Shale (Wenlockian; Clinton Group) in New York State and Ontario: Rochester [N.Y.] Academy of Science Proceedings, Centennial Colloquium Issue, v. 15, no. 2, p. 118–141.

Type locality: Exposures at Glenmark Falls on Sodus Creek near Sodus, Sodus Bay 7.5-minute quadrangle, Wayne County, N.Y.

The Glenmark Member of the Rochester Shale, here named, is a distinctive ledge-forming unit in the middle part of the Rochester in Wayne and Cayuga Counties, N.Y. Consists of dark bluish-gray, argillaceous limestone that has thin shaley partings and basal coarsely crystalline limestone that has hematite stringers. Gradationally overlies the calcareous lower part of the Rochester; abruptly and sharply underlies the upper Rochester. Thickness is 9 m at the type locality. Age is Middle Silurian (Wenlockian).

Glenmore Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: DePere Site, a gravel pit north of Highway X, near the top of the Silurian escarpment, southeast corner of sec. 38, T. 23 N., R. 20 E., DePere 7.5-minute quadrangle, Brown County, Wis. Named for the township of Glenmore.

Following the informal usage of McCartney and Mickelson (1982), the Glenmore Member of the Kewaunee Formation (new name), here named, is in the Green Bay Lobe east of the Fox River in Wisconsin. Consists of dull-reddish-brown sand, silt, and clay. Abruptly overlies the Chilton Member (new name) of the Kewaunee; underlies younger unnamed organic sediment or lacustrine silt and clay or is the surface unit in many places. Correlates with the Two Rivers Member of the Kewaunee Formation in the Lake Michigan Lobe and with the Middle Inlet Member (new name) of the Kewaunee on the west side of the Green Bay Lobe, from which it is separated by an arbitrarily determined vertical contact at the Fox River. Thickness is 6 m at the type section. Age is Pleistocene (late Wisconsinan).

Gooch Branch Chert of the Sylacauga Marble Group

Cambrian and Ordovician
Alabama
Piedmont-Blue Ridge province

Tull, J.F., 1985, Stratigraphy of the Sylacauga Marble Group, *in* Tull, J.F., and others, eds., Early evolution of the Appalachian miogeocline: Upper Precambrian-lower Paleozoic: Alabama Geological Society Guidebook, 22d Annual Field Trip, November 22–23, 1985, p. 21–26.

Type locality: None designated. Forms low hills in the city of Sylacauga, Talladega County, Ala.

The Gooch Branch Chert, here named, occurs in the Sylacauga Marble Group, as revised by Tull (1982), in the Talladega slate belt, Alabama. Consists of gray to tan, dolomitic marble interbedded with cream to white, foliated metachert that forms benches and rubble trains. Contains brown iron ore and manganese. Overlies the Shelvin

Rock Church Formation (new name) and underlies the Gantts Quarry Formation (new name), both of the Sylacauga Marble Group. Correlates with much of the Cambrian-Ordovician Knox Group, especially the Copper Ridge Dolomite. Age is Cambrian and Ordovician based on Early Ordovician conodonts in the overlying Gantts Quarry Formation.

Goose Creek Limestone

Pliocene
South Carolina
Atlantic Coast basin

Weems, R.E., Lemon, E.M., Jr., McCartan, Lucy, Bybell, L.M., and Sanders, A.E., 1982, Recognition and formalization of the Pliocene "Goose Creek phase" in the Charleston, South Carolina, area: U.S. Geological Survey Bulletin 1529–H, p. H137–H148.

Type section: Bluff along Goose Creek 0.3 km east of the Seaboard Coastline railroad bridge over Goose Creek, North Charleston 7.5-minute quadrangle, Berkeley County, S.C. (Sloan, 1908).

The Goose Creek phase of Sloan (1908) in the Charleston, S.C., area is here formally named the Goose Creek Limestone. Consists of gray to white, medium- to coarse-grained, quartzose, phosphatic, sparsely shelly calcarenite. Unconformably overlies the Ashley Member of the Cooper Formation. Thickness at the type section is 3 m. Age is Pliocene.

Governors Point Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Exposures on the west coast of Governors Point on Bellingham Bay, E½ sec. 26, T. 37 N., R. 3 E., Bellingham, Whatcom County, Wash.

The Governors Point Member, here named, is in the Chuckanut Formation in the Bellingham Bay area in the western part of the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands into the foothills of the North Cascades, Wash. Consists of fining-upward beds of cross-stratified arkosic sandstone and massive to crudely stratified metagraywacke-rich conglomerate, representing braided-river deposits. Conformably overlies the Bellingham Bay Member (new name) and unconformably underlies the Padden Member (new name), both of the Chuckanut. Thickness is 375 m at the type section.

Age is early middle Eocene based on the age of the tuff bed (49.9 Ma) at the top of the underlying Bellingham Bay Member.

Grand Prize Formation

Pennsylvanian(?) and Early Permian (Leonardian or Wolfcampian)
Idaho
Idaho Mountains province

Hall, W.E., 1985, Stratigraphy of and mineral deposits in middle and upper Paleozoic rocks of the black-shale mineral belt, central Idaho, *in* McIntyre, D.H., ed., Symposium on the geology and mineral deposits of the Challis 1° × 2° quadrangle, Idaho: U.S. Geological Survey Bulletin 1658 A–S, p. 117–131.

Type locality: North side of Pole Creek at its confluence with Grand Prize Creek, Horton Peak 7.5-minute quadrangle, Custer County, Idaho.

Rocks exposed in a 800-km^2 area from 2 km north of Galena Summit north to the Yankee Fork of the Salmon River on the eastern side of the Idaho batholith, formerly mapped as part of the Wood River Formation, are here named the Grand Prize Formation. Is divided at the type locality into four unnamed units: dark-gray, carbonaceous siltite and gray limestone, 690 m thick; bluish-gray, fine-grained limestone, 30 m thick; gray, banded, limy siltstone and carbonaceous siltite, 580 m thick; and dark-gray, banded siltite and gray limestone, 150 m thick. Overlies the Wood River Formation in thrust-fault contact. Age, based on conodonts, is Early Permian (Leonardian or Wolfcampian) or possibly as old as Pennsylvanian.

Grangeville Member of the Saddle Mountains Basalt of the Columbia River Basalt Group

Miocene
Idaho
Idaho Mountains province

Camp, V.E., 1981, Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho: Geological Society of America Bulletin, v. 92, no. 9, pt. I, p. 669–678.

Type locality: Grangeville, near South Fork of Clearwater River, Idaho County, Idaho.

The Grangeville Member of the Saddle Mountains Basalt of the Columbia River Basalt Group, here named, is in the Nez Percé plateau of the Clearwater embayment, Idaho. Consists of medium- to coarse-grained olivine basalt that erupted from dikes cutting the Nez Percé plateau in Rocky canyon. Overlies the basalt of Weippe of the Pomona

Member and underlies the Craigmont Member (new name), both of the Saddle Mountains Basalt. Age is late Miocene.

Granite Basin Porphyry

Cretaceous and (or) Tertiary
Arizona
Basin and Range province

Creasey, S.C., 1984, The Schultze Granite, the Teacup Granodiorite, and the Granite Basin Porphyry: A geochemical comparison of mineralized and unmineralized stocks in southern Arizona: U.S. Geological Survey Professional Paper 1303, 41 p.

Type locality: Granite Basin, T. 4 S., R. 16–17 E., Christmas 15-minute quadrangle (Christmas and Jerusalem Mountain 7.5-minute quadrangles), Gila and Pinal Counties, Ariz.

The Granite Basin Porphyry, here named, crops out in a 16-km^2 area about 35 km south-southeast of Globe, Ariz. Consists of euhedral phenocrysts of plagioclase, hornblende, and biotite in a holocrystalline, phanerocrystalline, aplitic groundmass of potassium feldspar, quartz, plagioclase, and hornblende that shows no indication of copper mineralization. Characterized by its uniformity of chemical composition, texture, and mineralogy and by the evenness in the degree and extent of secondary alteration. Is sill-like and intrudes the late Paleozoic Escabrosa and Naco Limestones. Age is Cretaceous and (or) Tertiary based on potassium-argon ages of hornblende of 72.3 and 60.7 Ma.

Green Spot Formation of the Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type locality: None designated. Named for Green Spot Hill, San Bernardino County, Calif.

Following the informal usage of Cameron (1981), the Green Spot Formation, here named, is in the Big Bear Group (new name) in the southwest part of the Sugarloaf Mountain area of the San Bernardino Mountains in California. Consists of a complexly imbricated and intruded sequence of dolomitic, cherty, calc-silicate, and stromatolitic marble, phyllite, and quartzite, and is divided into nine unnamed members, G1 to G9. Contacts between the members are conformable; conformably overlies the Moonridge Quartzite (new name) and gradationally underlies the Delamar Mountain Formation (new name), both of the Big Bear Group. Thickness is approximately 880 m. Age is late Precambrian.

Hall Canyon Conglomerate Member of the Goldens Ranch Formation

Oligocene
Utah
Great Basin province

Meibos, L.C., 1983, Structure and stratigraphy of the Nephi NW 7.5-minute quadrangle, Juab County, Utah: Brigham Young University Geology Studies, v. 30, pt. 1, p. 37–58.

Type locality: None designated. Best exposures are northwest and southeast of Hall Canyon on the east side of Long Ridge, NE1/4 sec. 16, T. 13 S., R. 1 W., Nephi NW 7.5-minute quadrangle, Juab County, Utah.

The Hall Canyon Conglomerate Member is here named the middle member of the Goldens Ranch Formation in the Great Basin province, Utah. Divided, on the basis of the presence of volcanic clasts, into units Q and V. Unit Q consists of 60 to 70 percent quartzite clasts and 30 to 40 percent limestone clasts. Unit V consists of 45 to 55 percent quartzite clasts, 15 percent limestone clasts, and 30 to 40 percent volcanic clasts of red andesite. The quartzite clasts resemble Tintic Quartzite; the limestone clasts are Paleozoic limestone. The matrix of both units is bentonitic clay. Overlies the Chicken Creek Tuff Member, here reduced in rank from formation, of the Goldens Ranch; unconformably underlies the Sage Valley Limestone Member of the Goldens Ranch. Correlates with parts of the Ajax and Crazy Hollow Formations. Thickness is about 250 m. Age is Oligocene.

Hannah Member of the **Promised Land Formation** of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54-A, p. 3–40.

Type locality: Exposures where powerlines cross a southwest running road northwest of Hannah Cemetery, near Centerville, Snellville 7.5-minute quadrangle, Gwinnett County, Ga.

The Hannah Member of the Promised Land Formation (new name) of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga., and is a thin unit of quartzite and schist at the top of the Promised Land. Fresh outcrops are white. Thickness is 3 m. Age is Late Proterozoic and (or) early Paleozoic.

Hansboro Formation of the Coleharbor Group

Pleistocene (Wisconsinan)
North Dakota
Williston basin

Bluemle, J.P., 1984, Geology of Towner County, North Dakota: North Dakota Geological Survey Bulletin 79, pt. I, p. 1–44.

Type locality: None designated. Named for the town of Hansboro, Towner County, N. Dak.

The Hansboro Formation of the Coleharbor Group, here named, was informally named by Howard Hobbs in an unpublished study of the glacial stratigraphy of northeastern North Dakota. Is the uppermost of five glacial till deposits representing separate advances of glacial ice in Towner County, N. Dak. Consists of fissile till and stratified sediment containing crystalline sand and carbonate grains and characterized by sparse shale. Color is buff where oxidized and light-gray where unoxidized. Directly overlies the Dahlen Formation; no overlying units have been observed. Probably deposited during a readvance of the glacier that had earlier deposited the Dahlen Formation. Till portion is less than 15 ft thick; total thickness attains 50 ft. Age is Pleistocene, probably late Wisconsinan.

Hanson Creek Member of the Miller Creek Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1-15.

Type section: Exposures in bluff, 1.5 km west of the mouth of Hanson Creek, SE¼SW¼SW¼ sec. 27, T. 49 N., R. 12 W., Poplar NE 7.5-minute quadrangle, Douglas County, Wis. Named for Hanson Creek, which drains into Lake Superior 1 km east of the mouth of the Amnicon River.

Following the informal usage of Need (1980), the Hanson Creek Member of the Miller Creek Formation (new name), here named, is in the Superior Lobe along the Lake Superior shoreline in Douglas and Bayfield Counties, Wis. Consists of dark reddish-brown till. Sharply overlies pre-Pleistocene rocks or the Pleistocene Copper Falls

Formation (new name); underlies the Douglas Member (new name) or sand of the Miller Creek Formation. Thickness is 7.5 m at the type section. Age is Pleistocene (latest Wisconsinan).

Haven Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Nuclear power plant site in Lake Michigan bluff, NW¼NW¼NE¼ sec. 22, T. 16 N., R. 23 E., Sheboygan North 7.5-minute quadrangle, Sheboygan County, Wis. Named for the community of Haven.

Following the informal usage of Acomb (1978), the Haven Member of the Kewaunee Formation (new name), here named, is in the Lake Michigan Lobe in Wisconsin. Consists of pinkish-gray, red, and reddish-brown, pebbly, sandy, and clayey silt till. Overlies the Ozaukee Member (new name) and underlies the Valders Member, both of the Kewaunee. Is equivalent to the Chilton (new name) and Kirby Lake (new name) Members of the Kewaunee in the Green Bay Lobe. Thickness ranges from 2.4 m to 15 m. Age is Pleistocene (late Wisconsinan).

Hays Member of the Bell Canyon Formation of the Delaware Mountain Group

Late Permian (Guadalupian)
Texas, New Mexico
Permian basin

Winner, Phil, 1985, Type section for the uppermost Bell Canyon Formation in the central Delaware basin of West Texas: West Texas Geological Society Bulletin, v. 24, no. 7, p. 7–10.

Type section: Gulf J.R. Grandin Number 1 well, sonic-gamma ray log, SE¼ sec. 33, Block 29 PSL Survey, Loving County, Tex. Named for the Hays field, Reeves County, Tex.

The Hays Member, here named, is the lowest producing unit in the informal A sand in the upper Bell Canyon Formation of the Delaware Mountain Group in the central Delaware basin of Texas and New Mexico. Called the informal Hays sandstone member of the Bell Canyon by Grauten (1965), who defined it as the petroleum-producing sand in the Hays field. The producing sand is now correlated with the Olds Member (new name) of the Bell Canyon, the main pay in the Olds field. The Hays is also a producing sand in the Quito field. Consists of silty, fine-grained sandstone and displays clean gamma-ray response and good porosity development at the base; the upper portion is relatively shaley and has lower porosity due to an increase in carbonate cement. Overlies the informal Bell Canyon B sand; underlies the Olds Member. Thickness ranges from 40 ft in the type well to 110 ft. [Age is Late Permian (Guadalupian).]

Helen Group

Late Proterozoic and Paleozoic
Georgia, North Carolina
Piedmont-Blue Ridge province

Nelson, A.E., and Gillon, K.A., 1985, Stratigraphic nomenclature in the Richard Russell and Helen thrust sheets, Georgia and North Carolina: U.S. Geological Survey Bulletin 1605-A, p. A59-A62.

Type locality: Exposures near the town of Helen, Helen 7.5-minute quadrangle, White County, Ga. (Gillon, 1982).
Subunits: **Nacoochee Formation, Horton Formation, Robertstown Formation.**

The name Helen Group, used informally by Gillon (1982), is here adopted for metamorphic rocks of the Helen thrust sheet between the Dahlonega and Shope Fork faults, Georgia and North Carolina. Includes the Nacoochee (new name), Horton (new name) (Gillon's informal Chattahoochee), and Robertstown (new name) (Gillon's informal Unicoi Park) Formations. The Group is fault bounded and isoclinally folded. The nature of the contact with the overlying Coweeta Group is uncertain. Age is tentatively Late Proterozoic and early Paleozoic.

Helen Member of the Canton Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

German, J.M., 1985, The geology of the northeastern portion of the Dahlonega gold belt: Georgia Geologic Survey Bulletin 100, p. 1-41.

Type locality: Named for town of Helen, White County, Ga.

The Helen Member of the Canton Formation, here named, is in the Dahlonega area, Georgia, and was previously mapped as the Carolina Gneiss by Keith (1909). [It is incorrectly stated by German (1985) that Gillon (1982) named these rocks the informal Helen sequence. Gillon's (1982) informal Helen group was formally named the Helen Group (new name) by Nelson and Gillon (1985), a usage that is consistent with Gillon's original definition and should take precedence over the usage of German (1985) of Helen Member of the Canton Formation.] The Helen Member consists of biotite-plagioclase-quartz gneiss and biotite-muscovite-quartz schist containing garnet. Is in sharp contact with the Chestatee Member (new name) of the Canton; grades into the Univeter (new name) and Tallulah Falls Formations to the southeast and the Palmer Creek Member (new name) of the Canton and the Coweeta Group to the northwest. Its boundaries are defined as the last occurrence of interlayered metagraywacke and biotite-muscovite-quartz schist. Age is Late Proterozoic and (or) early Paleozoic.

Hemlock Lake Formation of the Saginaw Group

Early Pennsylvanian (Morrowan)
Michigan
Michigan basin

Vugrinovich, Ray, 1984, Lithostratigraphy and depositional environments of the Pennsylvanian rocks and the Bayport Formation of the Michigan basin: Michigan Geological Survey Division, Report of Investigation 27, 33 p.

Type section: Michigan Consolidated Gas Company Number L–125 well, depth interval 770–1,000 ft, center NW¼NW¼ sec. 29, T. 18 N., R. 5 W., Lincoln Township, Clare County, Mich. Named for nearby Hemlock Lake.
Subunit: Six Lakes Limestone Member.

The Hemlock Lake Formation of the Saginaw Group, here named, lies in the subsurface of the Michigan basin. The lower part of the formation contains a thin discontinuous basal coal bed overlain by a sequence of thin-bedded, yellowish-gray sandstone, red and gray interbedded siltstone, and gray shale containing minor amounts of carbonate rock. The Six Lakes Limestone Member (new name) is present in the western part of the Hemlock Lake study area. The upper part of the Hemlock Lake consists of shale containing minor amounts of siltstone, sandstone, carbonate rock, and coal. The unit represents back-barrier and transgressive marine and alluvial plain deposits. Overlies the Parma Formation; underlies the Lake George Formation (new name) of the Saginaw Group with sharp contact. Thickness at the type well is 230 ft. Age is Early Pennsylvanian (Morrowan).

Herbert Till Member of the Glasford Formation

Pleistocene (Illinoian)
Illinois
Wisconsin arch

Kempton, J.P., Berg, R.C., and Follmer, L.R., 1985, Revision of the stratigraphy and nomenclature of glacial deposits in central northern Illinois: Illinois Geological Survey, Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 1–19.

Type section: Stone Quarry Road Boring, 6.4 km northwest of village of Herbert, NE¼NE¼NE¼ sec. 22, T. 43 N., R. 3 E., Boone County, Ill.

The recognition that the Esmond Till Member is a unit of the Illinoian Glasford Formation, rather than of the Wisconsinan Wedron Formation, has left three unnamed till members below the Esmond Member. The oldest of these, here named the Herbert Till Member of the Glasford Formation, occurs in the subsurface of parts of Boone, De Kalb, Ogle, McHenry, and Kane Counties, Ill. Consists of a gray-brown loam to sandy loam diamicton and has a clay-mineral composition similar to the Esmond, but illite often exceeds 80 percent. Overlies shale of the Maquoketa Group; underlies the Fairdale or Oregon Till Members (both new names) of the Glasford Formation. Was previously correlated with the Sterling Till Member of the Glasford. Thickness is less than 10 m. Age is Pleistocene (Illinoian).

Hersey Member of the Pierce Formation

Pleistocene (pre-Illinoian)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84-1, p. 1-15.

Type section: West side of abandoned gravel pit, north of Highway 12, 1 km southwest of Hersey, SW¼SE¼ SE¼ sec. 29, T. 29 N., R. 15 W., Wilson 7.5-minute quadrangle, St. Croix County, Wis.

Following the informal usage of Baker and Simpson (1981), the Hersey Member, here named, is the lower member of the Pierce Formation (new name) in west-central Wisconsin. Consists of yellowish-brown to dark-gray, structureless, calcareous till and associated sand and gravel. The lower contact is unknown except where it overlies Paleozoic bedrock; gradationally underlies the Kinnickinnic Member (new name) of the Pierce or sharply underlies the River Falls Formation (new name), and is the surface unit in Pierce, Buffalo, Pepin, and Dunn Counties. Thickness ranges from 1 to 55 m. Age is Pleistocene (pre-Illinoian).

Hexenkopf Complex

Middle Proterozoic
Pennsylvania
Appalachian basin

Drake, A.A., Jr., 1984, The Reading Prong of New Jersey and eastern Pennsylvania—An appraisal of rock relations and chemistry of a major Proterozoic terrane in the Appalachians: Geological Society of America Special Paper 194, p. 75-126.

Type locality: Exposures on and near Hexenkopf Hill, Riegelsville quadrangle, Northampton County, Pa.

The Hexenkopf Complex, here named, occurs in a 15-km^2 area in east-central Pennsylvania where the Riegelsville, Easton, Nazareth, and Hellertown quadrangles meet. Consists of a heterogeneous body of highly altered mafic rock of three general types: hornblende-augite-quartz-andesine gneiss, epidote-augite-hornblende-plagioclase gneiss, and quartz-garnet-augite granofels. Is in thrust contact with lower Paleozoic rocks on the south and with the Byram Intrusive Suite on the north. Underlies the Losee Metamorphic Suite and other metasedimentary rocks on the east and west. Age is Middle Proterozoic, predating all other Middle Proterozoic rocks in the area.

Highland Gypsum Member of the De Queen Formation of the Trinity Group

Early Cretaceous
Arkansas
Ouachita tectonic belt province

Darling, B.K., and Lock, B.E., 1984, The surface formations of the Trinity Group in southwestern Arkansas, and a proposed revision of stratigraphic rank for the three lower units: Gulf Coast Association of Geological Societies Transactions, 34th Annual Meeting, p. 321–327.

Type section: Highland gypsum quarry, SW¼NE¼ sec. 21, T. 8 S., R. 26 W., Pike County, Ark.

The Highland Gypsum Member, here named, is in the easternmost part of the De Queen Formation of the Trinity Group in Pike and Howard Counties, Ark. Consists of thin beds of claystone, lime mudstone, algal laminated dolomudstone, and mosaic gypsum. Gypsum beds do not appear to be laterally extensive and are indicative of deposition in shallow lagoonal waters, back-reef brine ponds, and abandoned tidal channels on mudflats. Overlies the Holly Creek Formation; underlies the Murfreesboro Member (new name) of the De Queen. Correlates with the Ferry Lake Anhydrite in the subsurface in Oklahoma. Thickness is 29 ft at the type section. Age is Early Cretaceous.

High Pond Member of the Bear Pond Gneiss

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: None designated. Named for High Pond, Tupper Lake 15-minute quadrangle, St. Lawrence County, N.Y.

The High Pond Member of the Bear Pond Gneiss (new name), here named, is in the Loon Pond syncline in the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y. Consists of quartz-rich, sugary-textured granulite containing magnetite, pyrite, garnet, biotite, sillimanite, and microcline and small boudins of garnet-quartz-augite gneiss. Thickness ranges from 10 to 15 m. Age is Precambrian.

High Shoals Granite

Pennsylvanian
North Carolina
Piedmont-Blue Ridge province

Horton, J.W., Jr., 1984, Stratigraphic nomenclature in the Kings Mountain belt, North Carolina and South Carolina: U.S. Geological Survey Bulletin 1537-A, p. A59–A67.

Type locality: Exposures at High Shoals on the South Fork Catawba River, lat 35°23′48″ N., long 81°12′05″ W., Gaston County, N.C.

Rocks previously mapped as Yorkville Granite by Keith and Sterrett (1931) and as Yorkville Quartz Monzonite by Espenshade and Potter (1960) are here named the High Shoals Granite. Was informally named the High Shoals granitic gneiss by Horton and Butler (1977) to distinguish it from nonfoliated granites like the type Yorkville near York, S.C. Occupies an area of batholithic size in the Kings Mountain belt, North Carolina. Consists of coarse-grained, generally porphyritic, gneissoid biotite granite or granitic gneiss. Uranium-lead isotopic data on zircons indicate a Pennsylvanian age of about 317 Ma.

Hill 2292 Member of the Lost Pond Marble

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Outcrops along the steep southern slopes of Loon Pond Mountain, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.

The Hill 2292 Member of the Lost Pond Marble (new name), here named, is in the Loon Pond syncline in the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y. Consists of sillimanite-microcline-quartz granulite. Overlies the Bog River Member (new name) and underlies the Sabattis Road Member (new name), both of the Lost Pond Marble. Thickness is more than 50 m. Age is Precambrian.

Hills Mountain Granulite Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., Gathright, T.M., II, and Henika, W.S., 1981, A tectonic model for the Blue Ridge in central Virginia: American Journal of Science, v. 281, no. 9, p. 1164–1183.

Type locality: Near Hills Mountain, 15 km northeast of Lovingston on a N. 18° E. trend, Greenfield 7.5-minute quadrangle, Nelson County, Va.

The Hills Mountain Granulite Gneiss, here named, is in the Lovingston massif in the central Blue Ridge, Va. Consists of gray, medium-grained, hypersthene-bearing quartz-feldspathic gneiss that has granoblastic texture and poorly developed segregation layering. Forms most of the country rock and roof pendants in the Archer Mountain pluton. The contact zone between the gneiss and the pluton consists of a zone of migmatitic granulite gneiss. Age is Middle Proterozoic.

Hills Point Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type section: Bluffs on the south shore of the Pamlico River, 0.2 km upstream from Camp Hardee and 1.2 km west of Hills Point, Blounts Bay 7.5-minute quadrangle, Beaufort County, N.C.

The Hills Point Member of the Flanner Beach Formation, here named, is in the Pamlico River valley, Blounts Bay area, Beaufort County, N.C. Blanketlike deposits, which may represent lagoonal or river estuary deposition, consist of laminated silty clay and clayey silt that have sand lenses, burrows, and carbonized wood. Unconformably overlies pre-Flanner Beach fluvial deposits; grades eastward into an unnamed heavily burrowed sand unit of the Flanner Beach; intertongues with and underlies the Mauls Point Member (new name) of the Flanner Beach. Thickness is 2.5 m at the type section. Age is middle Pleistocene.

Hilt Bed of the **Blue Gulch Mudstone Member** of the **Hornbrook Formation**

Late Cretaceous (Campanian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Roadcut along an access road to the Hilt exit east of Interstate Highway I–5, NW¼SW¼ sec. 24, T. 48 N., R. 7 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif. Named for the abandoned town of Hilt, 11 km northwest of Hornbrook.

The Hilt Bed, here named, is in the Blue Gulch Mudstone Member (new name) of the Hornbrook Formation in the northern margin of the Shasta Valley, Siskiyou County, Calif., and the Dark Hollow area, Jackson County, Oreg., on the northeast margin of the Klamath Mountains. The Hilt is a prominent, laterally continuous bed of gray sandstone in the middle part of the Blue Gulch Mudstone Member, about 480 m above the base. Thickness ranges from 2 to 5 m. Age is Late Cretaceous (Campanian).

Holly Fork Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R. 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut south of Holly Fork along westbound lanes of Interstate Highway I–64, 16 km west of its intersection with Kentucky Highway 2, Soldier quadrangle, Rowan County, Ky.

The Holly Fork Member, used informally by Ettensohn (1977) and here named, is in the Slade Formation (new name) and was previously included in units now restricted from the Cumberland Escarpment area of east-central and northeastern Kentucky. Consists of dolostone and calcilutite. Disconformably overlies or intertongues with the Armstrong Hill Member (new name) and disconformably underlies or intertongues with the Tygarts Creek Member (new name), both of the Slade. Maximum thickness is 5 m. Age is Late Mississippian.

Hooper Canyon Formation

Tertiary
Utah
Wasatch uplift

Van Horn, Richard, 1981, Geologic map of pre-Quaternary rocks of the Salt Lake City North quadrangle, Davis and Salt Lake Counties, Utah: U.S. Geological Survey Miscellaneous Investigations Map I–1330, scale 1:24,000.

Type locality: Exposures in the headwaters of Hooper Canyon in the Fort Douglas quadrangle, 1.5 km east of the Salt Lake City North quadrangle, Davis County, Utah.

The Hooper Canyon Formation, here named, is in the Wasatch uplift in north-central Utah, where it was deposited by west-flowing streams on a late Tertiary erosion surface. Consists of brown to gray, poorly to moderately consolidated, crudely bedded alluvium ranging in size from boulders to silt in a sandy and silty matrix. Subrounded to subangular clasts are 50 to 75 percent quartzite or sandstone and 30 to 50 percent limestone. Unconformably overlies upper Tertiary conglomerate. Thickness is as much as 15 m. Age is late Tertiary.

Horicon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Roadcut on the south side of Mapleview Road, west of its intersection with Maple Road, SE¼SW¼SW¼ sec. 34, T. 31 N., R. 10 E., Mattoon 7.5-minute quadrangle, Langlade County, Wis. Named for the city of Horicon, Dodge County.
Subunits: Liberty Grove Member, Mapleview Member.

The Horicon Formation, here named, is in the Green Bay Lobe in eastern, central, and southern Wisconsin. Includes the Mapleview Member (new name) on the west side of the Green Bay Lobe in Langlade and Marathon Counties and the equivalent Liberty Grove Member (new name) on the east side in Door County. No members are named in south-central Wisconsin. Consists of brown, reddish-brown, and yellowish-brown till and associated sand and gravel. Sharply overlies the Walworth Formation (new name) or bedrock or sand and gravel; is the surficial unit in much of south-central Wisconsin, but abruptly underlies the Kewaunee Formation (new name) near Green Bay. Thickness ranges from 1 m to more than 100 m. Age is late Pleistocene (late Wisconsinan).

Horsepen Mountain Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Outcrops along Virginia Highway 24 on the southern flank of Horsepen Mountain, lat 37°17′ N., long 79°49′ W., Stewartsville 7.5-minute quadrangle, Bedford County, Va.

The Horsepen Mountain Suite, here named, is in the Lovingston massif in the Blue Ridge of Virginia. Consists of biotite dioritoid and charnockite. Age is Middle Proterozoic.

Horton Formation of the **Helen Group**

Late Proterozoic and Paleozoic
Georgia, North Carolina
Piedmont-Blue Ridge province

Nelson, A.E., and Gillon, K.A., 1985, Stratigraphic nomenclature in the Richard Russell and Helen thrust sheets, Georgia and North Carolina: U.S. Geological Survey Bulletin 1605–A, p. A59–A62.

Type locality: Exposures along the Chattahoochee River in the city of Helen, Helen 7.5-minute quadrangle, White County, Ga. (Gillon, 1982). Named for Horton Creek, which flows into the Chattahoochee River south of Robertstown.

The informal Chattahoochee formation of Gillon (1982) is here named the Horton Formation of the Helen Group (new name) in the Helen thrust sheet in Georgia and North Carolina. Consists of an interlayered sequence of argillaceous and feldspathic metasandstone and metasiltstone (locally sulphidic), mica schist, aluminous schist, and amphibolite. Is conformable and gradational with the Nacoochee Formation (new name) of the Helen Group to the southeast; is conformable with the Robertstown Formation (new name) of the Helen Group to the northwest. Age is tentatively Late Proterozoic and early Paleozoic.

Houstenaden Creek Formation

Late Cretaceous (Campanian)
Oregon
Western Columbia basin

Bourgeois, Joanne, and Dott, R.H., Jr., 1985, Stratigraphy and sedimentology of Upper Cretaceous rocks in coastal southwest Oregon: Evidence for wrench-fault tectonics in a postulated accretionary terrane: Geological Society of America Bulletin, v. 96, no. 8, p. 1007–1019.

Type section: Composite of the exposures at Houstenaden Cove, Burnt Hill Cove, and Cape Sebastian, Curry County, Oreg. Named for Houstenaden Creek.

Rocks formerly mapped as lower Cape Sebastian Sandstone by Hunter and others (1970) and as Hunters Cove Formation by Dott (1971) are here named the Houstenaden Creek Formation in a region of complex juxtaposition of tectonostratigraphic terranes in southwest Oregon. With the Late Jurassic Otter Point complex [Formation] and the Late Cretaceous Cape Sebastian Sandstone and Hunters Cove Formation, it forms the distinctive Gold Beach terrane west of high-angle faults that mark the boundary of the Neogene Humboldt microplate. Consists of alternating beds of mudstone, siltstone, and sandstone turbidites in the lower part, overlain by thick amalgamated, coarse-grained sandstone that has channelized conglomerate bodies. Lies in fault contact with the underlying Otter Point; unconformably underlies the Cape Sebastian Sandstone. Thickness is at least 500 m. Age is Late Cretaceous (Campanian) based on dinoflagellates and pollen.

Hulopoe Gravel

Pleistocene
Hawaii

Moore, J.G., and Moore, G.W., 1984, Deposit from a giant wave on the Island of Lanai, Hawaii: Science, v. 226, no. 4680, p. 1312–1314.

Type locality: Exposures along the major gulch that drains into the northernmost extent of Kapihua Bay, the bay directly west of Hulopoe Bay, Island of Lanai, Hawaii.

The Hulopoe Gravel, here named, is on the coastal slopes of Lanai, Hawaii, where it reaches a maximum elevation of 326 m. Gravel was deposited by the surge of a giant ocean wave, created by the rapid movement of a submarine slide, that swept several hundred m up the flanks of Lanai and other nearby islands. Consists of a lower layer of subrounded to rounded clasts of 5 percent white limestone and 95 percent basalt, ranging in size from 3 cm to 1 m, and an upper layer of subangular to angular clasts of basalt, ranging from 20 cm to 1.5 m. Basalt boulders vary from vesicular to dense; limestone boulders are honeycomb coral, algae, and calcareous sandstone. Thickness and clast size decrease systematically with distance from shore and elevation. Overlies basaltic bedrock or fossil soil; upper surface consists of loose boulders. Similar deposits occur on other islands. Uranium-series age of the limestone clasts is Pleistocene (110 ka).

Humptulips Formation

Eocene (Narizian)
Washington
Western Columbia basin

Rau, W.W., 1984, The Humptulips Formation—A new Eocene formation of southwest Washington: Washington Geologic Newsletter, v. 12, no. 4, p. 1–5.

Type locality: Exposures in the East Fork of the Humptulips River, from its confluence with the West Fork upstream to the volcanics of the Crescent Formation, Grays Harbor County, Wash.

Strata in the northern part of the Grays Harbor basin, Washington, previously informally referred to as sedimentary rocks of late Eocene age are here named the Humptulips Formation. Consists of massive to thinly laminated sandy siltstone, mudstone, and sandstone that contain light-gray-weathering tuff beds. Unconformably overlies the Crescent Formation; conformably underlies the Lincoln Creek Formation. Correlates with the Skookumchuck and McIntosh Formations in southwest Washington and the Aldwell Formation and Twin River Group to the north. Thickness is greater than 3,000 ft. Age is middle and late Eocene (Narizian) based on foraminifera.

Hutchinson River Group

Cambrian to Middle Ordovician
New York, Connecticut
New England province

Baskerville, C.A., 1982, Adoption of the Hutchinson River Group and its subdivisions in Bronx and Westchester Counties, southeastern New York: U.S. Geological Survey Bulletin 1529–H, p. H1–H10.

Type locality: Terrane traversed by the Hutchinson River, which flows from Scarsdale, Westchester County, to Eastchester Bay, Bronx County, N.Y.

Subunits: **Hartland Formation** (New York and Connecticut) and its **Pelham Bay Member** (New York), **Harrison Gneiss** (New York and Connecticut).

The Hutchinson River Group, here named, is in the Manhattan Prong in Westchester and Bronx Counties, N.Y., and Fairfield County, Conn. Contains the Hartland Formation and its Pelham Bay Member (new name) and four informal amphibolite, schist, and gneiss members, and the overlying Harrison Gneiss. Age is Cambrian to Middle Ordovician.

Hyatt Ranch Member of the Tensleep Formation

Early Permian (Wolfcampian)
Wyoming
Big Horn basin

Moore, D.A., 1984, The Tensleep Formation of the southeastern Big Horn basin, Wyoming, *in* Goolsby, Jim, and Morton, Doug, eds., The Permian and Pennsylvanian geology of Wyoming: Wyoming Geological Association 35th Annual Field Conference Guidebook, p. 273–279.

Type locality: Exposures on either side of Hyatt Ranch on Paintrock Creek, center T. 50 N., R. 89 W., Big Horn County, Wyo.

A distinctive widespread aeolian unit of the Tensleep Formation on the west flank of the Big Horn Mountains in the Big Horn and Wind River basins, Wyoming, is here named the Hyatt Ranch Member. Consists of white to light-gray and buff, fine- to occasionally coarse-grained, friable to cemented, subrounded, cross-stratified, aeolian sands in the uppermost 30 m of the Tensleep and represents the tops of preserved dunes. Overlies the Medicine Lodge Creek Member (new name) of the Tensleep with angular unconformity. Correlates with the upper member of the Minnelusa Formation. Exhibits distinctive changes in thickness. Age is possibly Early Permian (Wolfcampian).

Ibex Formation

Late Proterozoic
California
Great Basin province

Wright, L.A., and Williams, E.G., 1984, Appendix II—Type section of the newly-named Proterozoic Ibex Formation, the basinal equivalent of the Noonday Dolomite, Death Valley region, California, *in* Wright, L.A., and Troxel, B.W., Geology of the northern half of the Confidence Hills 15-minute quadrangle, Death Valley region, eastern California: the area of the Amargosa chaos: California Division of Mines and Geology Map Sheet 34, p. 25–31.

Type section: Exposures 2 km southwest of Ibex Spring and south of a jeep road that connects the spring with Buckwheat Wash to the west, immediately north of the south border of the southwestern quarter of the Shoshone 15-minute quadrangle, Death Valley region, San Bernardino County, Calif.

The Noonday Dolomite in the Death Valley region, eastern California, grades abruptly southward into a markedly different succession of strata that have lithologies and bedding characteristics that indicate deposition in deep water. These strata, termed the basin facies of the Noonday Dolomite by Williams and others (1976), are here named the Ibex Formation and are mapped in the Confidence Hills quadrangle. Includes a lower conglomerate member, 5 m thick; overlain by a dolomite member, 8 m thick; an arkose member, 90 m thick; a limestone member, 21 m thick; a shaly limestone member, 23 m thick; and a dolomite member, 200 m thick. Total thickness is about 347 m. Overlies the Kingston Peak Formation; underlies the Johnnie Formation. Age is Late Proterozoic.

Icicle Flat Member of the Saddle Mountains Basalt of the Columbia River Basalt Group

Miocene
Idaho
Eastern Columbia basin

Camp, V.E., 1981, Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho: Geological Society of America Bulletin, v. 92, no. 9, pt. I, p. 669–678.

Type locality: Icicle Flat, Nez Percé plateau, Lewis County, Idaho.

The Icicle Flat Member of the Saddle Mountains Basalt of the Columbia River Basalt Group, here named, is in the Nez Percé plateau of the Clearwater embayment in Idaho. Consists of medium- to coarse-grained olivine basalt containing abundant plagioclase phenocrysts. Overlies the Asotin Member and underlies the Craigmont Member, both of the Saddle Mountains. Age is late Miocene.

Indian Run Formation

Late Proterozoic or Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., 1985, Tectonic implications of the Indian Run Formation—A newly recognized sedimentary melange in the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1324, 12 p.

Type locality: Exposures along Indian Run from just southeast of the intersection of Little River Turnpike and Evergreen Lane to the point at which the Run is crossed by Braddock Road, Annandale 7.5-minute quadrangle, Fairfax County, Va.

The Indian Run Formation, here named, was previously mapped as the Sykesville Formation in Virginia. Is a precursory sedimentary melange having a quartz-plagioclase-muscovite-biotite-chlorite-garnet matrix containing abundant olistoliths of Accotink Schist (new name) and Lake Barcroft Metasandstone (new name) of the Annandale Group (new name). Melange is believed to have been emplaced by subaqueous sliding, but its base is not exposed and the unit serving as the slide surface is not known. Tectonically underlies the Annandale Group on the Red Fox thrust fault; is intruded by the Occoquan Granite. Age is Late Proterozoic or Cambrian based on isotopic ages from the Occoquan Granite.

Inman Yard Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Deep cuts on the north side of Inman Yard railroad yard west of Marietta Road, Atlanta, Northwest Atlanta quadrangle, Fulton County, Ga.

The Inman Yard Formation, here named, is apparently the lowest unit in the Atlanta Group (new name) in the Newnan-Tucker synform in northern Georgia. Consists of interlayered gneiss, schist, and granite gneiss. Base of the unit is not exposed; underlies the Norcross Gneiss (new name) of the Atlanta with sharp and apparently conformable contact. Thickness is 700 m. Age is Late Proterozoic and (or) early Paleozoic.

Intrenchment Creek Quartzite of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Outcrops in excavations for the landfill beneath the powerline, just west of Intrenchment Creek, Southeast Atlanta quadrangle, De Kalb County, Ga.

The Intrenchment Creek Quartzite of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform in northern Georgia. Consists of a thin unit of spessartine quartzite and spessartine mica schist. Because of the manganiferous garnets, the rock weathers to blocky, hard black quartzite called coticule or gondite elsewhere. Sharply and conformably overlies the Clarkston Formation (new name) and underlies the Camp Creek Formation (new name) of the Atlanta. Thickness attains 3 m. Age is Late Proterozoic and (or) early Paleozoic.

Ironton Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: SW¼ sec. 33, T. 34 N., R. 3 E., Ironton quadrangle, Iron County, Mo.

Rocks previously mapped as the Lindsey Mountain composite ash flows and High Top bedded tuff by Anderson (1962) and Unit A of the tuff of Stouts Creek by Anderson (1970) are here named the Ironton Rhyolite. Occurs in the Taum Sauk Caldera in the western St. Francois Mountains in southeastern Missouri. Consists of dark-maroon to black ash-flow tuff containing phenocrysts of quartz and alkali feldspar. Overlies the Buck Mountain Shut-ins Formation (new name); underlies the Lindsey Mountain Rhyolite (new name). Thickness is 340 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Ironton Rhyolite.

Ishi Tuff Member of the **Tuscan Formation**

Pliocene
California
Sacramento basin

Harwood, D.S., Helley, E.J., and Doukas, M.P., 1981, Geologic map of the Chico monocline and northeastern part of the Sacramento Valley, California: U.S. Geological Survey Miscellaneous Investigations Map I–1238, scale 1:62,500.

Type locality: Exposures on the north rim of Big Chico Creek canyon, about 400 m northeast of Horseshoe Lake in Bidwell Park, city of Chico, T. 22 N., R. 2 E. Richardson Springs 15-minute quadrangle, Butte County, Calif. Named for Ishi Caves on the south wall of Deer Creek canyon, sec. 11, T. 25 N., R. 1 E., Panther Spring 15-minute quadrangle.

The Ishi Tuff Member, here named, is in the western part of the Tuscan Formation along the northeastern side of the Sacramento Valley from Chico to Red Bluff, Calif. Consists of white to light-gray, fine-grained, pumiceous airfall tuff composed of rhyolitic to dacitic glass and distinctive bronze-colored mica flakes commonly reworked and contains lenses and partings of sandstone and siltstone. Grades laterally into tan micaceous siltstone. Conformably overlies a layer of volcanic conglomerate, 2 to 3 m thick, and locally, a layer of tan siltstone, 1 m thick, at the top of unit B of the Tuscan; conformably and sharply underlies unit C lahar. Thickness is 0.3 m. Age is Pliocene based on stratigraphic relations.

Island Park Rhyolite

Pleistocene
Idaho
Snake River basin

Christiansen, R.L., 1982, Late Cenozoic volcanism of the Island Park area, eastern Idaho, *in* Bonnichsen, Bill, and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 345–368.

Type locality: Lookout Butte, Island Park area, Fremont County, Idaho.

Six small rhyolite domes that crop out adjacent to the Henrys Fork caldera in Fremont County, Idaho, are here named the Island Park Rhyolite. The rhyolite domes are named the Moonshine Mountain, Silver Lake, Osborne Butte, Elk Butte, Lookout Butte, and Warm River Butte domes and are steep sided and endogenous and have shell-like flow-structure patterns parallel to their sides and concentric around their vents. Rhyolite contains large phenocrysts of quartz, sodic sanidine, sodic oligoclase, opaque oxides, ferroaugite, and fayalitic olivine. Domes are nearly buried by the younger Gerrit Basalt (new name) and are younger than the Mesa Falls Tuff and older than the Lava Creek Tuff. The Pleistocene Osborne Butte dome is dated at 1.3 Ma, the age of the second volcanic cycle.

Jack Creek Quartzite of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Flurkey, A.J., Houston, R.S., Karlstrom, K.E., and Kratochvil, T.L., 1981, The geology of Archean and Early Proterozoic terranes of the Sierra Madre, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 3, p. 403–531.

Type locality: Exposures in Jack Creek Canyon and the cirque above North Spring Creek Lake, secs. 5, 8, and 9, T. 14 N., R. 86 W., Carbon County, Wyo.

The Jack Creek Quartzite, here named, is modified from the informal Jack Creek Formation of Graff (1978) to include all of the metasedimentary rocks at the base of the Phantom Lake Metamorphic Suite in the northern Sierra Madre, Wyo. Consists of quartzite and lenses of phyllite, marble, paraconglomerate, quartz-pebble conglomerate, and metagraywacke. The informal Deep Gulch Conglomerate is a radioactive, crossbedded, pyritic quartz-pebble conglomerate facies at the base of the Jack Creek, which represents fluvial deposits in a braided river system. Units in the Jack Creek above the Deep Gulch are interpreted as a marine transgressional succession. Unconformably overlies the Continental Divide Metavolcanic Rocks (new name); underlies the Silver Lake Metavolcanic Rocks (new name) of the Phantom Lake. Thickness ranges from 300 to 800 m. Age is Archean.

Jacksonwald Basalt Member of the Brunswick Formation of the Newark Supergroup

Early Jurassic (Hettangian)
Pennsylvania
Newark basin

MacLachlan, D.B., 1983, Geology and mineral resources of the Reading and Birdsboro quadrangles, Berks County, Pennsylvania: Pennsylvania Topographic and Geological Survey Atlas 187cd, one sheet, scale 1:24,000.

Type locality: Exposures south of the town of Jacksonwald, 4 mi southeast of Reading, Berks County, Pa. (Wherry, 1910).

The Jacksonwald trap of Wherry (1910), here named the Jacksonwald Basalt Member of the Brunswick Formation [of the Newark Supergroup], occurs in the Jacksonwald syncline, Berks County, Pa. Consists of fine-grained, dark-gray basalt that has a vesicular top, chemically identical to chill margins of York Haven-type intrusives. Overlies the lower member and underlies the upper member of the Brunswick. May be too thick to be a single flow unit, but no internal divisions have been identified. Thickness is 500 ft. Age is Early Jurassic (Hettangian) based on pollen and spores, in the lower member of the Brunswick Formation, which place the Triassic-Jurassic boundary more than 50 ft but less than 130 ft below the basalt.

Jared Member of the Tiger Formation

Eocene, Oligocene, and Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: East-facing outcrop 1 km southwest of Jared, SE¼SE¼NE¼ sec. 11, T. 34 N., R. 42 E., Pend Oreille County, Wash.

The Jared Member, here named, is in the revised Tiger Formation in the Cusick region of northeastern Washington. Consists of conglomerate containing clasts of two-mica granite and subordinate phyllitic metasedimentary rocks. Conformably overlies the Locke Member (new name) of the Tiger east of the Cusick Creek fault; unconformably overlies the Locke west of the fault. Correlates with the Calispell Lake Member (new name) of the Tiger and records erosion of older Tiger strata. Maximum thickness is 700 m. Age ranges from early middle Eocene based on inclusions of late early to early middle Eocene volcanic rock clasts through middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Jasper Point Formation

Triassic(?) and Early Jurassic
California
Sierra Nevada province

Bogen, N.L., 1985, Stratigraphic and sedimentologic evidence of a submarine island-arc volcano in the lower Mesozoic Penon Blanco and Jasper Point Formations, Mariposa County, California: Geological Society of America Bulletin, v. 96, no. 10, p. 1322–1331.

Type section: Exposures at Jasper Point on the Merced River, Penon Blanco Peak quadrangle, Mariposa County, Calif.

Rocks exposed in the core of the Cotton Creek anticline of Late Jurassic age in the southern part of the western Sierra Nevada metamorphic belt are here named the Jasper Point Formation. These rocks were previously included in the revised Penon Blanco Formation, and chert, here assigned to the Jasper Point, was called the informal Hunter Valley chert by Taliaferro (1943). Consists of a stratified sequence of more than 900 m of massive, pillowed, and brecciated basalt overlain by 100 m of red, white, brown, and black, rhythmically layered radiolarian chert, both altered to prehnite or chlorite grade. Is interbedded with and gradationally underlies the Penon Blanco Formation. Age is Early Jurassic or older based on a uranium-lead zircon age of the Don Pedro pluton, which intrudes the Jasper Point.

Jim Pond Formation

Cambrian(?) and Early Ordovician(?)
Maine
New England province

Boudette, E.L., 1982, Ophiolite assemblage of early Paleozoic age in central-western Maine, *in* St-Julien, P., and Beland, J., eds., Major structural zones and faults of the northern Appalachians: Geological Association of Canada Special Paper 24, p. 209–230.

Type section: Composite of exposures along the North Branch of the Dead River, northern Franklin County, Maine. Named for Jim Pond, located 8 km above the confluence of the North Branch of the Dead River with Flagstaff Lake.

Volcanic and metasedimentary rocks of the ophiolite sequence in central-western Maine are here named the Jim Pond Formation. Consists of a basal chlorite-albite-epidote-actinolite greenstone member that has minor amounts of metagraywacke, 150 to 500 m thick. Northwest of the Squirtgun fault it is divided into lower and upper units by a metadacite member in the east, 0 to 500 m thick, and a metagraywacke member in the west. The metadacite member is closely associated with hematitic chert iron-formation members. Greenstone is thickly layered with pillowed and massive flows. Patches of altered amphibolite are in undisturbed contact with the southeastern belt of tonalite of the Boil Mountain Complex (new name). Age is Cambrian(?) and Early Ordovician(?).

Jim Sage Volcanic Member of the Salt Lake Formation

Miocene
Idaho
Great Basin province

Williams, P.L., Covington, H.R., and Pierce, K.L., 1982, Cenozoic stratigraphy and tectonic evolution of the Raft River basin, Idaho, *in* Bonnichsen, Bill, and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 491–504.

Type locality: Southern Jim Sage Mountains, lat 42°05′ to 42°08′ N., long 113°28′ to 113°32′ W., Raft River basin, Cassia County, Idaho.

Rhyolite flows in the southern Jim Sage Mountains are here named the Jim Sage Volcanic Member of the Salt Lake Formation. Consists of lower rhyolite flows; a middle breccia, ash-flow tuff, sandstone, shale, and siltstone unit; and upper rhyolite flows. Overlies the lower tuffaceous member and underlies the upper rhyolite member, both of the Salt Lake Formation. Maximum thickness is 1,200 m. Age is Miocene, based on radiometric dates of 11 to 9 Ma.

Johns Creek Quarry Member of the Scotch Grove Formation

Early Silurian (Llandoverian, Telychian)
Iowa
Iowa shelf

Johnson, M.E., 1983, New member names for the Lower Silurian Hopkinton Dolomite of eastern Iowa: Iowa Academy of Science Proceedings, v. 90, no. 1, p. 13–18.

Type section: Johns Creek quarry, 6.5 km south of Farley, SE¼SW¼ sec. 36, T. 88 N., R. 2 W., Dubuque County, Iowa.

Previously divided on the basis of paleontologic units, the Hopkinton Dolomite is here divided into lithologic members to facilitate interregional correlations based on sea-level curves. Rocks previously called the Bioherm Beds of the Hopkinton are here named the Johns Creek Quarry Member of the Hopkinton in eastern Iowa. Consists of a patch-reef facies and an interreef facies, each having distinctly different lithologies and fossil content. Reef mounds in the patch-reef facies are tan, massive, micritic dolomite, 7 to 10 m thick; the interreef facies is cream to tan, medium-bedded, finely crystalline dolomite, 3 to 5 m thick. Overlies the Picture Rock Member (new name) of the Hopkinton; underlies the Welton Member (new name) of the Hopkinton. Age is Early Silurian (Llandoverian, Telychian).

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

The Johns Creek Quarry, Welton, and Buck Creek Quarry Members, all new names of Johnson (1983), are here reassigned from the upper part of the Hopkinton Dolomite to the lower part of the Scotch Grove Formation (new name). The Scotch Grove is defined between the Hopkinton and the Gower Formation for the purpose of preserving the original definitions of these units.

Johnson Shut-ins Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: Exposures in the swimming area of Johnson Shut-ins State Park, NW1/4SW1/4 sec. 16, T. 33 N., R. 2 E., Johnson Shut-ins quadrangle, Reynolds County, Mo.

Rocks previously mapped as Johnson ash-flow and air-fall tuffs by Anderson (1962) and as tuff of Johnson Shut-ins by Anderson (1970) are here named the Johnson Shut-ins Rhyolite. Occurs in the Taum Sauk Caldera in the western St. Francois Mountains of southeast Missouri. Consists of a lower unit of maroon ash-flow tuff containing quartz and feldspar phenocrysts, 23 m thick; a middle unit of crossbedded, water-deposited tuff, 0 to 5 m thick; and an upper unit of gray ash-flow tuff containing quartz and feldspar phenocrysts, 27 m thick. Overlies the Proffit Mountain Formation (new name); underlies the Cope Hollow Formation (new name). Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Johnson Shut-ins Rhyolite.

Joker Peak Member of the Sunrise Formation of the Volcano Peak Group

Early Jurassic (Pliensbachian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures on the southern flank of Joker Peak, Gabbs Valley Range, Mineral County, Nev.

The lower argillaceous part of the uppermost unit of Muller and Ferguson (1939) of the Sunrise Formation is here named the Joker Peak Member of the now revised Sunrise Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Consists of medium-gray to brown mudstone and siltstone containing thin calcareous beds. Sharply and conformably overlies the New York Canyon Member (new name) of the Sunrise; conformably underlies the Mina Peak Member (new name) of the Sunrise; the contact is drawn at the lowest limestone beds. Thickness is 30 m. Age is Early Jurassic (Pliensbachian) based on fossils.

Joynes Neck Sand

Pleistocene
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Borehole A–15, on county road 652 about 1.5 mi east-southeast of the town of Accomack and 0.5 mi southeast of the Edge Hill Cemetery, Joynes Neck area of Accomack County, Va.

The Joynes Neck Sand, here named, occurs along the east side of the Delmarva Peninsula in Accomack and Northampton Counties, Va. Consists of yellowish-gray, loose, fine to coarse, surficial quartz sand, interstratified with beds of pebbly sand and gravel. Truncates and disconformably overlies the Accomack Member (new name) of the Omar Formation; may truncate or be equivalent to the Butlers Bluff and Occohannock Members of the Nassawadox Formation (all new names); is truncated along its eastern margin by Holocene barrier-lagoon complex deposits. Thickness at the type section is 30 ft. Age is Pleistocene.

Juans Lake Beds of the **Allison Member** of the **Menefee Formation** of the **Mesaverde Group**

Late Cretaceous
New Mexico
San Juan basin

Miller, R.L., 1984, Subdivisions of the Menefee Formation and Cliff House Sandstone (Upper Cretaceous) in southwest San Juan basin, New Mexico: U.S. Geological Survey Bulletin 1537–A, p. A29–A53.

Type section: Exposures in the badlands area near Red Hill, SW1/4 to NE1/4 sec. 6, T. 22 N., R. 13 W., in the northeast part of The Pillar 3 SE 7.5-minute quadrangle, San Juan County, N. Mex. Named for Juans Lake in the La Vida Mission quadrangle.

The middle unit of the Allison Member of the Menefee Formation of the Mesaverde Group in the San Juan basin, New Mexico, is here named the Juans Lake Beds. Consists predominantly of interbedded, partly crossbedded, fine-grained sandstone and gray mudstone containing ironstone concretions, petrified wood, carbonized tree trunks, and plant fragments. Is distinguished from the overlying La Vida Beds (new name) of the Allison Member by the inclusion of numerous large, round, calcareous concretions composed of gray cryptocrystalline limestone above and below sandstone units and by the absence of coal beds.

Overlies lower beds of the Allison Member; underlies the La Vida Beds. Thickness at the type section is 900 ft. Age is Late Cretaceous.

Judds Falls Metabentonite

Early Devonian (Helderbergian)
New York
Appalachian basin

Conkin, J.E., and Conkin, B.M., 1984, Paleozoic metabentonites of North America: Part 1—Devonian metabentonites in the eastern United States and southern Ontario (their identities, stratigraphic positions, and correlation): Kentucky, University of Louisville Studies in Paleontology and Stratigraphy, no. 16, 135 p.

Type locality: Exposures along U.S. Highway 20, near an abandoned railway overpass, 0.4 mi east-southeast of the intersection of U.S. Highway 20 and N.Y. Highway 166, at Judds Falls, 2 mi northeast of Cherry Valley, Sprout Brook 7.5-minute quadrangle, Otsego County, N.Y.

The Judds Falls Metabentonite, here named, is in Otsego County, N.Y. Consists of variegated, unctuous clay containing 1-in-thick pyroclastic euhedral crystals. Has the appearance of the Onondaga Indian Nation Metabentonite, which is recognizable as far east as Cherry Valley. Lies 32 ft below the paracontinuous boundary of the Kalkberg Limestone and the Oriskany Sandstone. Age is Early Devonian (Helderbergian).

Jumping Branch Manganiferous Member of the **Battleground Formation**

Late Proterozoic
South Carolina, North Carolina
Piedmont-Blue Ridge province

Horton, J.W., Jr., 1984, Stratigraphic nomenclature in the Kings Mountain belt, North Carolina and South Carolina: U.S. Geological Survey Bulletin 1537–A, p. A59–A67.

Type locality: Taylor clay pit on the west side of secondary road 123 across from the western boundary of Kings Mountain National Military Park, lat 35°07′59″ N., long 81°25′17″ W., Cherokee County, S.C. Named for Jumping Branch, a tributary of Kings Creek, 4.1 km southwest of the type locality.

The Jumping Branch Manganiferous Member of the Battleground Formation, here named, is in the Kings Mountain belt, South Carolina and North Carolina. Was described as the manganese schist member of the Battleground by Keith and Sterrett (1931). Consists of fine-grained equigranular spessartine-almandine garnet and quartz rock (coticule or gondite) interlayered with quartz-sericite schist or phyllite. The dusky-brown color of secondary oxides and hydroxides of manganese and iron in weathered rock and saprolite makes the Jumping Branch Member a distinctive marker unit. Overlies the Dixon Gap Metaconglomerate Member (new name) and underlies the Draytonville Metaconglomerate Member of the Battleground. Age is Late Proterozoic.

Kahatchee Mountain Group

Late Precambrian and Cambrian
Alabama
Piedmont-Blue Ridge province

Tull, J.F., 1982, Stratigraphic framework of the Talladega slate belt, Alabama Appalachians, *in* Bearce, D.N., and others, eds., Tectonic studies in the Talladega and Carolina slate belts, southern Appalachian orogen: Geological Society of America Special Paper 191, p. 3–18.

Type area: Southwestern part of the Talladega slate belt in southeast Shelby and northeast Chilton Counties, Ala. Named for the mountainous area northwest of Sylacauga.
Subunits: Waxahatchee Slate, Sawyer Limestone, Brewer Phyllite, Wash Creek Slate.

The Kahatchee Mountain Group, here named, is the lower sequence in the southwestern part of the Talladega slate belt in Alabama. Includes the Waxahatchee Slate, Sawyer Limestone, Brewer Phyllite, and Wash Creek Slate. Consists predominantly of pelitic slate, phyllite, and metasandstone and a minor carbonate unit. Underlies the Sylacauga Marble Group or the Lay Dam Formation of the Talladega Group. The Kahatchee Mountain Group may extend farther northeast in Alabama and into Georgia and may correlate with the Ocoee Supergroup and Chilhowee Group in the Blue Ridge belt. Age is Late Proterozoic and Cambrian.

Kalo Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Atokan and Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures in bluffs along the Des Moines River, just west of the community of Kalo, SE¼NW¼SW¼, sec. 17, T. 88 N., R. 28 W., Webster County, Iowa.
Subunits: Blackoak Coal Member, Cliffland Coal Member.

The Kalo Formation, here named, occurs in the Cherokee Group of the Des Moines Supergroup and is recognized in most of southern and central Iowa. Includes two coal members: the basal Blackoak Coal Member (new name) and the overlying Cliffland Coal Member (new name). The remainder of the formation is predominated by fluvial and marginal marine deltaic sedimentary sequences of interlaminated sandstone, siltstone, and shale, which separate the coals and overlie the Cliffland. Overlies the Kilbourn Formation (new name); underlies the Floris Formation (new name). Thickness at the type section is about 50 ft and ranges from 17 to 120 ft. Age is Middle Pennsylvanian (late Atokan to early Desmoinesian).

Kalubik Formation of the Ugnuravik Group

Early Cretaceous (Barremian and Aptian)
Alaska
Arctic Coastal Plains province

Carman, G.J., and Hardwick, Peter, 1983, Geology and regional setting of Kuparuk oil field, Alaska: American Association of Petroleum Geologists Bulletin, v. 67, no. 6, p. 1014–1031.

Type section: Ugnu State 1 well, depth interval 5,670–5,890 ft b.r.t., in the Ugnuravik Group type section, Kuparuk field, Colville-Prudhoe basin, T. 12 N., R. 9 E., Umiat Base Line, Alaska. Named for Kalubik Creek, which flows into Harrison Bay west of the Kuparuk field.

The Kalubik Formation of the Ugnuravik Group (new name), here named, is in the Colville-Prudhoe basin, Alaska. Consists of brownish-gray to black, carbonaceous, moderately fissile, locally sideritic, silty mudstone containing nodular and disseminated pyrite. Gradationally overlies the Kuparuk Formation (new name) of the Ugnuravik; underlies the informal HRZ unit of the Ugnuravik. Correlates with the lower part of the unnamed shale of Early Cretaceous age of Jones and Spears (1976) and Jamison and others (1980). Thickness ranges from 200 to 300 ft. Age is Early Cretaceous (Barremian and Aptian) based on dinoflagellates and foraminifera.

Kanauguk Formation

Late Proterozoic
Alaska
Yukon-Koyokuck province

Sainsbury, C.L., 1974, Geologic map of the Bendeleben quadrangle, Seward Peninsula, Alaska: U.S. Bureau of Mines, U.S. Geological Survey, and The Mapmakers, scale 1:150,000, 31 p.

Type area: Central York Mountains, western Seward Peninsula, Alaska (Sainsbury, 1969). [Probably named for the Kanauguk River.]

The Kanauguk Formation, here named, was first described in the York Mountains by Sainsbury (1969) but is here recognized in many localities on the Seward Peninsula, Alaska. Consists of a thick, widespread unit of orange-weathering, thin-bedded, rhythmically interlayered argillaceous limestone and dolomitic limestone. Is schistose and contains veinlets of vitreous quartz where deformed. Conformably overlies the York Slate (new name) with a transitional boundary several hundred feet thick. Intensely deformed rocks are possibly mixed with the base of thrust sheets of Paleozoic(?) age. Age is at least in part Late Proterozoic based on a rubidium-strontium minimum age of 750 Ma for gneisses derived from the York.

Kawkawlin Bentonite

Middle Devonian
Michigan
Michigan basin

Baltrusaitis, E.J., 1974, Middle Devonian bentonite in Michigan basin: American Association of Petroleum Geologists Bulletin, v. 58, no. 7, p. 1323–1330.

Type section: Gulf Bateson 1 well, depth interval 3,160–3,165 ft, center S½SE¼SE¼ sec. 2, T. 14 N., R. 4 E., Kawkawlin oil field, Bay County, Mich.

The Kawkawlin Bentonite, here named, is a distinctive, widespread bentonitic ash fall present in evaporite and carbonate sedimentary rocks of the Lucas Formation of the Detroit River Group in the subsurface of the Michigan basin, Michigan. Post-Detroit River emergence and erosion of the flanks of the basin have resulted in the truncation of the ash bed to its present limits. Consists of soft, friable, gray to greenish-gray montmorillonite(?) clay containing flakes of unaltered brown biotite and minor amounts of pyrite, chert, and glauconite. Another thin unnamed bentonite bed that does not contain biotite lies 50 ft above the Kawkawlin in the Lucas Formation. May be equivalent to the Tioga Bentonite of the Appalachian and Illinois basins. Thickness ranges from a few inches to 1 ft. Age is Middle Devonian.

Keefus Till

Pleistocene (Wisconsinan)
Ohio
Appalachian basin

White, G.W., and Totten, S.M., 1979, Glacial geology of Ashtabula County, Ohio: Ohio Geological Survey Report of Investigations 112, 48 p.

Type section: Exposure on the north bank of Conneaut Creek, 150 ft east of the Keefus Road bridge across Conneaut Creek, 1.7 mi south of Lake Erie and 0.6 mi east of Amboy, Ashtabula County, Ohio.

The Keefus Till, here named, is in Ashtabula County, Ohio, where it crops out in many places and is recorded in drilling. Consists of dusky-red, hard, stony, calcareous till containing pebbles and small cobbles. Overlies the Devonian Chagrin Shale; underlies the Titusville Till or younger tills. Thickness at the type section is 3 ft. Age is Pleistocene (earliest Wisconsinan or older).

Keensburg Coal Member of the Mattoon Formation of the McLeansboro Group

Late Pennsylvanian (Missourian)
Illinois
Illinois basin

Nance, R.B., and Treworgy, C.G., 1981, Strippable coal resources of Illinois: Part 8—Central and southeastern counties: Illinois Geological Survey Circular 515, 32 p.

Type section: Exposure on McClearys Bluff, 2.5 mi south of the village of Keensburg, NW¼SW¼SE¼ sec. 29, T. 2 S., R. 13 W., Wabash County, Ill.

Coal exposed at McClearys Bluff, Wabash County, Ill., here named, is the Keensburg Coal Member of the Mattoon Formation of the McLeansboro Group. Lies 7 ft above the McClearys Bluff Coal Member and 50 to 55 ft above the Friendsville Coal Member of the Mattoon Formation. Thickness at the type section is 1 ft. Age is Late Pennsylvanian (Missourian).

Kellogg Creek Mafic Complex of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures along Kellogg Creek, Kennesaw 7.5-minute quadrangle, southern Cherokee County, Ga.

The informal Kellogg Creek metagabbro of McConnell and Costello (1980) is here named the Kellogg Creek Mafic Complex of the New Georgia Group (new name). This premetamorphic complex lies west of the outcrop area of the Laura Lake Mafic Complex (new name) of the New Georgia Group in the Greater Atlanta region, Georgia. Consists of garnet amphibolite, metagabbro, and minor amounts of meta-ultramafic rocks, and has no direct evidence of extrusive facies. Age is Late Proterozoic and (or) early Paleozoic.

Kelsey Tuff Member of the Kelseyville Formation

Pleistocene
California
Northern Coast Range province

Rymer, M.J., 1981, Stratigraphic revision of the Cache Formation (Pliocene and Pleistocene), Lake County, California: U.S. Geological Survey Bulletin 1502–C, p. C1–C35.

Type section: Roadcut along State Highway 29, 3.4 km south-southeast of the town of Kelseyville, SE¼NE¼ sec. 26, T. 13 N., R. 9 W., Kelseyville 7.5-minute quadrangle, Lake County, Calif. Named for Kelsey Creek.

Tuff referred to as volcanic ash aquifer and aquifer ash in the Clear Lake area, Lake County, Calif., is here named the Kelsey Tuff Member of the Kelseyville Formation (new name). Consists of a bed of pale-orange basaltic andesite lapilli tuff, 1.0 to 1.7 m thick, which, because of its distinctive character and presence throughout much of Big Valley, is a useful marker bed. The lower unit of the Kelsey, 20 to 30 cm thick, consists of several thin beds of gray, fine-grained, vitric tuff and coarser, lithic tuff. The upper unit, 120 to 170 cm thick, is an unsorted bed of pumiceous, gray, basaltic andesite lapilli tuff. Shows chemical affinity to flows of the Clear Lake volcanic field and possibly was erupted from a vent on Mount Konocti. Contains ground water under artesian pressure and is recognized in wells west and north of surface exposures of the Kelseyville Formation. Age is Pleistocene.

Kelseyville Formation

Pleistocene
California
Northern Coast Range province

Rymer, M.J., 1981, Stratigraphic revision of the Cache Formation (Pliocene and Pleistocene), Lake County, California: U.S. Geological Survey Bulletin 1502–C, p. C1–C35.

Type section: Exposures along Kelsey Creek and along a ravine south of Kelseyville and west of State Highway 29, SE¼NE¼ sec. 27, NW¼NW¼ sec. 26, and SW¼SW¼ sec. 23, T. 13 N., R. 9 W., Kelseyville 7.5-minute quadrangle, Lake County, Calif.
Subunit: **Kelsey Tuff Member.**

Lacustrine and fluvial beds exposed near Kelseyville in the Clear Lake area, Lake County, Calif., which were previously assigned to the revised Cache Formation, are here named the Kelseyville Formation. Consists of yellowish-gray sandstone and siltstone, locally interbedded pebble conglomerate, and several tuff beds, including the Kelsey Tuff Member (new name), a marker bed. Overlies rocks of the Franciscan assemblage, locally overlies serpentinite, and locally intertongues with and overlies flows of the Clear Lake volcanic field; underlies Quaternary terrace deposits. Maximum thickness is at least 140 m. Age is Pleistocene, between 0.64 and 0.13 Ma, based on potassium-argon ages of the underlying volcanic rocks and plant fossils.

Kennesaw Gneiss Member of the Laura Lake Mafic Complex of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures east of Kennesaw, Kennesaw 7.5-minute quadrangle, Cobb County, Ga.

The informal Kennesaw gneiss of Hurst (1952) is here named the Kennesaw Gneiss Member of the Laura Lake Mafic Complex (new name) of the New Georgia Group (new name). Is a mappable unit of quartz diorite gneiss located along the western margin of Laura Lake in the Greater Atlanta region, Georgia. Quarried locally for aggregate near Kennesaw, Cobb County. Age is Late Proterozoic and (or) early Paleozoic.

Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Lake bluff at the south edge of the city of Kewaunee, NE¼SE¼SE¼ sec. 19, T. 23 N., R. 25 E., Kewaunee 7.5-minute quadrangle, Kewaunee County, Wis.

Subunits:

Lake Michigan Lobe: Ozaukee, Haven, Valders, and Two Rivers Members.

Green Bay Lobe east of Fox River: Branch River, Chilton, and Glenmore Members.

Green Bay Lobe west of Fox River: Silver Cliff, Kirby Lake, and Middle Inlet Members.

The Kewaunee Formation, here named, occurs in the Lake Michigan and Green Bay Lobes in Wisconsin. In the Lake Michigan Lobe it is divided into the basal Ozaukee Member (new name) and the overlying Haven (new name), Valders, and Two Rivers Members. Members in the Green Bay Lobe east of the arbitrary vertical cutoff at the Fox River are the Branch River, Chilton, and Glenmore Members (all new names). West of the Fox River the Kewaunee is divided into the Silver Cliff, Kirby Lake, and Middle Inlet Members (all new names). Till of the Kewaunee is brown or reddish-brown, calcareous, sandy, silty, clay till. Overlies various members of the New Berlin Formation (new name) and Oak Creek Formation (new name) in the Lake Michigan Lobe, and the Horicon Formation (new name) in the Green Bay Lobe. Lies at the surface over much of northeast Wisconsin. Is equivalent to parts of the Wedron and Lake Michigan Formations in Illinois and younger parts of the Copper Falls Formation (new name) in northern Wisconsin. Thickness ranges from less than 1 m to more than 18 m. Age is Pleistocene (late Wisconsinan).

Kilbourn Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Atokan)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures in an abandoned quarry in NW¼SE¼ sec. 36, T. 70 N., R. 10 W., Van Buren County, Iowa. Named for the community of Kilbourn in north-central Van Buren County.

The Kilbourn Formation, here named, lies at the base of the Cherokee Group of the Des Moines Supergroup in central and southern Iowa. Strata are predominantly nonmarine sandstones, shales, and siltstones. Locally contains thin zones of limestone and thin, unnamed beds of coal that have little economic value. Unconformably overlies Mississippian St. Louis or Ste. Genevieve Limestones; underlies the Kalo Formation (new name) of the Cherokee. Thickness at the type section is approximately 20 ft; maximum measured thickness is 218 ft. Age is Middle Pennsylvanian (Atokan).

Kimball Mountain Tuff Bed of the **Parachute Creek Member**, **Anvil Points Member**, **Garden Gulch Member**, or **Douglas Creek Member** of the **Green River Formation**

Eocene
Colorado
Piceance basin

Johnson, R.B., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado: U.S. Geological Survey Bulletin 1529–I, 20 p.

Type section: West end of Kimball Mountain, SW¼SE¼ sec. 7, T. 7 S., R. 98 W., Long Point quadrangle, Garfield County, Colo.

The Kimball Mountain Tuff Bed, here named, is in the Green River Formation. At the type section on Kimball Mountain, in the southwestern part of the Piceance Creek basin, Colorado, the bed is present at the base of the Parachute Creek Member but is also mapped in the Anvil Points, Garden Gulch, and Douglas Creek Members of the Green River. Consists of distinctive, light-buff to dark-gray tuff composed of hexagonal analcime surrounded by large crystals of sparry calcite. Occurs 60 to 110 m above the base of the Long Point Bed (new name), in the Green River. Thickness ranges from 1 to 15 cm. Age is Eocene.

Kingsbury Limestone Member of the Great Meadows Formation of the Beekmantown Group

Early Ordovician
New York
New England province

Fisher, D.W., 1984, Bedrock geology of the Glens Falls—Whitehall region, New York: New York State Museum Map and Chart Series no. 35, 58 p.

Type locality: None designated. [Possibly named for the town of Kingsbury, Washington County, N.Y.]

The Kingsbury Limestone Member of the Great Meadows Formation of the Beekmantown Group is here named. Consists of massive, light-gray weathering, light- to medium-gray, fine- to medium-grained dolomitic limestone. Occurs as lenses and fissure fillings; fossils include algal heads. Overlies the Winchell Creek Siltstone Member and underlies the Fort Edward Dolostone Member, both of the Great Meadows. Thickness ranges from 0 to 12 m. Age is Early Ordovician.

Kingsley Cave Member of the Chico Formation

Late Cretaceous (Santonian)
California
Sacramento basin

Haggart, J.W., and Ward, P.D., 1984, Late Cretaceous (Santonian-Campanian) stratigraphy of the northern Sacramento Valley, California: Geological Society of America Bulletin, v. 95, no. 5, p. 618–627.

Type section: Exposures along Mill Creek, from NE¼NW¼ sec. 20 to SW¼ sec. 19, T. 27 N., R. 2 E., Tehama County, Calif. Named for nearby Kingsley Cave.

The Kingsley Cave Member of the Chico Formation is here named. Occurs along Deer, Mill, and Antelope Creeks, Tehama County, northeastern Sacramento Valley, Calif. Consists of greenish-gray to bluish-gray, spheroidally weathered, heavily bioturbated, fossiliferous, muddy siltstone and silty mudstone containing rare pebble conglomerate beds as much as 1 m thick. Was deposited locally in quiet water conditions and may represent a marine connection with regions farther northeast. Correlates with the Dobbins Shale Member of the Forbes Formation of the western Sacramento Valley. Thickness is 350 m. Age is Late Cretaceous (late Santonian) based on ammonites.

Kinkead Spring Limestone

Early Mississippian (Osagean)
Nevada
Great Basin province

Hose, R.K., Armstrong, A.K., Harris, A.G., and Mamet, B.L., 1982, Devonian and Mississippian rocks of the northern Antelope Range, Eureka County, Nevada: U.S. Geological Survey Professional Paper 1182, 19 p.

Type section: Exposures in SE¼ sec. 20 and SW¼ sec. 21, T. 16 N., R. 51 E., northern Antelope Range, Eureka County, Nev. Named for Kinkead Spring, 4 km southeast of the type section.

The Kinkead Spring Limestone, here named, is in the northern Antelope Range, Nev. Consists of gray, olive-gray, and yellowish-gray, thin bedded to platy echinoderm-bryozoan-brachiopod packstone and grainstone containing clasts composed of peloids, ooids, skeletal fragments, foraminifers, algae, and quartz grains. Contains reworked conodonts of Late Devonian and Early Mississippian age. Was deposited in an open platform marine environment. Sharply and conformably overlies the Davis Spring Formation (new name); sharply and unconformably underlies the Antelope Range Formation (new name). Thickness is 160 m at the type section but may be more than 220 m because there is a thrust fault in the upper part of the formation. Age is Early Mississippian (middle(?) to late Osagean) based on conodonts.

Kinnickinnic Member of the Pierce Formation

Pleistocene (pre-Illinoian)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84-1, p. 1-15.

Type section: Stream bank 400 m north of Highway FF, SE¼SW¼SW¼ sec. 12, T. 27 N., R. 19 W., River Falls West 7.5-minute quadrangle, Pierce County, Wis. Named for the Kinnickinnic River in western St. Croix and Pierce Counties, terminating in the St. Croix River, 10 km north of Prescott.

The upper member of the Pierce Formation (new name) in west-central Wisconsin is here named the Kinnickinnic Member. Consists of grayish-brown to dark-gray, thinly laminated, calcareous, silt loam of glacial lacustrine origin. Gradationally overlies the Hersey Member (new name) of the Pierce; sharply underlies the River Falls Formation (new name) or is exposed at the surface. Thickness is more than 21 m. Age is Pleistocene (pre-Illinoian).

Kirby Lake Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut on south side of Highway W, 0.16 km west of Kirby Lake Road, NE¼NW¼SE¼ sec. 27, T. 32 N., R. 19 E., Crivitz 7.5-minute quadrangle, Marinette County, Wis. Named for Kirby Lake 15 km west of Crivitz.

Following the informal usage of McCartney (1979), the Kirby Lake Member of the Kewaunee Formation (new name), here named, is in the Green Bay Lobe, west of the Fox River in Wisconsin. Consists of reddish-brown to yellowish-red sand-silt-clay till. Unconformably overlies pre-Pleistocene rocks or the Silver Cliff Member (new name) of the Kewaunee; unconformably underlies the Middle Inlet Member (new name) of the Kewaunee or is the surface unit. The contact with the equivalent Chilton Member (new name) of the Kewaunee Formation on the east side of the Green Bay Lobe is an arbitrarily drawn vertical cutoff at the Fox River. Thickness ranges from 1 m at the surface to 10 m in the subsurface. Age is Pleistocene (late Wisconsinan).

Klamath River Conglomerate Member of the **Hornbrook Formation**

Late Cretaceous (Cenomanian and Turonian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Old open cut mine workings 0.4 km west of the Klamath River, west of Interstate Highway I–5, 0.7 km southeast of the

McCavick mine, SE¼ sec. 32, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif.

The Klamath River Conglomerate Member, here named, is the lowermost of five members of the Hornbrook Formation along the northeastern margin of the Klamath Mountains in Siskiyou County, Calif., and Jackson County, Oreg. Consists of brown- and red-weathering gray, clast- and matrix-supported conglomerate and minor amounts of sandstone, siltstone, mudstone, and basal breccia deposited as laterally discontinuous alluvial-fan and braided-stream sediments. In places it forms a thin veneer at the base of the Hornbrook. Unconformably overlies pre-Cretaceous igneous and metamorphic rocks; conformably underlies the Osburger Gulch Sandstone Member (new name) of the Hornbrook. Thickness is 36.5 m at the type section and ranges from 0 to 90 m. Age is early Late Cretaceous (Cenomanian and Turonian) and could possibly range from to Berriasian to Turonian based on molluskan fossils from the Osburger Gulch Sandstone Member.

Klondike Lake Conglomerate of the Libby Creek Group

Early Proterozoic
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type area: Northern Medicine Bow Mountains, Carbon County, Wyo. Derivation of name not stated.

The Klondike Lake Conglomerate, here named, is in the Libby Creek Group and occurs in the Medicine Bow Mountains, Wyo. Consists of hematitic quartz-pebble conglomerate. Origin of iron-oxide grains in the conglomerate is uncertain, but the lack of other heavy minerals suggests deposition in lagoons on tidal flats. Lies 125 m below the top of the enclosing Medicine Peak Quartzite of the Libby Creek Group. Can be traced for 9 km. Thickness is 17 m. Age is Early Proterozoic. [Karlstrom and others (1983) refer to the unit as Klondike Lake Conglomerate Member of the Medicine Peak Quartzite of the Libby Creek Group of the Snowy Pass Supergroup.]

Komatke Granite

Precambrian
Arizona
Basin and Range province

Reynolds, S.J., 1985, Geology of the South Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 195, 61 p.

Type locality: Exposures at water tank on the southwest end of Main Ridge, South Mountains, sec. 33, T. 1 S., R. 2 E., Maricopa County, Ariz. Named for the village of Komatke, southwest of the South Mountains.

The Komatke Granite, here named, is in the southwest ends of Main Ridge and Alta Ridge in the South Mountains, near Phoenix, Ariz. Consists of gray to pinkish, coarse-grained and porphyritic granite that has nearly vertical crystalloblastic foliation. Alaskitic and aplitic phases occur near its intrusive contacts with Estrella Gneiss (new name). Age is Precambrian.

Kuna Formation of the **Lisburne Group**

Early Mississippian to Early Pennsylvanian
Alaska
Arctic Foothills province

Mull, C.G., Tailleur, I.L., Mayfield, C.F., Ellersieck, Inyo, and Curtis, S., 1982, New upper Paleozoic and lower Mesozoic stratigraphic units, central and western Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, v. 66, no. 3, p. 348–362.

Type locality: Exposures in the valley of an upper tributary of the Kuna River, SW1/4 sec. 21, T. 34 N., R. 5 E., western Howard Pass quadrangle, Endicott Mountains, Alaska.

Rocks previously called the black Lisburne or dark colored facies of the Lisburne in the De Long and Endicott Mountains of the Brooks Range, Alaska, are here named the Kuna Formation of the Lisburne Group. Consists of black, sooty, phosphatic, carbonaceous shale, black chert, fine-grained limestone, and dolomite, usually more shaly at the bottom and more cherty at the top. Is nonresistant and is exposed only in cutbanks and on steep slopes. Intertongues eastward with the Wachsmuth and Alapah Limestones of the Lisburne Group. Conformably and gradationally overlies the Kayak Shale of the Endicott Group; disconformably or gradationally underlies the Siksikpuk Formation of the Etivluk Group (new name). Age is Early Mississippian to Early Pennsylvanian based on fossils.

Kuparuk Formation of the Ugnuravik Group

Early Cretaceous (Valanginian to Barremian)
Alaska
Arctic Coastal Plains province

Carman, G.J., and Hardwick, Peter, 1983, Geology and regional setting of Kuparuk oil field, Alaska: American Association of Petroleum Geologists Bulletin, v. 67, no. 6, p. 1014–1031.

Type section: Ugnu State 1 well, depth interval 5,890–6,262 ft b.r.t., type section of the Ugnuravik Group, Kuparuk field, Colville-Prudhoe basin, T. 12 N., R. 9 E., Umiat Base Line, Alaska. Named for the Kuparuk River, which flows north into Gwydwr Bay.

The Kuparuk Formation of the Ugnuravik Group (new name), here named, is in the Kuparuk field in the Colville-Prudhoe basin, Alaska. Consists of a cyclic sequence of coarse- and fine-grained terrigenous clastic sediments informally subdivided into a lower member having A and B units characterized by thinly interbedded sandstone, siltstone, and mudstone and an upper member having a C unit characterized by massive sandstone and siltstone and a D unit characterized by silty mudstone. Gradationally overlies the Miluveach Formation (new name) and gradationally underlies the Kalubik Formation (new name), both of the Ugnuravik Group. Correlates with the Kongakut Formation to the east, the Okpikruak Formation to the south, and the Put River Sandstone (new name) in the Prudhoe Bay field. [The informal name Kuparuk River sands was used by Fackler and others (1970), who designated the type section as the Mobil-Phillips North Kuparuk State 1 well, depth interval 6,774–7,054 ft, in the Prudhoe Bay field, T. 12 N., R. 12 E., Umiat Base Line. Referred to as the Kuparuk River Formation by Jones and Spears (1976). Formal usage was implied by Jamison and others (1980), who described the Kuparuk River Formation in the Prudhoe Bay field where it consists of three sand members termed Lower, Middle, and Upper Sands, separated by shales and silty shales. At Prudhoe Bay, it conformably overlies the Kingak Shale and unconformably underlies unnamed Lower Cretaceous shale.] Hydrocarbon reserves of the Kuparuk and Prudhoe Bay fields occur in the Kuparuk Formation. Age is Early Cretaceous (Valanginian to Barremian) based on dinoflagellates. Foraminifers of mixed Late Jurassic and Early Cretaceous ages suggest that the Kuparuk may represent continuous deposition in the Late Jurassic and Early Cretaceous (Jamison and others, 1980).

Laddsdale Member of the Floris Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Stream cut on Soap Creek, SE¼SE¼NW¼ sec. 17, T. 70 N., R. 12 W., northeastern Davis County, Iowa. Named for the abandoned mining community of Laddsdale, Davis County.

The Laddsdale Member, here named, is the lower of two members of the Floris Formation (new name) of the Cherokee Group of the Des Moines Supergroup in south-central Iowa. The type section contains four coal beds that are 8.6 ft thick and are distributed through 30 ft of strata at the base of the Floris. Strata associated with the coals are nonmarine shales and siltstones, a thin fossiliferous marine shale above the second coal, and a fossiliferous marine limestone at the upper contact of the member. Other areas contain six coal beds representing six depositional cycles. Overlies the Kalo Formation (new name); underlies a fossiliferous limestone historically referred to as the informal Laddsdale limestone and correlated with the Seville Limestone of Illinois. Age is Middle Pennsylvanian.

Lady Slipper Granulite Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Sinha, A.K., and Bartholomew, M.J., 1984, Evolution of the Grenville terrane in the central Virginia Appalachians: Geological Society of America Special Paper 194, p. 175–186.

Type section: Outcrop on U.S. Highway 60, 400 m east of its junction with the Blue Ridge Parkway, lat 37°44′30″ N., long 79°18′ W., Buena Vista 7.5-minute quadrangle, Rockbridge County, Va. Derivation of name not stated.

The Lady Slipper Granulite Gneiss, here named, is a sequence of metavolcanic rocks in the Pedlar massif in the western parts of the

Buena Vista and Cornwall quadrangles, Virginia. Consists of light-gray, medium-grained, layered to massive gneiss containing quartz, plagioclase, hypersthene, garnet, and biotite. Is intruded by the Pedlar River Charnockite Suite (new name). Age is Middle Proterozoic based on a concordia intercept age of 1,130 Ma.

Lajas Formation

Late Cretaceous (Campanian)
Puerto Rico

Volckmann, R.P., 1984, Upper Cretaceous stratigraphy of southwest Puerto Rico: A revision: U.S. Geological Survey Bulletin 1537-A, p. A73–A83.

Type locality: Exposures at the abandoned railway station at the intersection of Roads 116 and 315 in the town of Lajas, San German 7.5-minute quadrangle, southwestern Puerto Rico.

Rocks in southwestern Puerto Rico, previously mapped as the lower part of the San German Formation as defined by Mattson (1960), are here named the Lajas Formation. The San German Formation is now abandoned and its Cotui Limestone Member is raised to formation rank as the Cotui Limestone. The Lajas consists of basal volcanic wacke overlain by grayish-red to grayish-purple, porphyritic lava and tuff containing labradorite and oxyhornblende phenocrysts in a fine-grained matrix of plagioclase, magnetite, hematite, and actinolite. Lack of pillows in the lava suggests subaerial deposition. The base of the Lajas is interlayered with volcanic wacke identical to volcanic wacke at the top of the Boqueron Basalt (new name), which it appears to overlie with minor disconformity. Underlies the Cotui Limestone with an apparently slight disconformity. Thickness is more than 1,000 m. Age is Late Cretaceous, probably middle Campanian or older, based on fossils in the overlying Cotui.

La Jencia Tuff

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: East slope of a west-dipping hogback on the west side of La Jencia basin, 6.5 mi north of Magdalena and 1.8 mi southeast of Bear Springs, NW¼ sec. 22, T. 1 S., R. 4 W., southern Bear Mountains, Magdalena NW 7.5-minute quadrangle, Socorro County, N. Mex.

Rocks in the northeast Mogollon-Datil volcanic field in southwestern New Mexico, formerly called the lower cooling unit of the tuff of Bear

Springs, A–L Peak Tuff, now abandoned, and Potato Canyon Rhyolite Tuff, now abandoned, are here named the La Jencia Tuff. Consists of multiple flows of crystal-poor, moderately to densely welded, rhyolite ash-flow tuff containing well developed primary flow structures, lineated pumice, lithic fragments, and exotic blocks. Overlies the Hells Mesa Tuff and the Luis Lopez Formation (new name); underlies the La Jara Peak Basaltic Andesite, Sawmill Canyon Formation (new name), or Vicks Peak Tuff. Thickness attains 3,000 ft; base is not exposed. Age is Oligocene based on its stratigraphic position between two dated units.

Lake Barcroft Metasandstone of the **Annandale Group**

Late Proterozoic or Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Lyttle, P.T., 1981, The Accotink Schist, Lake Barcroft Metasandstone, and Popes Head Formation—Keys to an understanding of the tectonic evolution of the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1205, 16 p.

Type locality: Exposures at the confluence of and along the Holmes Run and Tripps Run arms of Lake Barcroft, Annandale quadrangle, Fairfax County, Va.

The Lake Barcroft Metasandstone, here named, is the upper unit of the informal Eastern Fairfax sequence, the structurally lowest metamorphic rocks in northern Virginia. Consists of two types of metasandstone: Type I meta-arenite, thick-bedded quartzofeldspathic granofels having no interbedded pelite; Type II thin- to medium-bedded micaceous metagraywacke that has pelitic layers. Gradationally overlies the Accotink Schist (new name) of the Eastern Fairfax sequence; underlies the Sykesville Formation, which contains exotic blocks of Lake Barcroft Metasandstone and is believed to have been emplaced by subaqueous sliding on the top of the Lake Barcroft. Is intruded by Early Cambrian Occoquan Granite. Thickness is about 400 m.

Drake, A.A., Jr., 1985, Tectonic implications of the Indian Run Formation—A newly recognized sedimentary melange in the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1324, 12 p.

The Lake Barcroft Metasandstone is the upper unit of the Annandale Group (new name), originally called the informal Eastern Fairfax sequence of Drake and Lyttle (1981). The lower unit of the Annandale Group, the Accotink Schist (new name), and the Lake Barcroft lie between two melanges, the newly recognized lower Indian Run Formation (new name) and the upper Sykesville Formation. Fragments of Accotink and Lake Barcroft are restricted to an area of melange originally defined as Sykesville but now considered to be a separate unit, the Indian Run. Age is Late Proterozoic or Cambrian.

Lake Chelan Metabentonite

Early and Middle Devonian (Onesquethawan)
Indiana, Kentucky
Cincinnati arch

Conkin, J.E., and Conkin, B.M., 1984, Paleozoic metabentonites of North America: Part 1—Devonian metabentonites in the eastern United States and southern Ontario: Their identities, stratigraphic positions, and correlation: University of Louisville Studies in Paleontology and Stratigraphy, no. 16, 135 p.

Type locality: North wall of abandoned Sellersburg Stone Quarry (Denton and Voyles Quarry), Speed 7.5-minute quadrangle, Clark County, Ind. Named for Lake Chelan, across the road from the quarry.

The Lake Chelan Metabentonite, here named, is a metabentonite present in stylolitic seams associated with unit 2 of bone bed 4 of the Jeffersonville Limestone of southern Indiana and northwestern Kentucky. Occurs 5.8 ft below the Tioga Metabentonite, 5.5 ft above the Onondaga Indian Nation Metabentonite, and 16 ft above the Kawkawlin Metabentonite [Bentonite] (new name) in southern Indiana. Age is Early and Middle Devonian (Onesquethawan).

Lake George Formation of the Saginaw Group

Early Pennsylvanian (Morrowan)
Michigan
Michigan basin

Vugrinovich, Ray, 1984, Lithostratigraphy and depositional environments of the Pennsylvanian rocks and the Bayport Formation of the Michigan basin: Michigan Geological Survey Division, Report of Investigation 27, 33 p.

Type section: Michigan Consolidated Gas Company Number L–124 well, depth interval 764–885 ft, NW¼NW¼NW¼ sec. 21, T. 18 N., R. 5 W., Lincoln Township, Clare County, Mich. Named for the nearby village of Lake George.

The Lake George Formation of the Saginaw Group, here named, is in the subsurface of the Michigan basin. Consists of white to yellowish-gray to grayish-red, fine- to coarse-grained, friable, quartz sandstone and grayish-brown massive claystone containing local shale and siltstone. Overlies the Hemlock Lake Formation (new name) and gradationally underlies the Winn Formation (new name), both of the Saginaw Group. The deposits are channel fill sediments. Thickness at the type section is 121 ft. Age is Early Pennsylvanian (Morrowan).

Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type area: Exposures in the area north and west of Lake George, Warren County, N.Y.
Subunits:

Eastern Adirondacks: Eagle Lake Gneiss, Paradox Lake, Treadway Mountain, Lake Durant, Springhill Pond, Thunderbolt Mountain Formations.

Southern Adirondacks: Sacandaga Formation, Lake Durant Formation, Tomany Mountain Formation, Rooster Hill Megacrystic Gneiss, Peck Lake Formation, Green Lake Formation, Canada Lake Charnockitic Gneiss, Irving Pond Formation.

Metamorphosed sedimentary rocks in the Adirondack Mountains, N.Y., are here named the Lake George Group. In the eastern Adirondacks it includes, in ascending order, the Eagle Lake Gneiss (new name), Paradox Lake (new name), Treadway Mountain (new name), Lake Durant, Springhill Pond (new name), and Thunderbolt Mountain (new name) Formations. In the southern Adirondacks it includes the Sacandaga, Lake Durant, and Tomany Mountain Formations, Rooster Hill Megacrystic Gneiss, Peck Lake and Green Lake Formations, Canada Lake Charnockitic Gneiss, and Irving Pond Formation. Unconformably overlies the Piseco Group (new name) in the central, eastern, and southern Adirondacks. In the central Adirondacks the Cedar River, Lake Durant, Blue Mountain Lake, and Little Moose Mountain Formations are correlated with the southern Adirondack sequence but these units are not specifically assigned to the Lake George Group. Correlates with the Oswegatchie Group in the Northwest Lowlands. Regional metamorphism occurred during the Grenville orogeny. Age is Proterozoic.

Lake Katrine Member of the Port Ewen Formation of the Helderberg Group

Early Devonian
New York
Appalachian basin

Mazzo, C.R., and LaFleur, R.G., 1984, Stratigraphy of the Port Ewen Formation (Lower Devonian), eastern New York: Northeastern Geology, v. 6, no. 2, p. 71–82.

Type section: Roadcut on New York Route 199, 1.02 km west of the Kingston-Rhinecliff Bridge across the Hudson River, Kingston, Ulster County, N.Y.

The Lake Katrine Member, here named, is the lower of two members of the Port Ewen Formation of the Helderberg Group in the Silurian-Devonian outcrop belt in eastern New York. Consists of dark-gray- to brown-weathering, fissile to hackly, burrow mottled, nonresistant, platy claystone, mudstone, and shale containing bioclastic debris and coarse-grained carbonate at the base. Transitionally overlies the Alson Formation; underlies the East Kingston Member (new name) of the Port Ewen. Thickness at the type section is 6 m. Age is Early Devonian.

Lanier Mountain Quartzite Member of the **Snellville Formation**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Roadcut and natural outcrops on Lanier Mountain, Snellville quadrangle, Gwinnett County, Ga.

The Lanier Mountain Quartzite Member, here named, is the upper member of the Snellville Formation (new name) in the Newnan-Tucker synform near Atlanta, Ga. Consists of quartzite ranging in composition from quartz through muscovitic quartzite to garnetiferous, sillimanitic, muscovitic quartzite. Overlies the Norris Lake Schist Member (new name) of the Snellville and is probably younger than the Atlanta Group (new name). Age is Late Proterozoic and (or) early Paleozoic based on a maximum age of 1,100 Ma from detrital zircons.

Las Animas Formation

Middle Proterozoic
Colorado
Las Vegas-Raton basin

Tweto, Ogden, 1983, Las Animas Formation (Upper Precambrian) in the subsurface of southeastern Colorado: U.S. Geological Survey Bulletin 1529–G, 14 p.

Type section: R.W. Lange Number 1 Government test well, depth interval 2,045–6,210 ft, SW¼NW¼ sec. 10, T. 29 S., R. 62 W., Las Animas County, Colo. Reference section: Upper part: Phillips

Petroleum Company Number 1 E.W. Haskins well, depth interval 1,115–2,570 ft, NE¼NE¼ sec. 23, T. 29 S., R. 56 W. Named for Las Animas County.

A sequence of slightly to moderately metamorphosed sedimentary and igneous rocks that occurs only in the subsurface in a belt 80 mi long and up to 30 mi wide in southeastern Colorado is here named the Las Animas Formation. Consists mainly of dark-gray to black slate, phyllite, dark-gray fine-grained graywacke, and recrystallized chert. Carbonate and volcanic rocks are present in the upper part. Overlies(?) Precambrian granite dated at 1,400 to 1,300 Ma; unconformably underlies Permian Sangre de Cristo Formation at the type section; unconformably underlies Upper Cambrian Reagan Sandstone at the reference section. Thickness, unknown because the base of the formation has not been reached, is probably more than 5,575 ft. Age is Middle Proterozoic.

Laura Lake Mafic Complex of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures near Laura Lake, Kennesaw 7.5-minute quadrangle, eastern Cobb County, Ga.
Subunit: Kennesaw Gneiss Member.

The largest premetamorphic intrusive-extrusive complex in the Piedmont portion of the Greater Atlanta region, Georgia, is here named the Laura Lake Mafic Complex of the New Georgia Group (new name). Includes the Kennesaw Gneiss Member (new name), a unit of quartz diorite gneiss, along the western margin. Consists of migmatitic garnet amphibolite, clinopyroxene, felsic gneiss, metagabbro, meta-ultramafic rocks, and a banded iron formation. Is separated from the outcrop belt of the New Georgia Group by a thin strip of rocks of the Sandy Springs Group. Because of lithologic similarities to the New Georgia, the Laura Lake is believed to represent a slice of the New Georgia that, along with the Sandy Springs, was thrust over other units of the New Georgia. Age is Late Proterozoic and (or) early Paleozoic.

Laurel Branch Limestone

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Exposures on a hillside east of a sinkhole 0.4 km northwest of the intersection of State Highway 94 and a county road parallel to Laurel Branch (stream) and 0.4 km northeast of Laurel View Church, Camelot quadrangle, Hawkins County, Tenn.

The Laurel Branch Limestone, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., were previously named Newman Limestone by Hardeman and others (1966) but are isolated from the type Newman Limestone in the Newman Ridge syncline. Consists of gray fine-grained limestone containing nodules and lenses of black chert and a distinctive zone, 4.5 m thick, of calcareous siltstone and shale. Overlies the Pressmens Home Formation (new name); underlies the Snow Flake Formation (new name). Correlates with the lower part of the St. Louis Limestone. Thickness is 24 m. Age is Mississippian.

La Vida Beds of the **Allison Member** of the **Menefee Formation** of the **Mesaverde Group**

Late Cretaceous
New Mexico
San Juan basin

Miller, R.L., 1984, Subdivisions of the Menefee Formation and Cliff House Sandstone (Upper Cretaceous) in southwest San Juan basin, New Mexico: U.S. Geological Survey Bulletin 1537–A, p. A29–A53.

Type section: Exposures in the Red Hill-White Rock region, from the northeast corner of sec. 31 to the north central part of sec. 30, T. 22 N., R. 13 W., Pillar 3 SE 7.5-minute quadrangle, San Juan County, N. Mex. Named for La Vida Mission Indian School, San Juan County.

The fluvial upper unit of the Allison Member of the Menefee Formation of the Mesaverde Group in northwest New Mexico is here named the La Vida Beds. Consists of olive-gray and dark-brown mudstone, olive-gray siltstone, dark-gray shale, and gray, fine-grained sandstone containing petrified wood and ironstone concretions. Lenticular coal beds, most of which are more than 1 ft thick, are in the upper part of the unit. Overlies the Juans Lake Beds (new name) of the Allison Member; underlies the Cliff House Sandstone. Thickness is 232 ft at the type section. Age is Late Cretaceous.

Lavon Member of the Pecan Gap Formation of the Taylor Group

Late Cretaceous (Campanian)
Texas
Ouachita tectonic belt province

McNulty, C.L., Brezina, J.L., Dawson, W.C., and Maluf, F.W., 1981, Emendation of the Pecan Gap Chalk (Campanian) in northeast Texas: Gulf Coast Association of Geological Societies Transactions, v. 31, p. 353–358.

Type section: Exposures along Bear Creek about 1.0 mi east of the town of Lavon, Collin County, Tex. (Maluf, 1975).

Rocks informally named the Bear Creek member by Maluf (1975) are here named the Lavon Member of the revised Pecan Gap Formation of the Taylor Group. Is in the north-south belt of outcrop in Collin and Rockwall Counties, Tex., and can be traced, with the Rockwall Member (new name) of the Pecan Gap, between Farmersville and southern Rockwall County. Consists of light-gray, white-weathering, obscurely bedded, silty chalk and calcarenite containing poorly defined trace fossils. Disconformably overlies the Rockwall Member; sharply underlies the Marlbrook Formation. May become the Pecan Gap Chalk of the west-southwest belt of outcrop. Thickness at the type section is 30 ft. Age is Late Cretaceous (Campanian).

Leader Lake Quartz Monzonite

Late Cretaceous
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Society of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Exposures on the knolls southeast of Leader Lake, T. 33 N., R. 25 E., Okanogan County, Wash.

A postmetamorphic, orthomagmatic stock in the central Okanogan Range, Wash., is here named the Leader Lake Quartz Monzonite. Consists of fine- to medium-grained rocks composed of equal amounts of quartz, zoned oligoclase, and microcline and minor amounts of biotite and muscovite. Intrudes the Conconully Granodiorite (new name), but a combined rubidium-strontium mineral isochron age of 81 Ma is considered to be evidence that it is a slightly younger differentiate of the same parental magma as the Conconully. Age is Late Cretaceous.

Lees Summit Formation of the Pleasanton Group

Late Pennsylvanian (Missourian)
Missouri, Iowa
Forest City basin

Howe, W.B., 1982, Stratigraphy of the Pleasanton Group, Pennsylvanian System in Missouri: Missouri Department of Natural Resources, Open File Report Series OFR–82–10–GI, 99 p.

Type section: Section in Acme Brick and Tile Company shale quarry at Vale, NE¼NE¼ sec. 27, T. 48 N., R. 32 W., Jackson County, Mo. Named for the city of Lees Summit, Jackson County.
Subunits: Exline Limestone Member, Unity Farm Shale Member.

The Lees Summit Formation of the Pleasanton Group, here named, is in the Forest City basin in northwestern Missouri. Includes the basal Exline Limestone Member and the upper Unity Farm Shale Member (new name). The Exline Limestone Member, here reduced from formation rank in the Pleasanton Group in Missouri, consists of fossiliferous, massive, laminated algal limestone and silty calcareous shale containing masses of crinoidal limestone. Forms the floor of shale quarries in Cass, Jackson, and Livingston Counties, Mo., and Appanoose County, Iowa. The Unity Farm Shale Member is the shale overlying the Exline Member. The Lees Summit overlies the South Mound Shale Member of the Seminole Formation and unconformably underlies the Weldon River Sandstone Member (new name) of the Shale Hill Formation (new name). Thickness at the type section is 65 ft. Age is Late Pennsylvanian (early Missourian).

Lehigh Acres Formation of the **Glades Group**

Early Cretaceous (Comanchean)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies, October Transactions (supplement), v. 31, p. 447–453.

Type section: Humble Number 1 Lehigh Acres well P–407, depth interval 12,250–12,800 ft, sec. 14, T. 45 S., R. 27 E., Lee County, Fla. Named for the nearby community of Lehigh Acres.
Subunits: **West Felda Shale Member, Twelve Mile Member, Able Member.**

The Lehigh Acres Formation of the Glades Group, here named, is in the subsurface of the South Florida basin. Includes the West Felda Shale Member (new name), a gray, calcareous shale unit; the Twelve Mile Member (new name), a limestone unit containing the brown dolomite zone; and the Able Member (new name), an anhydrite and limestone unit that is the uppermost of four regionally persistent anhydrite units below the Punta Gorda Anhydrite of the Glades Group. Overlies the Pumpkin Bay Formation (new name); underlies the Punta Gorda Anhydrite. Thickness at the type well is 550 ft and ranges from 530 to 740 ft in the downdip portion of the basin. Age is Early Cretaceous (earliest Comanchean).

Lemitar Tuff

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Tributary canyon on the north side of Canoncito de Puertecito del Lemitar (Corkscrew Canyon), 8 mi northwest of Socorro, NW¼SE¼SE¼ sec. 12, T. 2 S., R. 2 W., Lemitar Mountains, Lemitar 7.5-minute quadrangle, Socorro County, N. Mex.

Rocks in the San Mateo, Magdalena, Lemitar, and Chupadera Mountains, Joyita Hills, and northern Jornada del Muerto, N. Mex., formerly called Potato Canyon Rhyolite Tuff (name now abandoned), are here named the Lemitar Tuff. Consists of a simple to compound cooling unit of densely welded rhyolite ash-flow tuff that has strong compositional zoning, divided into a lower light-gray to pale-red rhyolitic member and an upper medium-red to yellowish-gray crystal-rich member. Overlies the Vicks Peak Tuff or the Sawmill Canyon Formation (new name); overlies and underlies tongues of the La Jara Peak Basaltic Andesite; underlies the South Canyon Tuff (new name). Thickness ranges from 0 to 2,000 ft. Age is Oligocene based on a potassium-argon age of 28.4 Ma.

Leter Ranch Bed of the Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 1 of Morrison (1964), east of Leter Ranch on the south edge of Carson Sink, sec. 15, T. 21 N., R. 30 E., Churchill County, Nev.

The Leter Ranch Bed of the Pyramid Lake Member (new name) of the Mount Mazama Formation, here named, is in the Carson Desert of the Lake Lahontan area, Nevada. Consists of a 1-cm-thick bed of white tephra, present as an ashy parting. Is interbedded with the lower member of the Sehoo Formation. Overlies the Wono Bed (new name) of the Pyramid Lake, underlies the Upsal Hogback Bed (new name) of the Carson Desert Formation (new name). Age is Pleistocene, 35 to 11.5 Ma.

Lewiston Member of the Rochester Shale

Middle Silurian (Wenlockian)
New York, Ontario
Appalachian basin

Brett, C.E., 1983, Stratigraphy and facies relationships of the Silurian Rochester Shale (Wenlockian; Clinton Group) in New York State and Ontario: Rochester [New York] Academy of Science Proceedings, Centennial Colloquium Issue, v. 15, no. 2, p. 118–141.

Type locality: Cliff exposures in the east wall of Niagara Gorge, 1 km south of the Lewiston-Queenston bridge and 0.6 km north of the Robert Moses power plant, 2.3 km south of Lewiston, Lewiston 7.5-minute quadrangle, Niagara County, N.Y.

The Lewiston Member of the Rochester Shale, here named, is the lower unit of the Rochester in the area from Hamilton, Ontario, Canada, to Brockport, N.Y. Corresponds to Grabau's (1901) lower shales and Ringueberg's (1888) lower and middle third subdivisions. Consists of gray, brownish-weathering, fossiliferous, shaly mudstone containing thin interbedded lenses of biomicrite and burrowed micrite. Is subdivided into five units: unit A, a basal transition zone of brachiopod-crinoid-rich biomicrite lenses in shale, 1 m thick; unit B, gray mudstone containing bryozoan clusters, 1 to 3 m thick; unit C, sparsely fossiliferous shale and calcisiltites, variable thickness; unit D, fossiliferous mudstone and bryozoan-rich limestone, 2 m thick; and unit E, upper bryozoan-rich biomicrite and a minor amount of shale, which correspond to the bryozoa beds of Grabau (1901), 1.5 m thick. Gradationally or sharply overlies the Irondequoit Limestone; sharply underlies the Burleigh Hill Member (new name) of the Rochester or, west of Grimsby, Ontario, the Stoney Creek Member of the Rochester. Thickness at the type locality is 8.6 m. Age is Middle Silurian (Wenlockian).

Liberty Grove Member of the Horicon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut on north side of Waters End Road, west of the intersection with Highway ZZ, 4.8 km northeast of Sister Bay, SE¼SE¼NW¼ sec. 35, T. 32 N., R. 28 E., Sister Bay 15-minute quadrangle, Door County, Wis. Named for Liberty Grove Township.

Following the informal usage of Schneider (1981), the Liberty Grove Member of the Horicon Formation (new name), here named, is on the eastern side of the Green Bay Lobe in Door County, Wis. Consists of brown to yellowish-brown, coarse-grained, pebbly sandy loam till. Where it rests directly on bedrock, most of the clasts are Silurian dolomite. Lies at the surface or underlies the Kewaunee Formation (new name). Correlates with the Mapleview Member (new name) of the Horicon on the west side of the Green Bay Lobe. Thickness ranges from less than 3 m to more than 10 m. Age is Pleistocene (late Wisconsinan).

Lightning Gulch Formation of the Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., ed., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type section: Northwest of Wildhorse Meadows, NW¼ sec. 4, T. 1 N., R. 2 E., Moonridge 7.5-minute quadrangle, San Bernardino County, Calif. Named for Lightning Gulch.

Following the informal usage of Cameron (1981), the Lightning Gulch Formation, here named, is in the Big Bear Group (new name) in the southwest portion of the Sugarloaf Mountain area of the San Bernardino Mountains, Calif. Divided into a basal greenstone member, a time transgressive flow unit that locally overlies the Wildhorse Meadows Quartzite (new name) or lies within the lower phyllite member, L1, of the Lightning Gulch, where member L1 conformably overlies the Wildhorse Meadows; a middle quartzite member, L2, that gradationally overlies member L1 and underlies member L3; and an upper phyllite member, L3, that conformably underlies the Moonridge

Quartzite (new name) of the Big Bear Group. Thickness at the type section is 303 m. Age is late Precambrian.

Limekiln Spring Member of the **Kingston Peak Formation** of the **Pahrump Group**

Proterozoic
California
Mohave basin

Albee, A.L., Labotka, T.C., Lanphere, M.A., and McDowell, S.D., 1981, Geologic map of the Telescope Peak quadrangle, California: U.S. Geological Survey Geologic Quadrangle Map GQ–1532, scale 1:62,500.

Type section: Near Limekiln Spring in Surprise Canyon, east flank of the Panamint Range, T. 21 S., R. 45 E., Telescope Peak 15-minute quadrangle, Inyo County, Calif.

The Limekiln Spring Member of the Kingston Peak Formation of the Pahrump Group, here named, is in the Telescope Peak quadrangle, Inyo County, Calif. Consists mainly of fine-grained metagraywacke, pelitic schist, and amphibolitic schist, and is divided into four map units: arkosic conglomerate containing clasts of older Proterozoic gneiss or of Beck Spring Dolomite interbedded with metamorphosed arkose and dolomite; thick dolomite beds; quartzite and calcareous quartzite; and argillite, schist, amphibolite, and metamorphosed conglomerate. The top of the member is marked by 60 to 100 m of thin-bedded calcareous quartzite and quartz arenite. Interfingers with the upper part of Beck Spring Dolomite; locally unconformably overlies Beck Spring Dolomite, Crystal Spring Formation, and older Proterozoic rocks; underlies the Surprise Member of the Kingston Peak Formation. Thickness ranges from 50 to 500 m. Age is Proterozoic.

Lincoln Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Gravel pit, east side of Robin Road, 200 m south of its intersection with Highway B, 1.7 km west of Bakerville, SE¼NW¼NW¼ sec. 26, T. 25 N., R. 2 E., Marshfield 15-minute quadrangle, Wood County, Wis. Named for Lincoln County.
Subunits: Bakerville Member, Merrill Member.

The Lincoln Formation, here named, is in the Chippewa sublobe in Lincoln, Langlade, Marathon, Wood, Clark, and Taylor Counties, Wis.

Consists of reddish-brown till and associated sand and gravel. Is divided into the lower Bakerville Member (new name) and the upper Merrill Member (new name). Sharply overlies the Marathon Formation (new name) or Precambrian bedrock and is the surficial unit in most areas. Maximum thickness is 20 m. Age is Pleistocene (early Wisconsinan or older) based on organic matter overlying the Merrill Member.

Lindsay Formation

Middle Ordovician
Ontario, Pennsylvania
Appalachian basin

Wagner, W.R., 1966, Stratigraphy of the Cambrian to Middle Ordovician rocks of central and western Pennsylvania: Pennsylvania Geological Survey Bulletin G 49, 156 p.

Type section: Exposures along Highway 35, 4 mi northwest of Lindsay, Ontario, Canada (Liberty, 1969).

The Lindsay Formation of Liberty (1964) is here extended from Ontario in the subsurface near Lake Erie in Erie County, northwestern Pennsylvania, to replace the Salona Formation and the overlying Coburn Formation where they lose their character and consist of calcarenite and shale. In northwestern Pennsylvania the Salona Formation increases in thickness, becomes less argillaceous and more calcareous, and passes northward into a sequence of fossiliferous calcarenites and shales of the Lindsay Formation of Ontario. Overlies the Verulam Formation; underlies the Collingwood Formation. Age is Middle Ordovician.

Lindsey Mountain Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: S½NW¼ sec. 4, T. 33 N., R. 3 E., Ironton quadrangle, Iron County, Mo. Named for Lindsey Mountain.

Rocks previously mapped as the Lindsey Mountain ash flow by Anderson (1962) and Unit B of the tuff of Stouts Creek by Anderson (1970), here named the Lindsey Mountain Rhyolite, are in the Taum Sauk Caldera in the western St. Francois Mountains of southeast Missouri. Consists of violet-gray, blackish, or light-maroon ash-flow tuff containing quartz and alkali feldspar phenocrysts. Overlies the Ironton Rhyolite (new name); underlies the Russell Mountain Rhyolite (new name). Thickness ranges from 500 to 700 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Lindsey Mountain Rhyolite.

Little Bighorn Member of the **Madison Limestone**

Early Mississippian (Kinderhookian)
Wyoming, Montana
Powder River basin

Sando, W.J., 1982, New members of the Madison Limestone (Devonian and Mississippian), north-central Wyoming and southern Montana: U.S. Geological Survey Bulletin 1529–H, p. H125–H130.

Type section: Little Tongue River section, NE¼ sec. 27, T. 57 N., R. 87 W., Sheridan County, Wyo. Named for exposures in Little Bighorn Canyon, NW¼ sec. 30, T. 58 N., R. 89 W.

The informal lower dolomite member of Sando (1972), here named the Little Bighorn Member, is one of six members of the Madison Limestone in the Powder River basin in north-central Wyoming and southern Montana. Is also recognized in the subsurface in the Bighorn, Wind River, and Powder River basins. Consists of thick-bedded, fine- to medium-crystalline, fossiliferous, crinoidal dolomite and dolomitic limestone. Conformably overlies the Cottonwood Canyon Member of the Madison at most localities, or unconformably overlies the Devonian Jefferson Dolomite, Ordovician Bighorn Dolomite, or Ordovician and Cambrian Gallatin Limestone where the Cottonwood Canyon is absent; conformably underlies the Woodhurst Member of the Madison. Thickness is 17.5 m at the type section and ranges from 3 to 48 m. Age is Early Mississippian (Kinderhookian) based on brachiopods.

Little Charley Pond Formation

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Exposures in the vicinity of Little Charley Pond, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.

The Little Charley Pond Formation, here named, is the lowest unit of cover rocks in the Loon Pond syncline of the Bog River synclinorium, Adirondack Highlands, Hamilton, and St. Lawrence Counties, N.Y. The lower half consists of foliated quartzite interbedded with calcite-diopside-quartz granulite, the upper half consists of diopsidic marble containing scattered thin quartzite beds. Unconformably overlies basement rocks of the East Charley Pond Gneiss (new name); unconformably underlies the Bear Pond Gneiss (new name). Thickness ranges from 0 to 40 m. Age is Precambrian.

Little Jacks Tuff

Miocene
Idaho
Snake River basin

Ekren, E.B., McIntyre, D.H., and Bennett, E.H., 1984, High-temperature, large-volume, lavalike ash-flow tuffs without calderas in southwestern Idaho: U.S. Geological Survey Professional Paper 1272, 76 p.

Type locality: Exposures on the east wall of Little Jacks Creek canyon at the junction of a large tributary (Rattlesnake Creek of local usage), SW¼ sec. 5, T. 9 S., R. 3 E., 35 km south of Grand View, Owyhee County, Idaho.

Rocks previously informally named the rhyolite of Owyhee Plateau of Neill (1975) and the tuff of Antelope Ridge of Bennett (1976) are here named the Little Jacks Tuff. Erupted from a gentle dome in the area east of Juniper Mountain in the Owyhee Plateau, southwestern Idaho, and has been traced over an area 100 km in diameter. Tuffs were emplaced as ash flows at extremely high temperatures and coalesced to liquids before final emplacement and cooling. Contains at least four and possibly six cooling units of flow-banded, densely welded, brecciated, medium-gray to purplish-gray, vitrophyric, calc-alkalic rhyolite tuff containing phenocrysts of plagioclase and pigeonite. Weathers to dark-reddish-brown or purple. Onlaps the Swisher Mountain Tuff (new name) east of Juniper Mountain. Thickness is 275 m at the type locality and ranges from 90 to 600 m. Age is Miocene based on potassium-argon ages of 10 and 9.6 Ma.

Little Tongue Member of the **Madison Limestone**

Early Mississippian (Osagean)
Wyoming, Montana
Powder River basin

Sando, W.J., 1982, New members of the Madison Limestone (Devonian and Mississippian), north-central Wyoming and southern Montana: U.S. Geological Survey Bulletin 1529–H, p. H125–H130.

Type section: Little Tongue River section, NW¼ sec. 26, T. 56 N., R. 87 W., Sheridan County, Wyo.

The informal cliffy limestone member of Sando (1972), here named the Little Tongue Member, is one of six members of the Madison Limestone in the Powder River basin in north-central Wyoming and southern Montana. Is also recognized in the subsurface in the Bighorn, Wind River, and Powder River basins. Consists of cliff-forming, medium- to thick-bedded, cherty, fossiliferous, crinoidal limestone, dolomitic limestone, or dolomite. At most localities it is marked by a solution breccia that represents an interval of evaporite, carbonate, and terrigenous rocks at the surface; anhydrite occurs at this level in the subsurface. Conformably overlies the Big Goose Member (new name) of the Madison; conformably underlies the Bull Ridge Member of the Madison or disconformably underlies the Amsden Formation. Thickness is 70 m at the type section and ranges from 24 to 87 m. Age is Early Mississippian (Osagean) based on corals and brachiopods.

Lobsterville Sand

Pliocene
Massachusetts
Atlantic Coast basin

Kaye, C.A., 1983, The autochthonous and allochthonous Coastal Plain deposits of Martha's Vineyard and the Marshfield-Scituate area, southeastern Massachusetts: Atlantic Coastal Plain Geological Association Field Trip Guidebook, 34 p.

Type locality: Outcrops in the north part of Gay Head Cliff, Martha's Vineyard, Mass. Named for a section of Gay Head township that adjoins the north end of the cliff.

The Lobsterville Sand, here named, is part of the Gay Head moraine in Martha's Vineyard, Mass., and is composed of thrust plates made up of remnants of Coastal Plain sediments that were stacked up during Pleistocene glaciation. Consists of light-yellow to gray, medium- to coarse-grained, crossbedded, clean sand containing broken mollusk shells. Overlies the Devils Bridge Clay (new name). Thickness is 3.5 m. Age is early Pliocene based on fossils.

Locke Member of the Tiger Formation

Eocene, Oligocene, and Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Exposures in a road cut along the Locke Cut-off Road, SE¼NW¼ sec. 25, T. 34 N., R. 42 E., Pend Oreille County, Wash.

The Locke Member, here named, is in the revised Tiger Formation in the Cusick region, northeastern Washington. Consists of massive to horizontally and planar cross-stratified, coarse-grained sandstone fining upward to siltstone and carbonaceous shale and a minor amount of conglomerate. The base is not exposed but it presumably overlies Precambrian and Paleozoic strata; is a facies equivalent of, intertongues with, and is separated by a vertical arbitrary boundary from the Gibraltar Rock Member (new name) of the Tiger; conformably underlies the Jared Member (new name) of the Tiger east of the Cusick Creek fault; unconformably underlies the Jared west of the fault. Thickness is 34 m at the type section; inferred total thickness is 2,000 m. Age ranges from early middle Eocene, based on the inclusion of late early to early middle Eocene volcanic rock clasts, through middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Lombard Limestone of the **Snowcrest Range Group**

Late Mississippian (Meramecian, Chesterian)
Montana
Montana folded belt province

Wardlaw, B.R., and Pecora, W.C., 1985, New Mississippian-Pennsylvanian stratigraphic units in southwest Montana and adjacent Idaho, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–B, p. B1–B9.

Type section: Exposures 1 km north of Lombard Station, S½ sec. 7, T. 4 N., R. 3 E., Toston 7.5-minute quadrangle, Broadwater County, Mont.

The Lombard Limestone, here named, is the middle formation of the Snowcrest Range Group (new name). Crops out throughout most of southwest Montana in the Tendoy Mountains, Pioneer Mountains, Blacktail Mountains, Snowcrest Range, Ruby Range, Tobacco Root Range, northwestern part of the Gravelly Range, Elkhorn Mountains, Horseshoe Hills, and Bridger Range. Consists of a geographically restricted lower unit of poorly fossiliferous, thin to thick, indistinctly bedded lime-mudstone and packstone and an upper unit of fossiliferous, thin- to thick-bedded, skeletal lime-mudstone, wackestone, and packstone containing thin interbeds and partings of silty limestone, siltstone, and shale. Overlies the Kibbey Sandstone and underlies the Conover Ranch Formation (new name), both of the Snowcrest Range Group. Is equivalent to the Otter and Heath Formations of the Big Snowy Group and to part of the Tyler Formation of the Amsden Group in central Montana, to the South Creek and Surrett Canyon Formations in east-central Idaho, and to the Railroad Canyon Formation (new name) in the Beaverhead Range, Idaho and Montana. Thickness is 49.7 m at the type section and attains 130 m. Age is Late Mississippian (late Meramecian to late Chesterian) (Mamet Foraminifer Zone 15 and Sando and Bamber Coral Zone IV to Mamet Foraminifer Zone 19).

Lonesome Pine Formation

Middle Ordovician
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Along and in fields adjacent to State Highway 70, about 0.3 km north of Lonesome Pine School and about 1.6 km southeast of Livesay Mill, Kyles Ford 7.5-minute quadrangle, Hancock County, Tenn.

The Lonesome Pine Formation, here named, is in the area southeast of the Clinchport thrust fault in Hancock and Hawkins Counties, Tenn. Consists of pink and gray, fossiliferous limestone, including mound structures of reef origin, calcareous shale, and chert. Is divided into informal lower and upper members. Unconformably overlies the Elway Limestone; gradationally underlies the Luther Formation (new name). Thickness is 170 m at the type section. Age is Middle Ordovician.

Long Point Bed of the **Anvil Points Member, Garden Gulch Member,** or **Douglas Creek Member** of the **Green River Formation**

Eocene
Colorado
Piceance basin

Johnson, R.B., 1984, New names for units in the lower part of the Green River Formation, Piceance Creek basin, Colorado: U.S. Geological Survey Bulletin 1529–I, 20 p.

Type section: South side of Long Point in NE¼SW¼ sec. 18, T. 7 S., R. 97 W., Long Point quadrangle, Garfield County, Colo. Reference section: West end of Kimball Mountain, SE¼SE¼, sec. 7, T. 7 S., R. 98 W., Long Point quadrangle.

The Long Point Bed in the Green River Formation, here named, is in the Piceance Creek basin, Colorado. At its type section, the Long Point occurs at the base of the Anvil Points Member, on Kimball Mountain, it occurs at the base of the Garden Gulch Member, and elsewhere it occurs at the base of the Douglas Creek Member. Is thin or absent in the central part of the basin, and grades into a thick sandstone sequence to the east where it loses its identity. Consists of medium-gray ostracode- and oolite-rich, very fine to medium-grained sandstone and grayish-white ostracodal and oolitic limestone. Gastropods are abundant at the reference section, and thin claystone partings are common throughout. Overlies the Wasatch Formation. Thickness ranges from about 20 cm to 14.6 m. Age is Eocene.

Loon Pond Mountain Member of the Lost Pond Marble

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: None designated. Probably named for Loon Pond Mountain, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.

The Loon Pond Mountain Member of the Lost Pond Marble (new name), here named, is in the Loon Pond syncline of the Bog River synclinorium of the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y. Consists of massive pyritic quartzite. Overlies the Sabattis Road Member (new name) of the Lost Pond; lies at the top of the structure. Is cut by the Otter Pond Dioritic Gneiss (new name). Thickness is at least 40 m. Age is Precambrian.

Lost Creek Member of the Tiger Formation

Eocene, Oligocene, Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: East-facing bluffs near Lost Creek, W½NE¼ sec. 16, T. 36 N., R. 43 E., Pend Oreille County, Wash.

The Lost Creek Member, here named, is in the revised Tiger Formation in the area near Ione and Tiger in northeastern Washington. Consists of massive to horizontally stratified biotite-hornblende granitic conglomerate and arkosic sandstone containing all intermediate grain-size and clast-percent variations. Overlies and pinches out over the Box

Canyon Member (new name) of the Tiger; otherwise the base is not exposed. Thickness at the type section is 300 m and attains to more than 2,000 m. Age ranges from early middle Eocene, based on the inclusion of late early to early middle Eocene volcanic rock clasts, through middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Lost Mountain Amphibolite Member of the Univeter Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Lost Mountain, Lost Mountain 7.5-minute quadrangle, Cobb County, Ga.

The Lost Mountain Amphibolite Member of the Univeter Formation (new name) of the New Georgia Group (new name), here named, is in the Greater Atlanta region of northwest Georgia. Forms two limbs of a fold traceable for 80 mi in the Univeter and encloses the Rose Creek Schist Member (new name) of the Univeter. Consists of hornblende-plagioclase amphibolite and hornblende gneiss and local layers of banded iron formation. Age is Late Proterozoic and (or) early Paleozoic.

Lost Pond Marble

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Exposures near Lost Pond, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.
Subunits: Bog River Member, Hill 2292 Member, Sabattis Road Member, Loon Pond Mountain Member.

The Lost Pond Marble, here named, is the youngest cover unit in the Loon Pond syncline of the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y. Includes, in ascending order, the Bog River, Hill 2292, Sabattis Road, and Loon Pond Mountain Members (all new names). Forms two broad areas of outcrop characterized by low topographic relief and swamps. Consists of marble, granulite, and quartzite units. Overlies the Bear Pond Gneiss (new name). Is intruded by the Otter Pond Dioritic Gneiss (new name). Thickness is more than 300 m. Age is Precambrian.

Loudon Coal Member of the Mattoon Formation of the McLeansboro Group

Late Pennsylvanian (Missourian)
Illinois
Illinois basin

Nance, R.B., and Treworgy, C.G., 1981, Strippable coal resources of Illinois: Part 8—Central and southeastern counties: Illinois Geological Survey Circular 515, 32 p.

Type section: Exposure in the south cutbank of Moccasin Creek, NE¼SW¼SE¼ sec. 23, T. 8 N., R. 3 E., Loudon Township, Fayette County, Ill.

The Loudon Coal Member of the Mattoon Formation of the McLeansboro Group, here named, is in Fayette County, Ill. Lies 30 to 40 ft above the Millersville Limestone Member of the Bond Formation and 25 to 40 ft below the Oconee Coal Member (new name) of the Mattoon Formation. Correlates tentatively with the Belle Rive Coal Member (new name) of the Mattoon in Jefferson County to the south. Thickness at the type section is 15 in. Age is Late Pennsylvanian (Missourian).

Lovell Wash Member of the **Horse Spring Formation**

Miocene
Nevada
Great Basin province

Bohannon, R.G., 1984, Nonmarine sedimentary rocks of Tertiary age in the Lake Mead region, southeastern Nevada and northwestern Arizona: U.S. Geological Survey Professional Paper 1259, 72 p.

Type section: Exposures in Lovell Wash in the Muddy Mountains, lat 36°12′45″ N., long 114°42′30″ W., Hoover Dam 15-minute quadrangle, Clark County, Nev.

The Lovell Wash Member, here named the uppermost of four members of the Horse Spring Formation, is at Lovell Wash, Nev. Is not widely distributed at the surface and crops out only northwest of the Lake Mead fault system in Nevada. Consists of white limestone and dolomite, gray and white claystone, gray and brown tuff, tuffaceous sandstone, and arenaceous tuff. Probably originated as sediments and ash falls deposited in a lacustrine environment. Conformably overlies the Bitter Ridge Limestone Member (new name) of the Horse Spring Formation; unconformably underlies unnamed Miocene red sandstone in

White Basin and the Muddy Creek Formation at Black Mesa. Thickness at the type section is 300 m. Age is Miocene based on potassium-argon and fission-track dates.

Lower Bridge Member of the Williamsburg Formation of the Black Mingo Group

Paleocene (Thanetian)
South Carolina
Atlantic Coast basin

Van Nieuwenhuise, D.S., and Colquhoun, D.J., 1982, The Paleocene-lower Eocene Black Mingo Group of the east central Coastal Plain of South Carolina: South Carolina Geology, v. 26, no. 2, p. 47–67.

Type section: Outcrops along the Black River near the South Carolina Highway 377 bridge (Lower Bridge), Williamsburg County, S.C.

The Lower Bridge Member, here named, is the lower member of the Williamsburg Formation of the Black Mingo Group in the Coastal Plain of South Carolina. The revised Black Mingo Group includes all the strata from the base of the Paleocene to the top of the Ypresian Stage of the Eocene and is divided into the Rhems Formation of the Danian Stage, the Williamsburg Formation of the Thanetian Stage, and unnamed Ypresian strata. [In the Clubhouse Crossroads corehole Number 1, Gohn and others (1978) assigned the entire Paleocene section to the Black Mingo Formation, and Gohn and others (1983) named the Ypresian strata the Fishburne Formation (new name).] The Lower Bridge Member consists of fine-grained silicified mudstone, and fossiliferous, laminated, arenaceous shale. Unconformably overlies the Perkins Bluff Member (new name) of the Rhems; gradationally underlies the Chicora Member (new name) of the Williamsburg. Thickness at the type section is 12 ft. Age is Paleocene (Thanetian).

Lower Lake Formation

Pleistocene
California
Northern Coast Range province

Rymer, M.J., 1981, Stratigraphic revision of the Cache Formation (Pliocene and Pleistocene), Lake County, California: U.S. Geological Survey Bulletin 1502–C, p. C1–C35.

Type section: Exposures along the west side of State Highway 53 in the town of Lower Lake, W½SW¼SW¼ sec. 2, T. 12 N., R. 7 W., Lower Lake 7.5-minute quadrangle, Lake County, Calif.

Lacustrine deposits in the Clear Lake area, Lake County, Calif., previously assigned to the revised Cache Formation, are here named the Lower Lake Formation. Consists of a heterogeneous deposit of pebble conglomerate, sandstone, siltstone, calcareous siltstone, limestone, tuff, and diatomite. Unconformably overlies Cretaceous rocks of the Great Valley sequence, the Cache Formation, or dacite of the Clear Lake volcanic field. Underlies units of the Clear Lake volcanic field. Thickness at the type section is 130 m. Age is Pleistocene based on potassium-argon ages of the Clear Lake volcanic rocks.

Low-Water-Bridge Layered Gneiss

Middle Proterozoic
North Carolina
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Outcrop along river road, 0.5 mi north of the intersection of North Carolina State Roads 1527 and 1510 on the southeast side of the low-water bridge over the Yadkin River, 0.5 mi south of Rockford, lat 36°16′ N., long 80°39′ W., Copeland quadrangle, Surry County, N.C.

The Low-Water-Bridge Layered Gneiss, here named, is in the Sauras massif in the Blue Ridge in North Carolina. Represents country rock that was intruded by rocks of Grenville age. Contains biotite-rich relict amphibolite facies assemblages and lacks granulite facies. Age is Middle Proterozoic.

Luis Lopez Formation

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type area: South end of Luis Lopez manganese district, 11 mi southwest of Socorro and 7 mi southwest of the village of Luis Lopez, east side of the Chupadera Mountains from 2.5 mi north of Nogal Canyon to 3.3 mi south of Nogal Canyon, secs. 20, 29, 31, and 32, T. 4 S., R. 1 W., and secs. 4, 5, 6, 8, and 9, T. 5 S., R. 1 W., Luis Lopez 7.5-minute quadrangle, Socorro County, N. Mex.

The Luis Lopez Formation, here named, is in the Socorro Peak, Chupadera, and Magdalena Mountains, N. Mex., and is the heterolithic cauldron-fill unit of the Socorro cauldron. Includes the informal rhyolites of Bianchi Ranch and Hardy Ridge. Consists of rhyolite domes and flows, local ash-flow tuffs, volcaniclastic rocks, breccias, andesite flows, and intrusives. Overlies the Hells Mesa Tuff; underlies the La Jencia Tuff (new name). Thickness ranges from 0 to 3,500 ft. Age is Oligocene.

Luther Formation

Middle Ordovician
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Roadcut on east side of State Highway 31, 600 m northwest of War Creek Church at Luther, Lee Valley quadrangle, Hancock County, Tenn.

The Luther Formation, here named, is in the area southeast of the Clinchport thrust fault in Hancock and Hawkins Counties, Tenn. Consists of beds of fine-grained red and yellow limestone, argillaceous limestone, and shale. Gradationally overlies the Lonesome Pine Formation (new name); gradationally underlies the Witten Limestone. Correlates partly with the Bowen Formation. Thickness is 35 m at the type section. Age is Middle Ordovician.

Lynn Mountain Formation

Early and Middle Pennsylvanian (Morrowan and Desmoinesian)
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type section: Outcrops along U.S. Highway 271 from a point 0.1 mi south of the main entrance to Clayton Lake State Park southward to the contact with the Johns Valley Shale, NW¼SW¼ sec. 35, T. 1 N., R. 19 E., Pushmataha County, Okla. Named for Lynn Mountain, Pushmataha County.

The Lynn Mountain Formation, here named, is in the Ouachita Mountains in Pushmataha County, southeastern Oklahoma. Consists of alternating beds of greenish-gray, brown-weathering, fine-grained sandstone and dark-gray to black shale; clayey where more than 1 ft thick, and micaceous and silty where less than 1 ft thick. Conformably overlies the Johns Valley Shale; unconformably underlies the Lower Cretaceous Antlers Formation. Thickness at the type section is 1,844 ft; the top is eroded. Age is Early and Middle Pennsylvanian (Morrowan and Desmoinesian) based on palynomorphs.

Maddox Branch Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut along westbound lanes of Interstate Highway I–64, 15.7 km west of its intersection with Kentucky Highway 2, Soldier quadrangle, Rowan County, Ky. Named for Maddox Branch northeast of the type section.

Strata here named the Maddox Branch Member of the Slade Formation (new name) were previously assigned to the Newman Limestone, Hardinsburg Sandstone, and other stratigraphic units that are now restricted from the Cumberland Escarpment area of east-central and northeastern Kentucky. Consists of green calcareous shale containing calcilutite lenses. Conformably overlies the Ramey Creek Member (new name) of the Slade; conformably or disconformably underlies the Poppin Rock Member (new name) of the Slade. Thickness ranges from 0 to 14 m. Age is Late Mississippian.

Magdalena Peak Rhyolite of the Santa Fe Group

Miocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type area: On and south of Magdalena Peak, 1.25 to 5 mi south of the village of Magdalena on Magdalena Peak and along Hop and Agua Frio Canyons, sec. 34, T. 2 S., R. 4 W., and secs. 2, 3, 10, 11, 14, and 15, T. 3 S., R. 4 W., Magdalena SW 7.5-minute quadrangle, Socorro County, N. Mex.

The Magdalena Peak Rhyolite of the Santa Fe Group, here named, is on the west flank of the Magdalena Range in New Mexico. Consists of pink, buff, or gray, flow-banded, rhyolite domes and flows. Overlies fanglomerates of the Popotosa Formation; the top is eroded. Thickness ranges from 0 to 600 ft. Age is Miocene based on a potassium-argon age of 14.8 Ma.

Maple Falls Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Exposures in the bed of Coal Creek, S½ sec. 4, T. 39 N., R. 5 E., Whatcom County, Wash. Named for the town of Maple Falls.

The Maple Falls Member of the Chuckanut Formation, here named, is in the Sumas Mountain and North Fork Nooksack River valley area of the central part of the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands into the foothills of the North Cascades, Wash. Consists of alternating conglomerate-rich coarse-grained sandstone strata and fine-grained siltstone and mudstone beds, interpreted as interfingering alluvial fan and flood-plain deposits. Overlies and possibly interfingers with the Padden Member (new name) and Slide Member (new name) of the Chuckanut; is bounded on the north and west by faults. Thickness at the type section is more than 800 m. Age is late middle to late(?) Eocene based on stratigraphic correlation with the Padden Member.

Mapleview Member of the Horicon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Roadcut on the south side of Mapleview Road, west of its intersection with Maple Road, SE¼SW¼SW¼ sec. 34, T. 31 N., R. 10 E., Mattoon 7.5-minute quadrangle, Langlade County, Wis. Named for Mapleview Road, a town road running east from Highways 45, 47, and 52, south of Antigo.

Following the informal usage of McCartney and Mickelson (1982), the Mapleview Member of the Horicon Formation (new name) is here named. Lies on the west side of the Green Bay Lobe in Langlade and Marathon Counties, Wis. Consists of brown to reddish-brown, cobbly, pebbly, silty sand till. Overlies sand and gravel; interfingers with or sharply underlies the Nashville Member (new name) of the Copper Falls Formation (new name) or lies at the surface. Correlates with the Liberty Grove Member (new name) of the Horicon on the east side of the Green Bay Lobe. Thickness is unknown. Age is Pleistocene (late Wisconsinan).

Marathon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Gravel pit on west side of Ryan Street, 2.4 km south of Highway 29, SW¼SW¼NE¼ sec 27, T. 28 N., R. 8 E., Wausau 15-minute quadrangle, Marathon County, Wis. Named for Marathon County.
Subunits: Wausau Member, Edgar Member.

The Marathon Formation, here named, is in the Chippewa Sublobe in Marathon, Wood, and Clark Counties, Wis., where it is typified by a water-eroded landscape having thin light-gray, yellow, or brown till, sand, and gravel deposits. Is divided into the lower Wausau Member (new name), consisting of brown loam till, and the upper Edgar Member (new name), consisting of siltier brown loam till. Unconformably overlies Precambrian bedrock and is the surficial unit in most of Marathon County but sharply underlies the Lincoln and Copper Falls Formations (new names) to the north and west and the Horicon Formation (new name) to the east. Thickness ranges from 0 to 20 m. Age is Pleistocene, probably early Wisconsinan or older.

Marble Bluff Bed

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Marble Bluff, in the banks of Mud Lake (Winnemucca) Slough, 5.6 km north of Nixon, NW¼NW¼ sec. 12, T. 23 N., R. 23 E., Nixon 15-minute quadrangle, Washoe County, Nev.

The Marble Bluff Bed, here named, is attributed to Mount St. Helens in southwestern Washington because it contains cummingtonite, which is characteristic of Mount St. Helens tephra. Occurs in the Carson Desert and around Pyramid Lake in the Lake Lahontan area, Nevada. Is a graded bed, gray at the base and white at the top, 1 cm thick, and is the lowest tephra layer contained within the lower member of the Sehoo Formation. Underlies the Carson Sink Bed (new name) of the Mono Basin Formation (new name) and the Pelican Island Bed (new name) and Wono Bed (new name) of the Pyramid Lake Member (new name) of the Mount Mazama Formation. Age is Pleistocene, 35 to 11.5 ka.

Marple Canyon Sandstone Member of the Ridge Route Formation of the Ridge Basin Group

Miocene (Mohnian)
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Exposures on the north side of Marple Canyon where the Old Ridge Route crosses the outcrop at the head of the canyon, between 1.0 km south and 0.5 km north of the intersection of Old Ridge Route and Templin Highway, about 8.0 km north of Castaic, Los Angeles County, Calif.

The Marple Canyon Sandstone Member, here named, is in the Ridge Route Formation of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif. Is the oldest of five major clastic tongues in the Ridge Route. Consists of brown and white arkosic sandstone interbedded with mudstone and conglomerate and contains freshwater mollusk, ostracode, charophyte, and vertebrate fossils. Lateral extent is 8,000 m; interfingers with the Violin Breccia to the southwest and the Ridge Route Formation undivided to the northeast. Conformably overlies and interfingers with the Castaic Formation; conformably underlies the Paradise Ranch Shale Member (new name) of the Peace Valley Formation, redefined. Thickness is 420 m at the type section and ranges from 80 to 1,100 m. Age is late Miocene (late Mohnian) based on its stratigraphic position above the Castaic Formation.

Marshfield Center Formation

Miocene
Massachusetts
New England province

Kaye, C.A., 1983, The autochthonous and allochthonous Coastal Plain deposits of Martha's Vineyard and the Marshfield-Scituate area, southeastern Massachusetts: Atlantic Coastal Plain Geological Association Field Trip Guidebook, 34 p.

Type locality: Abandoned sand pits on the east side of Marshfield Center, Duxbury 7.5-minute quadrangle, Plymouth County, Mass.

Glacially dislocated, allochthonous masses in the Marshfield Hills moraine and at Third Cliff, Scituate, Mass., are here named the Marshfield Center Formation. Consists of gray, compact, micaceous, slightly glauconitic, horizontally bedded silt and clay. Overlies older granite; is thrust into Pleistocene moraine. Thickness attains 14 m. Age is Miocene, probably no younger than middle Miocene, based on pollen and spores.

Mars Hill Till

Pleistocene (Wisconsinan)
Maine
New England province

Genes, A.N., Newman, W.A., and Brewer, T.B., 1981, Late Wisconsinan glaciation models of northern Maine and adjacent Canada: Quaternary Research, v. 16, no. 1, p. 48–65.

Type locality: Mars Hill, southern Aroostook County, Maine.

The Mars Hill Till, here named, blankets the surface of southern Aroostook County, Maine, as an irregular hummocky sheet consisting of outwash, kames, kettles, and smaller till hummocks and an extensive moraine complex, characterized by distinct ridges, that rises above the general level of the drift surface. Clasts in the drift include DeBoullie Granodiorite, Chapman Sandstone, Mapleton Sandstone, and Mars Hill Conglomerate. Was deposited by the Laurentide ice sheet or by a separate ice cap in Maine. Correlates with the Van Buren Till (new name), also deposited by the Laurentide ice sheet, and the Lennoxville till of southeastern Quebec. Is the youngest till in Aroostook County and lies at the surface. Thickness ranges from 0 to 30 m. Age is Pleistocene (late Wisconsinan). [The geographic name Mars Hill has been preempted by the Mars Hill Conglomerate of Gregory (1900), named for the same geographic feature. The use of a preempted name violates the Code of Stratigraphic Nomenclature (American Commission on Stratigraphic Nomenclature, 1970), in effect at the time this name was introduced, as well as the North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983).]

Mauls Point Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type section: Bluffs on the south shore of the Pamlico River, 1.2 km southwest of Mauls Point on the southeastern shore of Blounts Bay, Blounts Bay 7.5-minute quadrangle, Beaufort County, N.C.

The upper member of the Flanner Beach Formation in the Pamlico River valley in the Blounts Bay area of Beaufort County, N.C., is here named the Mauls Point Member. Consists of a blanket-shaped unit of interbedded sand and mud containing clay interlaminations, and may represent open lagoonal deposits. Intertongues with and overlies the Hills Point Member (new name) of the Flanner Beach. Thickness at the type section is 4 m. Age is middle Pleistocene.

Mauzy Formation

Early Permian
Kentucky
Illinois basin

Kehn, T.M., Beard, J.G., and Williamson, A.D. 1982, Mauzy Formation, a new stratigraphic unit of Permian age in western Kentucky: U.S. Geological Survey Bulletin 1529–H, p. H73–H86.

Type section: Composite of measured section 340 ft thick from core hole Gil-30 of the Kentucky Geological Survey, 7.5 mi northeast of Sturgis, and 50 ft of younger strata in a nearby ridge 1 mi west of Cap Mauzy Lake, Bordley quadrangle, Union County, Ky.

Strata of Early Permian age preserved in a fault block near Sturgis in western Kentucky, formerly assigned to the uppermost part of the Pennsylvanian Sturgis Formation, are here named the Mauzy Formation. Consists of interbedded gray to black and green to greenish-gray shale and siltstone and lesser amounts of limestone and sandstone. Three thin coal or carbonaceous shale beds are in the lower part of the cored section. Conformably overlies the Sturgis Formation and may intergrade with it; the upper limit is not defined because it has been removed by erosion. Thickness at the type section is 390 ft; total thickness may be as much as 1,300 ft. The boundary between the Pennsylvanian and Permian Systems cannot be defined precisely but is placed at the proposed contact between the Sturgis and the Mauzy. Fusulinids of Early Permian age are found in the Mauzy 140 ft above the boundary.

Mazama Member of the Mount Mazama Formation

Holocene
Nevada, California
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 22a of Morrison (1964), Stillwater Reservoir diversion canal, Humboldt County, Nev.
Subunits: Tsoyawata Bed, Mazama Bed.

The Mazama Member of the Mount Mazama Formation, here named, is in the Lake Lahontan area of Nevada and California. Comprises at least three tephra beds, two of which are named the Tsoyawata Bed (new name) and Mazama Bed, formed during the eruptions that led to the collapse of Mount Mazama at about 7 ka. Age is Holocene. [The unit here named the Mazama Bed is described in the literature as the informal Mazama ash, widely distributed throughout the western United States and Canada. The use of the same geographic name, Mazama, for a unit and one of its parts violates the North American Stratigraphic Code (North American Commission on Stratigraphic Nomenclature, 1983).]

McKay Formation of the **Dalles Group**

Miocene and Pliocene
Oregon
Eastern Columbia basin

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C., Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, v. 43, no. 10, p. 131–140.

Reference sections: McKay Reservoir section, E½ sec. 33, T. 2 N., R. 32 E.; Mission section, North-facing roadcut, NW¼NE¼NE¼ sec. 12, T. 2 N., R. 32 E., Umatilla County, Oreg.

Fanglomerates in the vicinity of the McKay reservoir in the Agency basin, informally named the McKay beds by Hogenson (1964), are here named the McKay Formation of the Dalles Group. Consists of fanglomerate or valley fill deposits of partially carbonate-cemented basalt gravel and interbedded tuffaceous sand and silt. Conformably overlies the Frenchman Springs Member of the Wanapum Basalt and the Grande Ronde Basalt; underlies Quaternary loess. Thickness ranges from 2 to 72 m. Age is late Miocene and early Pliocene based on vertebrate fossils.

McKenzie Canyon Limestone of the **Tendoy Group**

Late Mississippian (Meramecian)
Montana
Montana folded belt province

Sando, W.J., Sandberg, C.A., and Perry, W.J., Jr., 1985, Revision of Mississippian stratigraphy, northern Tendoy Mountains, southwest Montana, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–A, p. A1–A10.

Type section: North side of Bell Canyon, sec. 17, T. 11 S., R. 10 W., Tendoy Mountains, Kidd 7.5-minute quadrangle, Beaverhead County, Mont. Named for exposures in McKenzie Canyon.

The McKenzie Canyon Limestone, here named, is the uppermost formation of the Tendoy Group (new name) in the Tendoy Mountains, Mont. Consists of gray, thin- to medium-bedded, sparsely cherty micrite, dismicrite, and pelmicrite and minor amounts of crinoidal wackestone, encrinite, pelsparite, evaporite-solution breccia, and silty dolomitic limestone. Represents a facies belt deposited near the shoreline of a karst plain developed on the craton. Conformably overlies the Mission Canyon Limestone of the Tendoy Group; conformably underlies the Kibbey Sandstone of the Snowcrest Range Group (new name). Thickness is 140 m at the type section. Age is Late Mississippian (early Meramecian) based on corals and conodonts.

McKown Formation of the Austin Group

Late Cretaceous
Texas
Ouachita tectonic belt province

Garner, L.E., and Young, K.P., 1976, Environmental geology of the Austin area—An aid to urban planning: Texas Bureau of Economic Geology Report of Investigations 86, 39 p.

Type locality: Named for the old McKown quarry site exposed along Onion Creek, upstream from U.S. Highway 183, near Pilot Knob, Travis County, Tex.

The McKown Formation of the Austin Group, here named, occurs only in the vicinity of Pilot Knob, Tex. Consists of coarse-grained, shell-fragment limestone and is a beach rock facies equivalent of the Pflugerville (new name), Burditt, and possibly the upper 40 ft of the Dessau Formations of the Austin. Grades laterally into pyroclastic tuff that surrounds the central intrusion of Pilot Knob. Underlies the Sprinkle Formation of the Taylor Group. Thickness ranges from 0 to 45 ft. Age is Late Cretaceous.

McMichael Member of the **Buttermilk Falls Limestone**

Middle Devonian
Pennsylvania
Appalachian basin

Epstein, J.E., 1984, Onesquethawan stratigraphy (Lower and Middle Devonian) of northeastern Pennsylvania: U.S. Geological Survey Professional Paper 1337, 35 p.

Type section: Railroad cut of Erie-Lackawanna Railroad, nearly 1 mi south of East Stroudsburg Post Office, Stroudsburg 7.5-minute quadrangle, Monroe County, Pa. Named for McMichael Creek north of Godfrey Ridge.

The middle of three mappable members of the Buttermilk Falls Limestone on Godfrey Ridge, Monroe County, Pa., is here named the McMichael Member. Consists of evenly bedded to lenticular, calcareous, partly silty, medium-gray fossiliferous shale interbedded with fossiliferous biomicrite and biomicrudite. Forms a topographic swale between cherty limestones below and above. Gradationally overlies the Foxtown Member (new name) and gradationally underlies the Stroudsburg Member (new name), both of the Buttermilk Falls. Thickness is 41 ft. Age is Middle Devonian.

Medicine Lodge Creek Member of the Tensleep Formation

Middle Pennsylvanian (Desmoinesian)
Wyoming
Big Horn basin

Moore, D.A., 1984, The Tensleep Formation of the southeastern Big Horn basin, Wyoming, *in* Goolsby, Jim, and Morton, Doug, eds., The Permian and Pennsylvanian geology of Wyoming: Wyoming Geological Association 35th Annual Field Conference Guidebook, p. 273–279.

Type locality: Exposures in the canyon of Medicine Lodge Creek, center T. 50 N., R. 89 W., Big Horn County, Wyo.

The lower, marine unit of the Tensleep Formation in the Big Horn and Wind River basins, Wyoming, is here named the Medicine Lodge Creek Member. Consists of white to tan and pink, subangular to subrounded, fine-grained, quartzose sandstone, extensively cemented by calcite and dolomite, and numerous gray-green to white, fossiliferous limestone and dolomite beds intercalated with marine shale beds. Underlies the Hyatt Ranch Member (new name) of the Tensleep with angular unconformity. Correlates with the middle member of the Minnelusa Formation. Thickness ranges from 150 to 200 ft. Age is Middle Pennsylvanian (Desmoinesian) based on marine megafossils and fusulinids.

Merrick Formation

Pleistocene (Wisconsinan)
New York
Atlantic Coast basin

Rampino, M.R., and Sanders, J.E., 1981, Upper Quaternary stratigraphy of southern Long Island, New York: Northeastern Geology, v. 3, no. 2, p. 116–128.

Type section: Borehole 201, Wantagh Pollution Control Plant, 0.25 mi east of Wantagh State Parkway and 1.2 mi south of Merrick Road, Wantagh, Long Island, Nassau County, N.Y.

Glacial outwash deposits in the subsurface of south-central Long Island are here named the Merrick Formation. Consists of light-brown to brown, firm to very dense, fine to coarse sand and gravel. Unconformably overlies Upper Cretaceous sediments; unconformably underlies the Wantagh Formation (new name). Correlates with the Montauk Drift of northern Long Island. Thickness at the type section is 14.5 ft. Age is late Pleistocene (early Wisconsinan).

Merrill Member of the Lincoln Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Northwest corner of the gravel pit north of Duginski Road, about 500 m west of the intersection of Duginski Road and old Highway 51, north of the town of Merrill, SE¼SE¼NW¼ sec. 1, T. 31 N., R. 6 E., Merrill 15-minute quadrangle, Lincoln County, Wis.

The upper member of the Lincoln Formation (new name) in the Chippewa Sublobe in central Wisconsin is here named the Merrill Member, following the informal usage of LaBerge and Myers (1971). Consists of dark-reddish-brown cobbly, pebbly, sandy loam till that resembles the adjacent Bakerville Member (new name) of the Lincoln in color and texture. Sharply overlies the Wausau Member (new name) of the Marathon Formation (new name); is the surface till unit in Langlade, Lincoln, and eastern Marathon Counties. No exposures of the contact with the overlying Nashville Member (new name) of the Copper Falls Formation (new name) are known. Thickness is less than 10 m. Age is Pleistocene (early Wisconsinan or older) based on overlying organic material.

Merritt Dam Member of the Ash Hollow Formation of the Ogallala Group

Miocene
Nebraska
Chadron arch

Skinner, M.F., and Johnson, F.W., 1984, Tertiary stratigraphy and the Frick Collection of fossil vertebrates from north-central Nebraska: American Museum of Natural History Bulletin, v. 178, art. 3, p. 215–368.

Type section: Outcrop above the Burge quarry on the east side of Snake River canyon, NW¼NE¼NE¼SE¼ sec. 15, T. 32 N., R. 30 W., Cherry County, Nebr. Named for Merritt Reservoir Dam, 9 mi south-southwest of the type section.

The Merritt Dam Member of the Ash Hollow Formation of the Ogallala Group, here named, is in north-central Nebraska. Consists of thin-bedded sandstone containing calcareous or marly zones and layers of vitric tuff and ash beds. Contains vertebrate fossil beds. Overlies the Cap Rock Member of the Ash Hollow; underlies Quaternary Sand Hills terrain. Thickness at the type section is 65 ft. Ash beds in the member are dated at 10 and 9.5 Ma. Age is Miocene.

Mexican Dam Bed

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Exposure in a high terrace of the Carson River about 6.5 km east-southeast of Carson City at Mexican Dam, center NW¼SE¼ sec. 35, T. 15 N., R. 20 E., Dayton 15-minute quadrangle, Lyon County, Nev.

The Mexican Dam Bed, here named, occurs at two localities near Carson City, Nev., above the highest shoreline of Lake Lahontan. Consists of white, rhyolitic tephra containing elongated glass shards. Overlies the Dibekulewe Bed (new name). Age is Pleistocene.

Michoud Formation

Holocene
Louisiana
Gulf Coast basin

Miller, William, III, 1983, Stratigraphy of newly exposed Quaternary sediments, eastern Orleans Parish, Louisiana: Tulane Studies in Geology and Paleontology, v. 17, no. 3, p. 85–103.

Type section: East wall of Lake Carmel borrow pit, 0.5 km northeast of the junction of Bullard Avenue and Interstate Highway I–10, and northwest of the village of Michoud, on the outskirts of New Orleans, Orleans Parish, La.

Bay-sound deposits formed on a deltaic facies of the Deweyville terrace in Orleans Parish, La., are here named the Michoud Formation. Consists of fine-grained, slightly shelly, greenish-gray silt and clay containing sand lenses. Unconformably overlies buried Pleistocene soil; grades upward into a barrier bar sand unit. Thickness is 3.8 m at the type section. Peat at the base of the unit has a radiocarbon age of 7.3 ka. Age is Holocene.

Middle Granville Slate

Early Cambrian
New York
New England province

Fisher, D.W., 1984, Bedrock geology of the Glens Falls—Whitehall region, New York: New York State Museum Map and Chart Series no. 35, 60 p.

Type section: Quarries and adjacent outcrops 300 to 1,500 m north-northwest of the bridge over the Mettawee River at Middle Granville, Granville 7.5-minute quadrangle, Washington County, N.Y. Four reference sections are designated.

Extensively quarried green, purple, maroon, and gray slates in Washington County, N.Y., previously mapped as the Mettawee Slate and as part of the West Castleton Formation, are here named the Middle Granville Slate. Contains local interbeds of micrite, in places reduced to layers of nodules; weathers to a distinctive tan color. Overlies the Browns Pond Formation (new name); the contact is placed where gray slate changes upward to green slate; underlies the Hatch Hill Formation; the contact is placed where slates change upward to sooty, fissile black slates. Thickness at the type section is 95 m. Age is Early Cambrian based on fossils.

Middle Inlet Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut on north side of Caylor Road, 1.5 km north of Highway JJ, NE¼NW¼SE¼ sec. 8, T. 33 N., R. 23 E., Stephenson 15-minute quadrangle, Marinette County, Wis. Named for the Township of Middle Inlet.

The upper member of the Kewaunee Formation (new name) on the west side of the Green Bay Lobe in Wisconsin is here named the Middle Inlet Member, following the informal usage of McCartney (1979). Consists of reddish-brown sand-silt-clay till. Unconformably overlies the Kirby Lake Member (new name) of the Kewaunee; lies at the surface in much of Marinette County. Contact with the equivalent Glenmore Member (new name) of the Kewaunee on the east side of the Green Bay Lobe is arbitrarily placed at the vertical contact at the Fox River. Thickness is 4.5 m at the type section. Age is Pleistocene (late Wisconsinan).

Milky River Formation

Pliocene
Alaska
Bristol Bay basin

Detterman, R.L., Miller, T.P., Yount, M.E., and Wilson, F.H., 1981, Geologic map of the Chignik and Sutwik Island quadrangles, Alaska: U.S. Geological Survey Miscellaneous Investigations Map I–1229, scale 1:250,000.

Type locality: Northeast spur of an unnamed mountain, 12 km east of Bear Lake, secs. 14, 15, and 22, T. 48 S., R. 69 W., Chignik quadrangle, Alaska. Named for Milky River which lies west of the mountain.

Volcanogenic nonmarine sedimentary rock interlayered with flows and sills, the informal Milky River Formation of Galloway (1974), are here defined and formally named the Milky River Formation. Lower part consists of 1,000 m of dark-brown to gray, poorly indurated, coarse, crossbedded and channeled, volcanic sandstone and cobble-boulder conglomerate. Upper part contains porphyritic andesite flows, lahars, and tuff beds interlayered with sedimentary rock; volcanic layers are thicker and more numerous upward. Unconformably overlies Bear Lake Formation; unconformably underlies volcanic flows and surficial deposits of Pleistocene and Holocene age. Thickness at the type locality is 1,525 m. One flow unit near top has a radiometric age of 3 Ma; age is Pliocene.

Miller Creek Formation

Pleistocene (Wisconsinan) and Holocene
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Exposures in bluff, 1.5 km west of the mouth of Hanson Creek, SE¼SW¼SW¼ sec. 27, T. 49 N., R. 12 W., Poplar NE 7.5-minute quadrangle, Douglas County, Wis. Named for Miller Creek, a tributary of the Amnicon River.
Subunits: Hanson Creek Member, Douglas Member.

The Miller Creek Formation, here named, is in the Superior Lobe in Wisconsin. Includes the older Hanson Creek Member (new name) along the Lake Superior shoreline and the Douglas Member (new name) west of the Bayfield Peninsula. Consists of till, reddish clay sediments that have been called Red Clay, and offshore silt and clay beds. Sharply overlies the Copper Falls Formation (new name); lies at the surface in the Superior lowland. Thickness ranges from 10 to 90 m. Age is late Pleistocene (latest Wisconsinan) and Holocene.

Mill Knob Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Natural Bridge Stone Company quarry, 4 km southeast of Mill Knob and 3 km south of Bowen, Stanton 7.5-minute quadrangle, Powell County, Ky.

Strata previously assigned to the Newman Limestone and other units that are now restricted from the Cumberland Escarpment outcrop belt in east-central and northeastern Kentucky are here named the Mill Knob Member of the Slade Formation (new name). Consists of calcarenite and calcilutite and lesser amounts of dolostone and shale. Intertongues with or conformably overlies the Warix Run Member (new name) of the Slade, or disconformably overlies the Ste. Genevieve and St. Louis Members; disconformably underlies the Cave Branch Bed of the Slade. Thickness ranges from 0 to 13 m. Age is Late Mississippian.

Miluveach Formation of the Ugnuravik Group

Early Cretaceous (Valanginian to Barremian)
Alaska
Arctic Coastal Plains province

Carman, G.J., and Hardwick, Peter, 1983, Geology and regional setting of Kuparuk oil field, Alaska: American Association of Petroleum Geologists Bulletin, v. 67, no. 6, p. 1014–1031.

Type section: Ugnu State 1 well, depth interval 6,262–6,793 ft b.r.t., also the type section of the Ugnuravik Group, Kuparuk field, Colville-Prudhoe basin, T. 12 N., R. 9 E., Umiat Base Line, Alaska. Named for the Miluveach River located west of the Kuparuk field.

The Miluveach Formation of the Ugnuravik Group (new name), here named, is in the Colville-Prudhoe basin, Alaska. Consists of grayish-brown to black, brittle, micaceous, silty mudstone containing finely disseminated pyrite, pyritized foraminifera, and rounded quartz grains. Unconformably overlies the Kingak Shale; gradationally underlies the Kuparuk Formation (new name) of the Ugnuravik Group. Correlates with the lower part of the Kongakut Formation to the southeast, and possibly with the Pebble Shale to the west. Thickness ranges from 300 to 500 feet. Age is Early Cretaceous (Valanginian to Barremian) based on dinoflagellates.

Mina Peak Member of the Sunrise Formation of the Volcano Peak Group

Early Jurassic (Pliensbachian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures on Mina Peak, Gabbs Valley Range, Mineral County, Nev.

The upper carbonaceous part of the uppermost unit of Muller and Ferguson (1939) of the Sunrise Formation is here named the Mina Peak Member of the now revised Sunrise Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Consists of medium- to thick-bedded bioclastic limestone. Conformably overlies the argillaceous Joker Peak Member (new name) of the Sunrise, and the contact is drawn at the lowest limestone beds; gradationally underlies the Dunlap Formation. Thickness is 75 m. Age is Early Jurassic (Pliensbachian) based on fossils.

Mirounga Formation

Late Cretaceous (Turonian(?) to Maastrichtian)
California
Santa Maria basin

Bartling, W.A., and Abbott, P.L., 1983, Upper Cretaceous sedimentation and tectonics with reference to the Eocene, San Miguel Island, and San Diego area, California, *in* Larue, D.K., and Steel, R.J., eds., Cenozoic marine sedimentation Pacific margin, U.S.A.: Society of Economic Paleontologists and Mineralogists, Pacific Section, May 18, 1983, p. 133–150.

Type section: Beach cliffs from Point Bennett northeastward to the west side of Otter Harbor, and from the mouth to the head of west Green Mountain Canyon, west end of San Miguel Island, Calif. Named for *Mirounga augustirostris*, the northern elephant seal, which breeds at the base of the outcrop.

Submarine fan deposits of the middle fan-fringe facies on San Miguel Island, formerly assigned to the Jalama Formation of the California mainland, are here named the Mirounga Formation. Consists of interbedded sandstone, mudstone, and channel conglomerate dominated by durable, brittle, black rhyodacite, which gives the rock a salt-and-pepper appearance, whereas the Jalama Formation is dominated by quartzite. Underlies Eocene submarine fan deposits. Thickness is 7,800 ft at the type section. Age is Late Cretaceous (Turonian(?) to Maastrichtian) based on potassium-argon ages of the rhyodacite.

Mobley Mountain Granite

Late Proterozoic
Virginia
Piedmont-Blue Ridge province

Herz, Norman, and Force, E.R., 1984, Rock suites in Grenvillian terrane of the Roseland district, Virginia. Part 1. Lithologic relations: Geological Society of America Special Paper 194, p. 187–200.

Type locality: Mobley Mountain, Piney River 7.5-minute quadrangle, Amherst County, Va.

The Mobley Mountain Granite, here named, underlies Mobley Mountain in the southwestern corner of the Roseland district, Amherst County, Va. Consists of fine- to medium-grained, massive granite that has a salt-and-pepper appearance resulting from biotite patches disseminated through granular quartz and feldspar. The granite body is plug shaped under Mobley Mountain, and irregular smaller bodies, veins, and migmatites extend for 2 km in each direction away from the mountain. Intrudes the Turkey Mountain pluton of the Roses Mill Plutonic Suite (new name). Is part of a belt of granites emplaced about 650 Ma. Age is Late Proterozoic.

Mokelumne River Formation

Late Cretaceous
California
Sacramento basin

Campion, J.T., Jr., 1980, Conway Ranch gas field: California Division of Oil and Gas, Publication TR24, 13 p.

Type section: Brazos Oil and Gas Company (now Union Oil Company of California) well, S.R. Unit 1, depth interval 4,364–5,906 ft, sec. 17, T. 4 N., R. 4 E., San Joaquin County, Calif.

Rocks in the subsurface of the southern Sacramento Valley, Calif., formerly called the Meganos-Martinez Formation and currently known as the informal Mokelumne formation, (not to be confused with the formally named Mokelumne Formation of Taliaferro (1951), of Permian age, located in El Dorado County, Calif.) are here named the Mokelumne River Formation. Consists of white to gray-green, fine- to medium-grained, friable, quartzose sandstone and gray to brown carbonaceous shale interbedded with thin layers of lignite. Overlies the H & T shale; unconformably underlies the Eocene Capay Formation. Gas is produced from three sandstone zones in the Mokelumne River Formation; the middle zone is informally named the IOC sand. Thickness is 1,542 ft. Age is Late Cretaceous.

Mono Basin Formation

Pleistocene and Holocene
California, Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type area: Mono Basin, California.

Subunits: Carson Sink Bed, Salt Wells Member and its Walker Lake Bed and Turupah Flat Bed.

The Mono Basin Formation, here named, is in the Mono Lake and Lake Lahontan areas, California and Nevada. Contains the Carson Sink Bed (new name) and the Salt Wells Member and its Walker Lake Bed and Turupah Flat Bed (all new names). Consists of tephra, the source of which is believed to be Mono Basin in eastern California because of its similarity in petrography and age to known tephra from Mono Basin and its geographic distribution, which is limited to the area south of Carson Sink. Age is Pleistocene and Holocene, 35 to 0.6 ka.

Monumental Mills Formation of the Lynchburg Group

Late Proterozoic
Virginia
Piedmont-Blue Ridge province

Wehr, Frederick, 1985, Stratigraphy of the Lynchburg Group and Swift Run Formation, Late Proterozoic (730–570 Ma), central Virginia: Southeastern Geology, v. 25, no. 4, p. 225–239.

Type locality: Exposures near Monumental Mills, Castleton 7.5-minute quadrangle, Rappahannock County, Va.

The Monumental Mills Formation of the Lynchburg Group, here named, is in the Culpeper area, Virginia. Includes two informal members: a lower sandstone member consisting of gray, fine- to medium-grained, well-sorted sandstone and siltstone that makes up the bulk of the formation and an upper siltstone member consisting of dark-gray to greenish, thinly laminated siltstone and mudstone. The outcrop belt of the Monumental Mills is 0 to 1,500 m wide and thins to the south. Contacts are not exposed, but it appears to gradationally overlie the Bunker Hill Formation of the Lynchburg; sharply underlies the Thorofare Mountain Formation (new name) of the Lynchburg. Age is Late Proterozoic based on an age ranging from 730 to 570 Ma for the Lynchburg Group.

Moonridge Quartzite of the Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type section: 1.5 km northeast of Sugarloaf Mountain at Peak 9,433 ft, NW¼ sec. 5, T. 1 N., R. 2 E., Moonridge 7.5-minute quadrangle, San Bernardino County, Calif.

Rocks in the southwest part of the Sugarloaf Mountain area of the San Bernardino Mountains in California, informally called the Sugarloaf Quartzite by Cameron (1981), are here named the Moonridge Quartzite of the Big Bear Group (new name). Is divided into a lower quartzite member, M1, consisting of white, massive, vitreous orthoquartzite that conformably overlies the Lightning Gulch Formation (new name) of the Big Bear Group; a lower laminated quartz phyllite member, M2; a middle quartzite member, M3, consisting of light-gray to tan, well-bedded quartzite; an upper phyllite member, M4, consisting of quartz phyllite, micaceous quartzite, and marble; and an upper quartzite member, M5, consisting of blue-gray to white, cliff-forming quartzite that conformably underlies the Green Spot Formation (new name) of the Big Bear Group. Contacts between the members are conformable. Thickness at the type section is more than 125 m. Age is late Precambrian.

Moonshine Creek Latite

Oligocene
Nevada
Great Basin province

Hose, R.K., 1983, Geologic map of the Cockalorum Wash quadrangle, Eureka and Nye Counties, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I–1410, scale 1:31,680.

Type section: Exposures on the east side of upper Moonshine Creek, sec. 16 (projected), T. 13½ N., R. 51 E., southwest corner of Cockalorum Wash 15-minute quadrangle, Nye County, Nev.

The Moonshine Creek Latite, here named, is in the Antelope Range, Nev. Consists of pale-brown to pale-red, vuggy, andesitic lava containing phenocrysts and yellow zeolite-lined vesicles in a dense partially devitrified groundmass. Unconformably overlies the Mulligan Canyon Rhyolite (new name); conformably underlies Oligocene dacite porphyry. Thickness is 200 m. Age is Oligocene based on stratigraphic position.

Moreno Hill Formation

Late Cretaceous (Turonian)
New Mexico
San Juan basin

McLellan, Marguerite, Haschke, Laura, Robinson, Laura, Carter, M.D., and Medlin, Antoinette, 1983, Middle Turonian and younger Cretaceous rocks, northern Salt Lake coal field, Cibola and Catron Counties, New Mexico, *in* Hook, S.C., compiler, Contributions to mid-Cretaceous paleontology and stratigraphy of New Mexico—Part II: New Mexico Bureau of Mines and Mineral Resources Circular 185, p. 41–47.

Type section: Exposures on southwest side of Santa Rita Mesa, beginning in N½ sec. 7, T. 4 N., R. 18 W., Moreno Hill quadrangle, Cibola County, N. Mex. Named for Moreno Hill.

The Moreno Hill Formation, here named in west-central New Mexico, includes unnamed lower, middle, and upper members. Consists of nonmarine olive-gray shale; olive gray, brown, or brown-gray carbonaceous shale; orange to brown, very fine grained to very coarse-grained, poorly sorted, subangular, and steeply crossbedded sandstones; olive-gray to yellow-brown siltstones; and thin coal beds. Sandstones are fluvial channel and splay deposits, shales are back-bay swamp or lagoon deposits. Overlies the Atarque Sandstone; unconformably underlies the Miocene Fence Lake Formation (new name). Is laterally equivalent in part to the Tres Hermanos Formation, Pescado Tongue of the Mancos Shale, and Gallup Sandstone. Upper part may be laterally equivalent to the lowest part of the Crevasse Canyon Formation. Thickness at the type section, which includes only the lower and middle members, is 519 ft. Age is Late Cretaceous (middle and late Turonian) based on the middle Turonian age of the underlying Atarque Sandstone.

Morgan School Shale of the Marmaton Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Center of the east line, NW¼ sec. 18, T. 72 N., R. 22 W., Lucas County, Iowa. Named for the former site of Morgan School, approximately 1 mi to the southeast.
Subunit: Summit Coal Member.

The Morgan School Shale, here named, is in the Marmaton Group of the Des Moines Supergroup in southeastern and central Iowa. Includes the poorly developed Summit Coal Member (new name), described as the Summit coal in Missouri by McGee (1885), at the top. Consists of nonmarine and marginal marine clastic olive to brownish-green, calcareous shale and siltstone; a weathered carbonaceous streak marks the position of the Summit Coal Member. The Morgan School and the underlying Mouse Creek Formation (new name) encompass the lower of two depositional cycles in the Marmaton; the overlying Stephens Forest Formation (new name) and Labette Formation encompass the upper depositional cycle of the Marmaton. Thickness is 5.6 ft at the type section and ranges from less than 1.0 ft to 19 ft. Age is Middle Pennsylvanian (Desmoinesian).

Moselem Member of the **Virginville Formation**

Late Cambrian and Early Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures along Maiden Creek north of Moselem and in the southern half of the Hamburg quadrangle, Berks County, Pa.

The Moselem Member of the Virginville Formation (new name), here named, is in the Richmond slice of the Hamburg klippe in Pennsylvania. Consists of cleaved black and green mudstone and shale that has variable amounts of carbonate rock. Tectonically underlies the Sacony Member (new name) and Onyx Cave Member (new name) of the Virginville. Thickness is 230 m. Age is Late Cambrian and late Early Ordovician based on conodonts.

Mount Hyatt Member of the Gabbs Formation of the Volcano Peak Group

Late Triassic (Norian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures east of Mount Hyatt, New York Canyon, Gabbs Valley Range, Mineral County, Nev.

The middle member of Muller and Ferguson (1939) of the Gabbs Formation, here named the Mount Hyatt Member of the now revised Gabbs Formation of the Volcano Peak Group (new name), is in the Gabbs Valley Range, west-central Nevada. Consists of grayish-brown to medium- and dark-gray, brownish-gray- to orange-brown-weathering, medium- to thick-bedded, bioclastic, silty to sandy limestone containing interbeds of calcareous siltstone. Conformably overlies the Nun Mine Member (new name) of the Gabbs; sharply and conformably underlies the Muller Canyon Member (new name) of the Gabbs, and the contact is drawn above the highest limestone bed of the Mount Hyatt. Thickness is 30 m. Age is Late Triassic (Norian) based on fossils.

Mount Kelly Graywacke Tongue of the Fortress Mountain Formation

Early Cretaceous (Aptian and Albian)
Alaska
Arctic Foothills province

Mull, C.G., 1985, Cretaceous tectonics, depositional cycles, and the Nanushuk Group, Brooks Range and Arctic Slope, Alaska, *in* Huffman, A.C., Jr., ed., Geology of the Nanushuk Group and related rocks, North Slope, Alaska: U.S. Geological Survey Bulletin 1614, p. 7–36.

Type locality: Mount Kelly, western foothills of the De Long Mountains, sec. 21, T. 11 S., R. 50 W., Umiat meridian, Arctic slope, Alaska.

Rocks in the western foothills of the De Long Mountains, in a stratigraphic position similar to the Fortress Mountain Formation, were assigned to that unit by Chapman and Sable (1960). Because the distinctive calcareous, micaceous graywacke lithology is quite different from that of the type Fortress Mountain, this rock unit is here named the Mount Kelly Graywacke Tongue of the Fortress Mountain Formation. The Fortress Mountain is restricted to the sections of massive conglomerate, shale, and noncalcareous, nonmicaceous graywacke north of the Endicott and eastern De Long Mountains. Consists of fine- to coarse-grained sandstone containing quartz, chert, muscovite, and limestone and other lithic rock fragments in an extremely argillaceous matrix, gray silty shale, and mudstone. Bedding features suggest turbidite deposition. Base of the tongue is not exposed but may be an unconformity; top appears to be gradational and to interfinger with the overlying Torok Formation. Structural deformation by folding and thrust faulting makes thickness determination impossible but may be as much as several hundred meters. Age is late Early Cretaceous (Aptian and Albian) based on flora.

Mount Mineral Formation

Late Proterozoic
Massachusetts
New England province

Robinson, Peter, and Luttrell, G.W. 1985, Revision of some stratigraphic names in central Massachusetts: U.S. Geological Survey Bulletin 1605–A, p. A71–A78.

Type locality: Mount Mineral, 5 km north of the village of Shutesbury, Shutesbury 7.5-minute quadrangle, Franklin County, Mass.

The informal Mount Mineral Formation of Robinson and others (1973), here named, is exposed in the eastern part of the Shutesbury quadrangle, Franklin County, Mass. Consists of aluminous schist, locally rich in garnet and kyanite, amphibolite, and quartzite. Lenses of partially serpentinized harzburgite contain veins of anthophyllite, including the Pelham asbestos quarry. Probably correlates with and may be a southern facies of the Poplar Mountain Gneiss of Late Proterozoic age.

Mount Pablo Formation

Early Cretaceous (Aptian and Albian)
Montana
Sweetgrass arch

Mudge, M.R., and Rice, D.D., 1982, Lower Cretaceous Mount Pablo Formation, northwestern Montana: U.S. Geological Survey Bulletin 1502–D, 19 p.

Type section: Exposure on north side of Badger Creek in the Blackfeet Indian Reservation, NE¼SW¼ sec. 3, T. 29 N., R. 11 W., Half Dome Crag quadrangle, Pondera County, Mont. Named for Mount Pablo in the Sawtooth Range, 14 km south of East Glacier Park, Glacier County, Mont.
Subunit: **Cut Bank Sandstone Member.**

Strata of the Mount Pablo Formation, here named, were formerly assigned to the lower part of the Kootenai Formation, now geographically and stratigraphically restricted; the unnamed formation of Mudge, Earhart, and Rice (1977), Mudge, Earhart, and Claypool (1977), Mudge and Earhart (1979), and Mudge (1979); and the western facies of the Morrison Formation by Mudge (1972). Includes at its base the Cut Bank Sandstone Member, here geographically extended to the Sawtooth Range from the Cut Bank area where it is a member of the Kootenai Formation. Consists of gray, poorly sorted, crossbedded, coarse- to very fine grained sandstone and conglomerate in the lower part, variegated gray and greenish-gray mudstone interbedded with some sandstone in the middle part, and distinctive light-gray limestone interbedded with and overlain by gray-brown mudstone in the upper part. Unconformably overlies the Morrison Formation in most places; at the type section the Cut Bank Sandstone Member unconformably overlies the Swift Formation; unconformably underlies the Kootenai Formation. Correlates with the lower part of the Kootenai in the Cut Bank area. Thickness at the type section is 61 m and ranges from 34 m to 90 m. The Mount Pablo is the lowest Cretaceous unit in the Sawtooth Range. Age is Early Cretaceous (possibly late Aptian and early Albian) based on palynomorphs.

Mount Watson Formation of the Uinta Mountain Group

Precambrian
Utah
Uinta uplift

Sanderson, I.D., 1984, The Mount Watson Formation, an interpreted braided-fluvial deposit in the Uinta Mountain Group (upper Precambrian), Utah: The Mountain Geologist, v. 21, no. 4, p. 157–164.

Type section: Exposures on Mount Watson, secs. 25 and 36, T. 1 S., R. 8 E., and secs. 30 and 31, T. 1 S., R. 9 E., Summit County, Utah. Section begins east of Mount Watson at the south end of Wall Lake, continues northwest to the east shore of Clyde Lake, and then southwest from the north end of Clyde Lake up the northeast ridge to the summit of Mount Watson.

The Mount Watson Formation of the Uinta Mountain Group, informally named by Wallace (1972) and here named, is in the western Uinta Mountains of north-central Utah. Consists of a sequence of very light gray or almost white quartz arenite and subarkose interbedded with minor amounts of pale-red or grayish-red arkosic arenite and grayish-green shale. Was deposited in a braided-stream environment. Overlies the informal Moosehorn Lake formation of Wallace (1972) and underlies the informal Hades Pass formation of Wallace (1972), both of the Uinta Mountain Group. Thickness at the type section is 607 m and ranges from 550 m in the southeast to 700 m in the northwest. Age is late Precambrian.

Mouse Creek Formation of the Marmaton Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures in a gully along Whitebreast Creek, NW¼NE¼NE¼ sec. 8, T. 73 N., R. 22 W., Lucas County, Iowa. Named for Mouse Creek, 5 mi to the west-northwest.
Subunits: Excello Shale Member, Blackjack Creek Limestone Member.

The Mouse Creek Formation, here named, is the lowermost formation in the Marmaton Group of the Des Moines Supergroup in southeastern and south-central Iowa. Includes the lower Excello Shale Member and the upper Blackjack Creek Limestone Member. The Excello consists of dark-gray shale containing abundant light-brown phosphate nodules and grades upward into greenish-brown mudstone. The Blackjack Creek consists of a single massive bed of argillaceous, fossiliferous limestone. Overlies the Swede Hollow Formation (new name) of the Cherokee Group of the Des Moines Supergroup; underlies the Morgan School Shale (new name) with which it encompasses the lower of two depositional cycles in the Marmaton. Thickness at the type section is 4.9 ft; the upper contact is not exposed. Age is Middle Pennsylvanian (Desmoinesian).

Mud Creek Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: Exposures near and along Mud Creek, New Georgia 7.5-minute quadrangle, Paulding County, Ga.
Subunits: Cedar Lake Quartzite Member, Villa Rica Gneiss Member.

The Mud Creek Formation of the New Georgia Group (new name), here named, is in the Villa Rica antiform on the northwest limb of the Austell-Frolona antiform in west-central Georgia. Includes the Cedar Lake Quartzite Member (new name) and the Villa Rica Gneiss Member (new name). Consists of amphibolite, hornblende gneiss, biotite gneiss, mica schist, and quartzite. Stratigraphically underlies and grades into the Andy Mountain Formation (new name) and Bill Arp Formation (new name) of the informal Roosterville group. Age is Proterozoic(?).

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Age is Late Proterozoic and (or) early Paleozoic.

Mulberry Rock Gneiss

Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures at Mulberry Rock, New Georgia 7.5-minute quadrangle, western Paulding County, Ga.

The Mulberry Rock Gneiss, here named, is a pre- to synmetamorphic intrusive body at the Allatoona fault, the boundary between the

Piedmont and Blue Ridge in the Greater Atlanta region, Georgia. Consists of equigranular muscovite-quartz-microcline-plagioclase orthogneiss. Age is Paleozoic.

Muley Canyon Sandstone Member of the Mancos Shale

Late Cretaceous (Campanian)
Utah
Paradox basin

Smith, Curtis, 1983, Geology, depositional environments, and coal resources of the Mt. Pennell 2 NW quadrangle, Garfield County, Utah: Brigham Young University Geology Studies, v. 30, pt. 1, p. 145–167.

Type section: Exposures at the head of Muley Canyon, SE¼SW¼ sec. 16, T. 33 S., R. 7 E., Mt. Pennell 2 NW quadrangle, Garfield County, Utah.

Strata formerly mapped as the Bluegate Sandstone by Gilbert (1877) and the Emery Sandstone Member of the Mancos Shale by Hunt (1946) are here named the Muley Canyon Sandstone Member in the upper part of the Mancos Shale in the Paradox basin, Utah. Consists of a lower massive sandstone, 27.5 to 66.7 m thick; a middle slope-forming unit that contains coal, carbonaceous mudstone, and sandstone, 30 m thick; and an upper sandstone, 30 m thick. Unconformably overlies the Blue Gate Shale Member of the Mancos; unconformably underlies the Masuk Shale Member of the Mancos. Correlates with the Star Point Sandstone on the Wasatch plateau and with the Drip Tank Member of the Straight Cliffs Formation on the Kaiparowits plateau. Thickness ranges from 57 to 109 m. Age is Late Cretaceous (early Campanian).

Muller Canyon Member of the Gabbs Formation of the Volcano Peak Group

Late Triassic (Norian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures on the east flank of Ferguson Hill along the west side of Muller Canyon, Gabbs Valley Range, Mineral County, Nev. This section is proposed as the stratotype for the Triassic-Jurassic System boundary.

The Muller Canyon Member, here named, is in the now revised Gabbs Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range, west-central Nevada. The Muller Canyon includes most of the upper member of Muller and Ferguson (1939) of the Gabbs and the 10 m of unfossiliferous shales designated by them as the boundary between the Gabbs and Sunrise Formations. Consists of pinkish sandy siltstone that has small-scale cross-laminations and numerous thin gypsum beds. Sharply and conformably overlies the Mount Hyatt Member (new name) of the Gabbs; conformably underlies the Ferguson Hill Member (new name) of the Sunrise Formation of the Volcano Peak Group. Thickness attains 15 m. Age is Late Triassic (Norian) based on fossils.

Mulligan Canyon Rhyolite

Oligocene
Nevada
Great Basin province

Hose, R.K., 1983, Geologic map of the Cockalorum Wash quadrangle, Eureka and Nye Counties, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I–1410, scale 1:31,680.

Type area: Exposures on Bills Peak, southwest of Indian Spring Ranch, sec. 10, T. 14 N., R. 51 E., Cockalorum Wash 15-minute quadrangle, Nye County, Nev. Named for Mulligan Canyon, secs. 33, 34, and 35, T. 15 N., R. 51 E., in the Antelope Range.

The Mulligan Canyon Rhyolite, here named, is in the Antelope Range, Nev. Consists mainly of massive flows of light-gray porphyritic rhyolite but is laharlike from the Indian Spring Ranch north to Mulligan Canyon. Unconformably overlies the Sheep Spring Rhyolite (new name); unconformably underlies the Moonshine Creek Latite (new name). Thickness attains 400 m. Age is Oligocene based on stratigraphic position.

Murfreesboro Member of the DeQueen Formation of the Trinity Group

Early Cretaceous
Arkansas
Ouachita tectonic belt province

Darling, B.K., and Lock, B.E., 1984, The surface formations of the Trinity Group in southwestern Arkansas and a proposed revision of stratigraphic rank for the three lower units: Gulf Coast Association of Geological Societies Transactions, 34th Annual Meeting, p. 321–327.

Type locality: None designated. Probably named for Murfreesboro, Pike County, Ark.

The Murfreesboro Member, here named, is in the easternmost part of the DeQueen Formation of the Trinity Group in Pike and Howard Counties, Ark. Consists of alternating gray to buff, dense, fossiliferous limestone, claystone, and minor amounts of sand, silt, gypsum, and celestite deposited during a time of marine circulation and periods of hypersalinity, subaerial exposure, and freshwater flooding. Overlies the Highland Gypsum Member (new name) of the DeQueen Formation; underlies the Antlers Sand of the Trinity Group. Correlates with the lowermost part of the Mooringsport Member of the Rusk Formation in the subsurface. Age is Early Cretaceous.

Musty Buck Member of the Chico Formation

Late Cretaceous (Coniacian and Santonian)
California
Sacramento basin

Haggart, J.W., and Ward, P.D., 1984, Late Cretaceous (Santonian-Campanian) stratigraphy of the northern Sacramento Valley, California: Geological Society of America Bulletin, v. 95, no. 5, p. 618–627.

Type section: Exposures on Big Chico Creek, from the center sec. 1 to west margin sec. 13, T. 23 N., R. 2 E., Butte County, Calif. Derivation of name not stated.

The Musty Buck Member, informally named by Saul (1961) and here named, is in the Chico Formation along Big Chico, Butte, Deer, and Mill Creeks, Butte and Tehama Counties, northeastern Sacramento Valley, Calif. Consists of greenish-gray to tan, arkosic, cross-stratified, bioturbated sandstone containing extensive pebble beds and local shell-lag deposits. Unconformably overlies pre-Cretaceous metamorphic rocks or conformably overlies the Ponderosa Way Member (new name) of the Chico; conformably underlies the Ten Mile Member (new name) of the Chico. Upper part of the Musty Buck is correlative with the Guinda Formation of the western Sacramento Valley. Thickness ranges from 110 to 215 m. Age is Late Cretaceous (Coniacian and Santonian) based on ammonites.

Nacoochee Formation of the **Helen Group**

Late Proterozoic and Paleozoic
Georgia, North Carolina
Piedmont-Blue Ridge province

Nelson, A.E., and Gillon, K.A., 1985, Stratigraphic nomenclature in the Richard Russell and Helen thrust sheets, Georgia and North Carolina: U.S. Geological Survey Bulletin 1605–A, p. A59–A62.

Type locality: Exposures along Chattahoochee River from the Nacoochee bridge on Georgia Highway 17 for 0.3 mi, Helen 7.5-minute quadrangle, White County, Ga. (Gillon, 1982).

The Nacoochee Formation of the Helen Group (new name), informally named by Gillon (1982) and here named, is in the Helen thrust sheet in Georgia and North Carolina. Consists of an interlayered sequence of amphibolite and graphitic-aluminous schist and minor amounts of micaceous metasandstone, feldspathic metasiltstone, epidote quartzite, and biotite schist. Is gradational and conformable with the Horton Formation (new name) of the Helen Group to the west and is truncated on the southeast by the Dahlonega fault. Age is tentatively set at Late Proterozoic and early Paleozoic.

Nahahum Canyon Member of the **Chumstick Formation**

Eocene
Washington
Northern Cascade Range-Okanogan province

Gresens, R.L., Naeser, C.W., and Whetten, J.W., 1981, Stratigraphy and age of the Chumstick and Wenatchee Formations: Tertiary fluvial and lacustrine rocks, Chiwaukum graben, Washington: Geological Society of America Bulletin, v. 92, no. 5, pt. I, p. 233–236; pt. II, p. 841–876.

Type section: East flank of the Eagle Creek anticline about 0.5 km east of the Van Creek road extending for 1.3 km along the Eagle Creek road, secs. 13 and 24, T. 25 N., R. 18 E., and sec. 19, T. 25 N., R. 19 E., north of Leavenworth, Chelan County, Wash. Named for Nahahum Canyon northeast of Cashmere.

The shaly sandstone and shale of Whetten and Laravie (1976) are here named the Nahahum Canyon Member in the upper part of the Chumstick Formation (new name) on the northeast side and northwest end of the Chiwaukum graben in the central Cascade Range of Washington. Consists of fine-grained shaly sandstone and shale containing thin laminae of biotite and organic matter, suggestive of quiet-water deposition in a shallow lake environment. Conformably overlies the lower part of the Chumstick; grades laterally into sandstone and conglomerate of the Chumstick near the Entiat fault and near the core of the Eagle Creek anticline; unconformably underlies the Wenatchee Formation (new name). Thickness is about 2,000 m. Age is middle(?) Eocene based on a zircon age of about 45 Ma for tuff in the lower part of the Chumstick and an age of 34 Ma for volcanic rocks in the Wenatchee.

Nash Stream Till

Pleistocene (Wisconsinan)
New Hampshire
New England province

Koteff, Carl, and Pessl, Fred, Jr., 1985, Till stratigraphy in New Hampshire: Correlations with adjacent New England and Quebec, *in* Borns, H.W., Jr., and others, eds., Late Pleistocene history of northeastern New England and adjacent Quebec: Geological Society of America Special Paper 197, p. 1–12.

Type locality: Composite of outcrops along Nash Stream, Coos County, N.H.

The lower till at Nash Stream, northern New Hampshire, is here named the Nash Stream Till. Consists of dark-olive-gray compact, silty till containing clasts of Ordovician and Devonian quartz monzonite, schist, and phyllite in a silt and clay matrix. Oxidation, which extends to a depth of 10 m, suggests a long interval before deposition of the unconformably overlying Stratford Mountain Till (new name) or glaciolacustrine outwash. Correlates with the [informal] New Sharon till in Maine and the Johnville Till in Quebec. Maximum thickness is 21 m. Age is late Pleistocene (early Wisconsinan) based on the depth of weathering.

Nashville Member of the Copper Falls Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Exposures in gravel pit in drumlin, SE¼SW¼SE¼ sec. 7, T. 35 N., R. 12 E., Nashville 7.5-minute quadrangle, southwestern Forest County, Wis. Named for the Township of Nashville.

Following the informal usage of Simpkins (1979), the Nashville Member of the Copper Falls Formation (new name), here named, is in the Chippewa Sublobe in Forest, Langlade, and Oneida Counties, Wis. Consists of reddish-brown, yellowish-red, and dark-brown pebbly, sandy loam till containing sand lenses. Sharply overlies the Marathon and Lincoln Formations (both new names) and overlies and intertongues with the stratigraphically equivalent Mapleview Member of the Horicon Formation (both new names); sharply underlies sand and gravel of the Copper Falls Formation or is the surface unit. Thickness ranges from 2 to 17 m. Age is late Pleistocene (late Wisconsinan).

Nassawadox Formation

Pleistocene
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Borehole Ch-11, east end of Route 648, 0.5 mi east of Stumptown, west of the Penn Central Railroad, 10 mi south-southwest of the town of Nassawadox, Cheriton 7.5-minute quadrangle, Northampton County, Va.

Subunits: **Stumptown Member, Butlers Bluff Member, Occohannock Member.**

Sand and gravel deposits that underlie the Franktown plain and southern upland in the area south of the Ames Ridge shoreline in the Delmarva Peninsula, Va., are here named the Nassawadox Formation. Includes the lower subsurface Stumptown Member (new name), which unconformably overlies the Eastover and Yorktown Formations; the Butlers Bluff Member (new name), which forms the upper part of the Nassawadox in the southern upland area; and the upper Occohannock Member (new name), which conformably overlies the Butlers Bluff Member to the southwest. Thickness at the type section is 200 ft and ranges from 20 to 200 ft. Age is Pleistocene.

Nellysford Granulite Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., Gathright, T.M., II, and Henika, W.S., 1981, A tectonic model for the Blue Ridge in central Virginia: American Journal of Science, v. 281, no. 9, p. 1164–1183.

Type locality: Near Nellysford, Sherando 7.5-minute quadrangle, Nelson County, Va.

The Nellysford Granulite Gneiss, here named, is in the Pedlar massif in the central Blue Ridge, Va. Consists of well-layered, dark grayish-green to dark-green, fine- to medium-grained, granoblastic, garnet-hypersthene-quartz-feldspar gneiss. Occurs along the eastern margin of and as roof-pendants in the Pedlar River pluton [Pedlar River Charnockite Suite (new name)]. Contacts with the pluton are concordant and gradational. Age is Middle Proterozoic.

New Berlin Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Exposures in gravel pit on north side of Highway I (Lawnsdale Road), 0.8 to 1.6 km west of Highway Y (Racine Avenue), SE1/4 sec. 19 and SW1/4 sec. 20, T. 6 N., R. 20 E., Muskego 7.5-minute quadrangle, Waukesha County, Wis. Named for the city of New Berlin.

The New Berlin Formation, here named, is in the Lake Michigan Lobe in southeastern Wisconsin. Consists of brown to yellowish-brown, sandy, pebbly, calcareous till and is divided into an informal lower sand and gravel member and an upper till member. At several places the till splits into two units, informally designated 1A and 1B by Mickelson and others (1977), separated by outwash sand and gravel deposits. Sharply to gradationally overlies the Tiskilwa Member of the Zenda Formation (new name); sharply or unconformably underlies the Oak Creek Formation (new name) or various members of the Kewaunee Formation (new name) in the Lake Michigan Lobe; is the surface unit in much of Waukesha and Walworth Counties. Correlates with the Horicon Formation (new name) of the Green Bay Lobe. Thickness is at least 22 m. Age is late Pleistocene (late Wisconsinan).

New Bern Formation

Eocene
North Carolina
Atlantic Coast basin

Baum, G.R., Harris, W.B., and Zullo, V.A., 1978, Stratigraphic revision of the exposed middle Eocene to lower Miocene formations of North Carolina: Southeastern Geology, v. 20, no. 1, p. 1–19.

Type section: Exposure at Martin Marietta quarry at New Bern, Craven County, N.C.

The New Bern Formation, here named, is in the area lying between the Neuse and Trent Rivers, Craven and Jones Counties, N.C. Consists of predominantly sandy, basal pelecypod-mold biomicrosparrudite, 6 m thick, and overlying biosparite and biosparrudite, 1.8 m thick, and biomicrosparrudite, 1.4 m thick. Disconformably overlies the Castle Hayne Limestone; disconformably underlies the Trent or Yorktown Formation. Age is late Eocene.

New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: None designated. Named for the town of New Georgia, near Dallas, Paulding County, Ga.
Subunits: Mud Creek Formation and its Cedar Lake Quartzite Member and Villa Rica Gneiss Member.

The informal Dallas group of McConnell and Costello (1980), here formally named the New Georgia Group, occupies the Villa Rica antiform, an upwarped area on the northwestern limb of the Austell-Frolona antiform in west-central Georgia. The name is changed to prevent confusion with the better known geographic locality of Dallas, Tex. Includes the Mud Creek Formation (new name) and its Cedar Lake Quartzite Member (new name) and Villa Rica Gneiss Member (new name). Consists of an interlayered sequence of metamorphosed mafic and felsic volcanic and plutonic rocks containing minor amounts of metasedimentary rocks. Grades upward into the stratigraphically overlying but structurally underlying Andy Mountain and Bill Arp Formations (both new names) of the informal Roosterville group of the Austell-Frolona antiform. Age is Proterozoic(?).

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Subunits: Laura Lake Mafic Complex and its Kennesaw Gneiss Member, Kellogg Creek Mafic Complex, Univeter Formation and its Lost Mountain Amphibolite Member and Rose Creek Schist Member, Mud Creek Formation and its Cedar Lake Quartzite Member and Villa Rica Gneiss Member, Pumpkinvine Creek Formation and its Galts Ferry Gneiss Member, Canton Formation, Acworth Gneiss.

In the Greater Atlanta region of northwest Georgia, the New Georgia Group includes the Laura Lake Mafic Complex and its Kennesaw Gneiss Member (both new names), the Kellogg Creek Mafic Complex (new name), the Univeter Formation and its Lost Mountain Amphibolite Member and Rose Creek Schist Member (all new names), the Mud Creek Formation and its Cedar Lake Quartzite Member and Villa Rica Gneiss Member (all new names), the Pumpkinvine Creek Formation and its Galts Ferry Gneiss Member (new name), the Canton Formation, and the Acworth Gneiss. Age is Late Proterozoic and (or) early Paleozoic.

Newport Sand Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type locality: Sand ridges extending from the town of Newport to the vicinity of Bogue, Carteret County, N.C. (Mixon and Pilkey, 1976).

A barrier-sand lithosome associated with ridge-and-swale landforms in the Neuse River valley in Carteret County, N.C., is here named the Newport Sand Member of the Flanner Beach Formation, following the informal usage of Mixon and Pilkey (1976). Consists of pale-yellowish-gray, crossbedded, fine to coarse, well-sorted quartz sand that has quartz and chert pebbles and zones impregnated with black organic colloids. Intertongues with the Beard Creek Member (new name) of the Flanner Beach to the northwest. Thickness ranges from 3 to 12 m. Age is middle Pleistocene.

New York Canyon Member of the Sunrise Formation of the Volcano Peak Group

Early Jurassic (Sinemurian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures near the mouth of New York Canyon, Gabbs Valley Range, Mineral County, Nev.

Unit 8 of Muller and Ferguson (1939) of the Sunrise Formation is here named the New York Canyon Member of the now revised Sunrise Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Consists of blue-gray, orange-brown-weathering, medium- to thick-bedded bioclastic limestone. Conformably overlies the Five Card Draw Member (new name) of the Sunrise; sharply and conformably underlies the Joker Peak Member (new name) of the Sunrise. Thickness is 120 m. Age is Early Jurassic (Sinemurian) based on fossils.

Nimtz Till Member of the Winnebago Formation

Pleistocene (Illinoian)
Wisconsin
Wisconsin arch

Berg, R.C., and Kempton, J.P., 1985, Winnebago and Glasford Formation diamictons at the Nimtz Quarry Section: Illinois Geological Survey and Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 87–97.

Type section: Nimtz Quarry Section, 5 km east of Loves Park, N½SE¼ sec. 33, T. 45 N., R. 2 E., Winnebago County, Ill.

The Nimtz Till Member of the Winnebago Formation, here named, occurs primarily in the subsurface east of the Rock River in Winnebago, Boone, and McHenry Counties, Ill. Consists of gray-brown or buff loam to sandy loam diamicton, which is 69 percent illite. Was previously described as the Argyle Till Member, but it has been determined to be stratigraphically distinct from the overlying Argyle diamicton, which is 63 percent illite. Overlies the Beaver Creek Sand Member (new name) of the Winnebago or the Belvidere Till Member (new name) of the Glasford Formation. Thickness is less than 15 m. Age is Pleistocene (Illinoian).

Norcross Gneiss of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Industrial parks on both sides of Jimmy Carter Boulevard southeast of Interstate Highway I–85, Norcross 7.5-minute quadrangle, Gwinnett County, Ga. Named for the city of Norcross.

The Norcross Gneiss of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga. Consists of well-foliated gray, epidote-biotite-muscovite-plagioclase gneiss containing pods and lenses of amphibolite. Sharply and conformably overlies the Inman Yard Formation (new name) of the Atlanta Group; lies in sharp contact and correlates with the Wolf Creek Formation (new name) of the Atlanta to the southwest; gradationally and conformably underlies the Clairmont Formation (new name) of the Atlanta. Thickness is 2,000 m. Age is Late Proterozoic and (or) early Paleozoic.

Norris Lake Schist Member of the **Snellville Formation**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Outcrops in No Business Creek, just below the dam at Norris Lake, Snellville quadrangle, Gwinnett County, Ga.

The Norris Lake Schist Member is here named the lower member of the Snellville Formation (new name) in the Newnan-Tucker synform near Atlanta, Ga. Consists of interlayered garnet-biotite-muscovite schist, hornblende-plagioclase amphibolite, and minor amounts of biotite gneiss and quartzite. Discordantly overlies the Lithonia Gneiss and

Atlanta Group (new name); underlies the Lanier Mountain Quartzite Member (new name) of the Snellville. Thickness is 30 m. Age is Late Proterozoic and (or) early Paleozoic based on an age of 1,100 Ma for detrital zircons from the Lanier Mountain Quartzite Member.

Novi Mountain Formation

Early Ordovician
Alaska
Holitna basin

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic formations in the northern Kuskokwim Mountains, west-central Alaska: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Type section: East and west flanks of Novi Mountain, secs. 29, 30, and 32, T. 17 S., R. 28 E., Medfra (D–1) quadrangle, Alaska.

The Novi Mountain Formation, here named, is in the Nixon Fork terrane of the Kuskokwim Mountains, Alaska, where it was deposited in a shallow-water carbonate environment. Consists of calcareous siltstone and shale and has evidence of bioturbation in the lower third of the unit. The upper two-thirds are characterized by 5- to 30-m-thick carbonate cycles of limestone, shaly limestone, and calcareous siltstone. Outcrops are variegated gray carbonate rocks alternating with yellow-weathering siltier rocks. Overlies Precambrian or lower Paleozoic calc-schist; conformably underlies the Telsitna Formation (new name). Thickness is 900 m. Age is Early Ordovician based on conodonts.

Noxapaga Formation

Tertiary
Alaska
Yukon-Koyukuck province

Sainsbury, C.L., 1974, Geologic map of the Bendeleben quadrangle, Seward Peninsula, Alaska: U.S. Bureau of Mines, U.S. Geological Survey, and The Mapmakers, 31 p., scale 1:150,000.

Type area: Tertiary basin traversed by the Noxapaga River, western Bendeleben quadrangle, Seward Peninsula, Alaska.

Rocks of unquestionable Tertiary age exposed only in trenched pingos west of the Noxapaga River in the small Tertiary basin in the western part of the Bendeleben quadrangle, Alaska, previously assigned to the younger Kougarok Gravel by Hopkins (1963), are here named the Noxapaga Formation. Consists of conglomerate, sandstone, thin lignitic coal, and fireclay. Unconformably underlies unconsolidated Pleistocene Kougarok Gravel.

Nun Mine Member of the Gabbs Formation of the Volcano Peak Group

Late Triassic (Norian)
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Exposures near Luning Draw, Gabbs Valley Range, Mineral County, Nev. Named for the Nun mine near Five Card Draw.

The lower member of Muller and Ferguson (1939) of the Gabbs Formation is here named the Nun Mine Member of the now revised Gabbs Formation of the Volcano Peak Group (new name) in the Gabbs Valley Range in west-central Nevada. Consists of dark-gray to black, grayish-purple-weathering, thin-bedded, calcareous mudstone and siltstone intercalated with thin to thick beds of black limestone. Conformably overlies the Luning Formation; sharply and conformably underlies the Mount Hyatt Member (new name) of the Gabbs. Thickness is 90 m. Age is Late Triassic (Norian) based on fossils.

Oak Creek Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Oakwood Road South Section, in Lake Michigan bluffs between Oakwood Road and Elm Road, north of Oak Creek Power Plant, NE¼NE¼NE¼ sec. 36, T. 5 N., R. 22 E., and NW¼ sec. 31, T. 5 N., R. 23 E., Racine North 7.5-minute quadrangle, Milwaukee County, Wis. Named for the city of Oak Creek.

The Oak Creek Formation, here named, is in the Lake Michigan Lobe in southeastern Wisconsin. Consists of fine-grained glacial till, lacustrine clay, silt, and sand, and glaciofluvial sand and gravel. Three till units designated 2A, 2B, and 2C, were identified by Mickelson and others (1977). Sharply or unconformably overlies the upper till member of the New Berlin Formation (new name); sharply underlies lacustrine deposits or the Kewaunee Formation (new name), or occurs as surface drift. Thickness attains 35 m. Age is Pleistocene (late Wisconsinan).

Oakley Shale Member of the Swede Hollow Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures along a tributary to Whitebreast Creek at the Swede Hollow type section, secs. 33 and 34, T. 73 N., R. 22 W., and sec. 3, T. 72 N., R. 22 W., Lucas County, Iowa. Named for the community of Oakley in northern Lucas County.

The Oakley Shale Member of the Swede Hollow Formation (new name) of the Cherokee Group, here named, is in southern Iowa. Consists of fissile, black shale, containing phosphate nodules at the base, overlain by bioturbated gray shale in the eastern area. In the western area the black fissile facies is underlain by gray shale containing plant fossils. Overlies the Whitebreast Coal Member (new name) of the Swede Hollow with a sharp, irregular contact; underlies the Ardmore Limestone Member of the Swede Hollow. The black shale bed may be equivalent to the Mecca Quarry Shale in northeastern Illinois. Thickness ranges from 1.5 ft at the type section to 25 ft in the western area. Age is Middle Pennsylvanian (Desmoinesian).

Occohannock Member of the **Nassawadox Formation**

Pleistocene
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Exposures in west-facing cliff at the mouth of Shields Cove on the north side of Occohannock Creek, 2.5 mi west of Bell Haven, Delmarva Peninsula, Northampton County, Va. Reference section: Cliffs on south bank of Occohannock Creek, Shooting Point, and Hungars Beach.

Surficial deposits of the Franktown plain, Northampton County, Va., are here named the Occohannock Member, the upper member of the Nassawadox Formation (new name). Consists of light-yellowish-gray, fine to medium quartz sand beds. Disconformably overlies the Accomack Member (new name) of the Omar Formation to the north; conformably to disconformably overlies the Butlers Bluff Member (new name) of the Nassawadox to the southwest; is truncated and overlapped by the Kent Island Formation or lies at the surface. May be equivalent to the Joynes Neck Sand (new name). Thickness at the type section is 15 ft and ranges from 7 to 20 ft. Age is Pleistocene.

Ochoa Point Member of the Dox Formation of the Unkar Group

Middle Proterozoic
Arizona
Plateau sedimentary province

Stevenson, G.M., and Beus, S.S., 1982, Stratigraphy and depositional setting of the upper Precambrian Dox Formation in Grand Canyon: Geological Society of America Bulletin, v. 93, no. 2, p. 163–173.

Type section: Exposures in an unnamed streamway on the southwest side of Ochoa Point, a promontory west of Basalt Canyon on the northwest side of the Colorado River, eastern Grand Canyon, Vishnu Temple quadrangle, Coconino County, Ariz.

The Ochoa Point Member is here named the uppermost member of the Dox Formation of the Unkar Group in the eastern Grand Canyon, Ariz. The lower half consists of slope-forming, reddish-brown, micaceous siltstone containing thin interbeds of sandstone. Upper half consists of steep-slope-forming, thicker and more closely spaced sandstone beds containing thin shale partings. Represents tidal-flat deposits. Gradationally overlies the Comanche Point Member (new name) of the Dox; conformably underlies the Cardenas Lavas. Thickness is 76 m at the type section and ranges from 53 to 91 m. Age is Middle Proterozoic based on the age of the overlying Cardenas Lavas (1.1 Ma).

Ocmulgee Formation of the Ocala Group

Eocene
Georgia
Atlantic Coast basin

Huddlestun, P.F., and Hetrick, J.H., 1985, Upper Eocene stratigraphy of central and eastern Georgia: Georgia Geologic Survey Bulletin 95, 78 p.

Type locality: Exposures at Taylors Bluff on the east side of the Ocmulgee River, 2.7 mi north of Hawkinsville, Pulaski County, Ga.

The Ocmulgee Formation of the Ocala Group, here named, is in the Georgia Coastal Plain from Houston and Pulaski Counties in the west to as far east as the Savannah River. Previously mapped as the Cooper Marl, but the units are not laterally equivalent. Consists of a basal sandy, glauconitic, indurated limestone overlain by tough, massive, glauconitic, granular, even-textured, slightly argillaceous, calcarenitic limestone. Conformably overlies the Twiggs Clay Member of the Dry Branch Formation; paraconformably underlies the Marianna Limestone. Thickness at the type locality is 35 ft. Age is late Eocene.

Oconee Coal Member of the Mattoon Formation of the McLeansboro Group

Late Pennsylvanian (Missourian)
Illinois
Illinois basin

Nance, R.B., and Treworgy, C.G., 1981, Strippable coal resources of Illinois: Part 8—Central and southeastern counties: Illinois Geological Survey Circular 515, 32 p.

Type section: Exposure in a west-flowing tributary to Coal Creek, 4 mi north of the village of Oconee, SE¼SE¼SE¼ sec. 34, T. 11 N., R. 1 E., approximately 300 ft north of the county line road in Christian County, Ill.

The Oconee Coal Member of the Mattoon Formation of the McLeansboro Group, here named, is in Shelby, Cumberland, Effingham, and Jasper Counties, Ill. Lies 25 to 40 ft above the Loudon Coal Member (new name) and 60 to 110 ft below the Shelbyville Coal Member of the Mattoon Formation. Thickness is 1 ft at the type section. Age is Late Pennsylvanian (Missourian).

Oil Creek Formation

Oligocene
California
Eel River basin

Bachman, S.B., Underwood, M.B., and Menack, J.S., 1984, Cenozoic evolution of coastal northern California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, p. 55–66.

Type locality: Oil Creek near False Cape, 6 mi southwest of Ferndale, Humboldt County, Calif.

The Oil Creek Formation, here named, is in the Eel River basin, California. Consists of a debris flow containing clasts of sandstone, shale, and conglomerate derived from the Coastal Belt Complex and less indurated siltstones of unknown origin. Concordantly overlies the Coastal Belt Complex; unconformably underlies fractured rocks of the Wildcat Group. Unit may represent deposition during a period of regional uplift preceding the main phase of Wildcat deposition. Thickness is 33 ft. Age is Oligocene based on microfauna.

Old Church Formation of the **Chesapeake Group**

Oligocene and Miocene
Virginia, Maryland
Atlantic Coast basin

Ward, L.W., 1985, Stratigraphy and characteristic mollusks of the Pamunkey Group (lower Tertiary) and the Old Church Formation of the Chesapeake Group—Virginia Coastal Plain: U.S. Geological Survey Professional Paper 1346, 78 p.

Type section: Exposure at USGS locality 26412 on the south bank of the Pamunkey River at Horseshoe, Manquin 7.5-minute quadrangle, Hanover County, Va. Named for the nearby village of Old Church.

The upper Oligocene or lower Miocene beds in the outcrop area on the Pamunkey River from above Horseshoe to below the mouth of Matadequin Creek, Va., are here named the Old Church Formation of the Chesapeake Group. Consists of grayish-olive, clayey quartz sands containing molluskan shell fragments, foraminifers, ostracodes, and small amounts of reworked glauconite. Irregular indurated masses occur as boulder-size concretions. Unconformably overlies the Piney Point Formation; unconformably underlies the Calvert Formation. Thickness ranges from less than 1 ft to 3 ft. A bed along the Patuxent River in Maryland, called zone 1 of the Calvert Formation by Shattuck (1904), that lies unconformably between the Woodstock Member of the Nanjemoy Formation and Shattuck's (1904) zone 2 of the Calvert Formation, may be equivalent to and belong in the Old Church. Subsurface beds in Maryland, Delaware, and New Jersey, mapped as the Piney Point Formation by Olsson and others (1980), are equivalent to the Old Church. Ward and others (1978) correlated the Pamunkey River outcrop with the Chickasawhayan-age River Bend Formation in North Carolina.

Old Mill Branch Metasiltstone Member of the **Popes Head Formation**

Late Proterozoic and (or) Early Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Lyttle, P.T., 1981, The Accotink Schist, Lake Barcroft Metasandstone, and Popes Head Formation—Keys to an understanding of the tectonic evolution of the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1205, 16 p.

Type locality: Exposures along Old Mill Branch between Clifton Road and the Occoquan Reservoir, Manassas 7.5-minute quadrangle, Fairfax County, Va.

The Old Mill Branch Member of the Popes Head Formation (new name), here named, is in Fairfax County, northern Virginia. Consists of alternating beds of coarser grained micaceous metasiltstone and metasandstone and finer grained metapelite and micaceous metasiltstone containing interbedded felsic and mafic metatuff layers. Is isoclinally folded and phyllitic cleavage is subparallel to bedding. Discordantly overlies all other rocks of the Wissahickon terrane in Fairfax County; gradationally underlies the Station Hills Phyllite Member (new name) of the Popes Head; is intruded by the Occoquan Granite. Maximum thickness is about 730 m. Age is Late Proterozoic and (or) Early Cambrian based on the age of the Occoquan Granite, which has been determined radiometrically to be Early Cambrian.

Olds Member of the Bell Canyon Formation of the Delaware Mountain Group

Late Permian (Guadalupian)
Texas, New Mexico
Permian basin

Winner, Phil, 1985, Type section for the uppermost Bell Canyon Formation in the central Delaware basin of West Texas: West Texas Geological Society Bulletin, v. 24, no. 7, p. 7–10.

Type section: Gulf J.R. Grandin Number 1 well, sonic-gamma ray log, SE1/4 sec. 33, Block 29 PSL Survey, Loving County, Tex. Named for the Olds field, Reeves County, Tex.

The Olds Member, here named, is in the informal A sand in the upper Bell Canyon Formation of the Delaware Mountain Group in the central Delaware basin in Texas and New Mexico. Previously designated the informal unranked Olds sand by Nottingham (1960) and the Olds sandstone member, the main pay in the Olds field, by Grauten (1965). Produces in the Olds, Hays, Quito, and Grice fields. Consists of silty, fine-grained sandstone and has an upward increase in sonic porosity; four separate sand units have been mapped locally. The base is picked at the first shale above the top of the Bell Canyon B sand where sonic porosity shows a significant increase. Overlies the Hays Member (new name) and underlies the Ford Member (new name), both of the Bell Canyon. Is regionally extensive but is absent to the north beneath the Paduca field. Thickness ranges from 0 to 50 ft. [Age is Late Permian (Guadalupian).]

Onaway Member of the Wanapum Basalt of the Columbia River Basalt Group

Miocene
Idaho, Washington
Eastern Columbia basin

Camp, V.E., 1981, Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho: Geological Society of America Bulletin, v. 92, no. 9, pt. I, p. 669–678.

Type locality: Potlatch River area near and around Onaway, Latah County, Idaho.

The Onaway Member of the Wanapum Basalt of the Columbia River Basalt Group, here named, is in the Potlatch River area of the Clearwater embayment in western Idaho and adjoining eastern Washington. Consists of several flows of medium- to coarse-grained basalt containing plagioclase phenocrysts extruded from vents extending from Palouse, Wash., to Potlatch, Troy, and Joel, Idaho. The informal basalt of Potlatch is the only mappable flow in the member. The Onaway is at the top of the Wanapum and contains flows that lie both below and above the Priest Rapids Member of the Wanapum; hence the Wanapum-Saddle Mountains Basalt contact is redefined at the top of the Onaway. Age is late Miocene.

Onyx Cave Member of the **Virginville Formation**

Late Cambrian and Early Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures at Onyx Cave, Hamburg 7.5-minute quadrangle, Berks County, Pa.

The Onyx Cave Member of the Virginville Formation (new name), here named, is in the Richmond slice of the Hamburg klippe in Pennsylvania. Consists of four distinct rock types: granular and quartzose limestone, interbedded black lime mudstone and limestone, massive carbonate-clast conglomerate, and laminated black shale and orange dolostone. Conformably overlies the Sacony Member (new name) of the Virginville; tectonically overlies the Moselem Member (new name) of the Virginville. Minimum thickness is 90 m. Age is Late Cambrian and Early Ordovician based on conodonts.

Oreanna Bed

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Badlands on the west side of the Humboldt River, 7.6 km south of Rye Patch Dam and 7.7 km north of Oreanna, NE1/4SW1/4SW1/4 sec. 6, T. 29 N., R. 33 E., Oreanna 15-minute quadrangle, Pershing County, Nev.

The Oreanna Bed, here named, is exposed between Rye Patch Dam and Oreanna on the Humboldt River, Lake Lahontan area, Nevada. Is attributed to a source at the Island Park Caldera of northeastern Idaho because it is chemically and petrographically similar to Pearlette ash beds O and B, which are correlative to welded tuffs of the Yellowstone Group in Yellowstone Park. Age is Pleistocene, 600 ka.

Oregon Till Member of the Glasford Formation

Pleistocene (Illinoian)
Illinois
Wisconsin arch

Kempton, J.P., Berg, R.C., and Follmer, L.R., 1985, Revision of the stratigraphy and nomenclature of glacial deposits in central northern Illinois: Illinois Geological Survey, Midwest Friends of the Pleistocene, 32d field conference, guidebook 19, p. 1–19.

Type section: Grand Detour Section, 16 km south of Oregon, SW1/4SW1/4NE1/4 sec. 25, T. 22 N., R. 9 E., Lee County, Ill.

The recognition that the Esmond Till Member is a unit of the Illinoian Glasford Formation rather than of the Wisconsinan Wedron Formation has left three unnamed till members below the Esmond Member. The upper till is here named the Oregon Till Member of the Glasford Formation for its widespread occurrence near Oregon in Ogle County, and in Boone, Winnebago, and Lee Counties, Ill. Consists of a pinkish-brown loam to sandy loam diamicton. Its siltier fining-downward component is referred to as the Oregon Till Member silty facies by Kempton and Berg (1985). Overlies the Fairdale Till Member (new name) and underlies the Esmond Till Member, both of the Glasford. Replaces the Argyle Till Member of the Winnebago Formation in Winnebago, Ogle, and Lee Counties. Thickness is 1 m. Age is Pleistocene (Illinoian).

Orme Spring Conglomerate

Paleocene and Eocene
Utah
Great Basin province

Meibos, L.C., 1983, Structure and stratigraphy of the Nephi NW 7.5-minute quadrangle, Juab County, Utah: Brigham Young University Geology Studies, v. 30, pt. 1, p. 37–58.

Type section: Exposures in the northeast corner of sec. 31, T. 13 S., R. 2 W., Nephi NW 7.5-minute quadrangle, Juab County, Utah. Reference localities: secs. 31, 33, and 35, T. 13 S., R. 1 W. Named for Orme Spring nearby.

The Orme Spring Conglomerate, here named, is in the Great Basin province, Utah, where it forms rounded knobs and low ledges. Is probably an alluvial fan deposit of local extent. Consists of conglomerate that has local coarse sandstone lenses. Conglomerate clasts are subangular to subrounded fossiliferous upper Paleozoic limestone, quartz, and calcareous sandstone; matrix is medium- to coarse-grained quartz, quartzite, chert, and limestone. Unconformably(?) overlies the Red Narrows Conglomerate; unconformably underlies the Chicken Creek Tuff Member (reduced in rank from formation) of the Goldens Ranch Formation. The age of the laterally and temporally equivalent Flagstaff Limestone is late Paleocene. Age shown on correlation chart is late Paleocene and Eocene.

Osburger Gulch Sandstone Member of the **Hornbrook Formation**

Late Cretaceous (Cenomanian, Turonian, and Coniacian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Near the mouth and along the north flank of Osburger Gulch, east of the Klamath River and 3.5 km south of the town of Hornbrook, SW¼ sec. 33, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif.

The Osburger Gulch Sandstone Member of the Hornbrook Formation, here named, is along the northeast margin of the Klamath Mountains in Siskiyou County, Calif., and Jackson County, Oreg. Consists of gray sandstone containing some conglomerate, siltstone, and shale, and represents transgressive shoreline and shelf deposits. Conformably overlies the Klamath River Conglomerate Member (new name) of the Hornbrook or unconformably overlies pre-Cretaceous basement rocks; conformably underlies the Ditch Creek Siltstone Member (new name) of the Hornbrook. Thickness is 116.5 m at the type section and ranges from 75 to 150 m. Age is Late Cretaceous (Cenomanian, Turonian, and early Coniacian) based on mollusks.

Osgood Bed

Holocene
California
Sierra Nevada province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Osgood Swamp, 0.5 km northwest of U.S. Highway 50 at the foot of Myers Grade, near South Lake Tahoe, El Dorado County, Calif.

The Osgood Bed, here named, occurs at Osgood Swamp, California, where it overlies the Tsoyawata Bed of the Mazama Member (both new names) of the Mount Mazama Formation. Age is Holocene, 6 to 2 ka, based on the age of peat underlying the tephra.

Osito Canyon Shale Member of the Peace Valley Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Exposures along Osito Canyon adjacent to California Highway 99, about 15 km north of Castaic, Los Angeles County, Calif.

The Osito Canyon Shale Member, here named, is in the Peace Valley Formation, redefined, of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif., where clastic tongues of the Ridge Route Formation separate the Peace Valley into five members. Consists of unfossiliferous gray shale, mudstone, and interbeds of siltstone and sandstone. Extends laterally for 6,154 m and interfingers with the Ridge Route Formation undivided to the northeast and the Violin Breccia to the southwest. Conformably overlies the Fisher Spring Sandstone Member (new name) and conformably underlies the Frenchman Flat Sandstone Member (new name), both of the Ridge Route. Thickness at the type section is 976 m. Age is late Miocene based on its stratigraphic position above the marine Castaic Formation and below the Cereza Peak Shale Member (new name) of the Peace Valley.

Otter Pond Dioritic Gneiss

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB-2, p. 3–15.

Type locality: Exposures along the high ridge west of Otter Pond, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y.

The Otter Pond Dioritic Gneiss, here named, is in the Loon Pond syncline of the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y., where it is extensively distributed throughout the area. Consists of ridge-forming, dark-green, massive, foliated to granitic dioritic gneiss, containing plagioclase, hornblende, and magnetite, that weathers to a black and white salt and pepper texture. Is concordant with surrounding units in most areas or cuts them at a low angle. Intrudes the East Charley Pond Gneiss, Bear Pond Gneiss, and Lost Pond Marble and its Bog River, Hill 2292, Sabattis Road, and Loon Pond Mountain Members (all new names). Age is Precambrian.

Otuk Formation of the **Etivluk Group**

Early Triassic to Middle Jurassic
Alaska
Arctic Foothills province

Mull, C.G., Tailleur, I.L., Mayfield, C.F., Ellersieck, Inyo, and Curtis, S., 1982, New upper Paleozoic and lower Mesozoic stratigraphic units, central and western Brooks Range, Alaska: American Association of Petroleum Geologists Bulletin, v. 66, no. 3, p. 348–362.

Type section: Bluff on the east bank of Otuk Creek, a tributary of the East Fork of the Etivluk River, sec. 31, T. 10 S., R. 16 W., western Killik River quadrangle, Alaska. Principal reference section designated. *Subunit:* **Blankenship Member**.

Rocks previously assigned to the Shublik Formation in the Endicott and De Long Mountains are here named the Otuk Formation of the Etivluk Group (new name). As here redefined, the Shublik is confined to the autochthonous terrane of northern Alaska and the Otuk is confined to allochthonous sheets of the central and western Brooks Range. Is divided into lower informal shale, chert, and limestone members and the Blankenship Member (new name), locally present at the top. Lower part consists of brown- or green-weathering, gray chert and nonsiliceous shale, and upper part consists of yellow- to orange-gray, rhythmically interbedded chert, siliceous shale, and silicified limestone. The Blankenship Member consists of black shale, chert, and limestone. Conformably or disconformably overlies the Siksikpuk Formation of the Etivluk; disconformably underlies Lower Cretaceous rocks. Thickness ranges from 50 to 100 m. Age is Early Triassic to Middle Jurassic based on fossils.

Oventop Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Exposure along Virginia State Road 635, 1 mi west of Hume, lat 38°50′ N., long 78°02′ W., Flint Hill 7.5-minute quadrangle, Fauquier County, Va. Named for Oventop Mountain.

The Oventop Suite, here named, is in the Lovingston massif in the Blue Ridge of Virginia. Consists of biotite dioritoid plutonic rocks. Age is Middle Proterozoic.

Owiyukuts Complex

Archean
Utah, Colorado
Uinta uplift

Sears, J.W., Graff, P.J., and Holden, G.S., 1982, Tectonic evolution of lower Proterozoic rocks, Uinta Mountains, Utah and Colorado: Geological Society of America Bulletin, v. 93, no. 10, p. 990–997.

Type area: South flank of O-Wi-Yu-Kuts Mountain, Uinta Mountains, Daggett County, Utah.

Rocks mapped as Red Creek Quartzite by Hansen (1965) are here named the Owiyukuts Complex. Underlies an area less than 3 km^2 in the Beaver Creek block and also occurs in the Mountain Home, Dutch John, and Bender Mountain blocks of the Uinta Mountains in Utah and Colorado. Consists of medium- to fine-grained potassium-feldspar-rich granitic gneiss, quartzofeldspathic gneiss, garnet gneiss, migmatitic gneiss, biotite gneiss, and garnet amphibolite enclosing massive coarse-grained pegmatite bodies. Unconformably underlies the Red Creek Quartzite along a shear surface. Age is Archean based on a rubidium-strontium whole-rock isochron age of 2.7 Ma for Owiyukuts gneiss.

Ozaukee Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Lake Park Section, north of Port Washington Harbor, NW¼SE¼NE¼ sec. 28, T. 11 N., R. 22 E., Port Washington East 7.5-minute quadrangle, Ozaukee County, Wis. Named for Ozaukee County.

Following the informal usage of Acomb (1978), the Ozaukee Member is here named the lowermost member of the Kewaunee Formation (new name) and occurs in the Lake Michigan Lobe in Ozaukee and Milwaukee Counties, Wis. Consists of reddish-brown or pinkish-gray, pebbly, clayey, and silty till and associated lake sediments. Overlies the Oak Creek Formation (new name); is present at the top of the Lake Michigan coastal bluff from Milwaukee to Sheboygan County where it is the surface unit. Is equivalent to the Branch River and Silver Cliff Members (both new names) of the Kewaunee Formation in the Lake Michigan Lobe and the Green Bay Lobe, respectively. Thickness ranges from 2.4 m to 20 m. Age is Pleistocene (late Wisconsinan).

Padden Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Composite of outcrops along Bellingham Bay, on the south and north limbs of the Chuckanut syncline, sec. 25 and W½ sec. 13, T. 37 N., R. 2 E., Whatcom County, Wash. Named for Lake Padden.

The Padden Member, here named, is in the Chuckanut Formation in the Bellingham Bay area on the mainland and is on Lummi and Sucia Islands, in the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands into the North Cascades, Wash. Consists of alternating medium- to coarse-grained, crossbedded sandstone, massive to crudely stratified conglomerate, and mudstone containing minor amounts of coal. Represents braided river and flood-plain deposits. Conformably overlies the Bellingham Bay and Governors Point Members (both new names) of the Chuckanut, or unconformably overlies pre-Tertiary rocks in the western part of the outcrop belt; interfingers with the Slide Member and underlies the Maple Falls Member (both new names) of the Chuckanut. On Sucia Island strata of the Padden Member, formerly assigned to the Nanaimo Group, are in fault contact with the Nanaimo. Thickness is 680 m at the type section; total thickness may exceed 3,000 m. Age is middle to late Eocene based on zircon fission-track ages and pollen.

Palisades-Kepler Member of the Scotch Grove Formation

Early Silurian (Wenlockian)
Iowa
Iowa shelf

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

Type locality: Exposures extending along the banks of the Cedar River for 1.6 mi in Palisades-Kepler State Park, E½SW¼ and SW¼NE¼ sec. 4, T. 82 N., R. 6 W., Linn County, Iowa.

Horizontally bedded, nonlaminated strata called the informal Palisades-Kepler Mound facies by Witzke (1981), included within the LeClair facies of the Gower Formation by previous workers, are here named the Palisades-Kepler Member of the Scotch Grove Formation (new name) in eastern Iowa. Consists of crinoidal skeletal-moldic and skeletal-replaced dolomite containing wackestone, packstone, and rare grainstone fabrics, characterized by mounded carbonate reefs, including single mounds that range in size from 200 to 300 ft laterally and from 30 to 200 ft vertically, and coalesced complexes of mounds. Base of the member has not been observed; extends laterally into strata of the Buck Creek Quarry, Waubeek, and Fawn Creek Members (all new names) of the Scotch Grove; sharply underlies the Anamosa Member or Brady Member (new name) of the Gower Formation. Age is Early Silurian (early and middle Wenlockian).

Palmer Creek Member of the Canton Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

German, J.M., 1985, The geology of the northeastern portion of the Dahlonega gold belt: Georgia Geologic Survey Bulletin 100, p. 1–41.

Type locality: Exposures along Palmer Creek near Dawsonville, Dawsonville 7.5-minute quadrangle, Dawson County, Ga.

The Palmer Creek Member of the Canton Formation, here named in the Dahlonega area, Georgia, was previously mapped as the Carolina Gneiss by Keith (1909). Consists of biotite-quartz schist containing hornblende or garnet. The boundary between the Palmer Creek and the underlying Proctor Creek Member (new name) of the Canton is gradational at the lowest occurrence of biotite-quartz schist. Is in fault contact with the overlying Chestatee Member (new name) of the Canton at the first occurrence of interlayered felsic gneiss and amphibolite. Where the Chestatee Member is absent the Palmer Creek grades into the Helen Member (new name) of the Canton at the first occurrence of biotite-plagioclase-quartz gneiss. Age is Late Proterozoic and (or) early Paleozoic.

Pan Tak Granite

Tertiary
Arizona
Basin and Range province

Wright, J.E., and Haxel, Gordon, 1982, A garnet-two-mica granite, Coyote Mountains, southern Arizona: Geologic setting, uranium-lead isotopic systematics of zircon, and nature of the granite source region: Geological Society of America Bulletin, v. 93, no. 11, p. 1176–1188.

Type area: Northern part of the Coyote Mountains, Baboquivari Peak quadrangle, Pima County, Ariz. Named for the town of Pan Tak, Pima County.

The Pan Tak Granite, here named, occurs in the Coyote Mountains, southern Papago Indian Reservation, south-central Arizona. Granite of the pluton consists of two phases: an older phase of reddish-weathering, medium-grained, leucocratic, biotite and muscovite-biotite granite intruded by a younger phase of white- to pinkish- or orangish-gray-weathering, medium-grained, leucocratic, garnet-muscovite and garnet-biotite granite and associated pegmatite dikes. Granite was generated by the melting of late Precambrian crystalline basement during latest Cretaceous and early Tertiary crustal thrust faulting. Intrudes Paleozoic metasedimentary rocks and Jurassic plutonic rocks. Age is early Tertiary based on a uranium-lead isotopic age of 58 Ma.

Panther Bluff Formation of the **Great Smoky Group**

Late Proterozoic
Georgia, Tennessee
Piedmont-Blue Ridge province, Appalachian basin

Gair, J.E., and Slack, J.F., 1982, Geologic maps of the Cohutta Wilderness and the Hemp Top Roadless Area, northern Georgia and southeastern Tennessee: U.S. Geological Survey Miscellaneous Field Studies Map MF–1415–A, scale 1:48,000.

Type locality: Panther Bluff in the south-central part of the Cohutta Wilderness, lat 34°54′ N., long 84°36′ W., Hemp Top 7.5-minute quadrangle, Fannin County, Ga.

The Panther Bluff Formation, here named, is the lower unit of the Great Smoky Group in the Cohutta Wilderness and Hemp Top Roadless Area, Ga., and Tenn. Consists of quartzose, feldspathic, and micaceous metasandstone and metawacke containing minor amounts of metashale and metaconglomerate. Is in fault contact with rocks of the underlying Snowbird Group; conformably underlies the lower part of the Boyd Gap Formation of the Great Smoky Group. Maximum thickness is 2,000 ft. Age is Late Proterozoic.

Paradise Granodiorite

Late Cretaceous
California
San Joaquin basin

Moore, J.G., 1981, Geologic map of the Mount Whitney quadrangle, Inyo and Tulare Counties, California: U.S. Geological Survey Geologic Quadrangle Map GQ–1545, scale 1:62,500.

Type locality: Exposures on the east side of Paradise Valley, east-central Marion Peak 15-minute quadrangle, Fresno County, Calif.

The Paradise-Whitney nested sequence extends 83 km southeastward from the central part of the Marion Peak quadrangle on the northwest, through the Mount Whitney quadrangle, to the southeastern part of the Olancha quadrangle on the southeast in Inyo, Tulare, and Fresno Counties, Calif. Includes the Paradise pluton, here named the Paradise Granodiorite, and the Whitney pluton, named the Whitney Granodiorite (new name). Consists of porphyritic granodiorite and granite that have potassium-feldspar phenocrysts characterized by zonally arranged inclusions of biotite and hornblende. The Paradise-Whitney nested sequence was emplaced as a single intrusion about 85 Ma, but before complete solidification occurred, the partly molten and more differentiated central Whitney Granodiorite core burst through the solidified wall of the Paradise Granodiorite on the southeast side. Western and eastern contacts of the Whitney dip under the Paradise and its axis plunges north beneath the Paradise. Age is Late Cretaceous based on potassium-argon biotite and hornblende ages of 78 and 84 Ma and a uranium-lead age of 86 Ma.

Paradise Fork Formation

Silurian (Llandoverian and Wenlockian)
Alaska
Holitna basin

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic formations in the northern Kuskokwim Mountains, west-central Alaska: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Type locality: Low hills between upper Paradise Fork and upper Sulukna River drainages, secs. 11, 12, 14, and 23, T. 19 S., R. 26 E., Medfra (D–2) quadrangle, Alaska.

The Paradise Fork Formation, here named, is mapped in the northern part of the Nixon Fork terrane of the Kuskokwim Mountains, Alaska, where it was deposited in a shallow-water carbonate environment. Consists of dark-gray, platy, silty limestone and interbedded black silt shale containing isolated limestone lenses in the upper part of the sequence. Disconformably(?) overlies the Telsitna Formation (new name); underlies the Whirlwind Creek Formation (new name). Is terminated by a major northwest-trending vertical fault at White Mountain Creek. Thickness is a minimum of 1,000 m. Age is Silurian (latest Llandoverian and Wenlockian) based on graptolites and ostracodes.

Paradise Ranch Shale Member of the Peace Valley Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Exposure along the east side of Interstate Highway I–5 from Templin Highway north to Three Mile Grade, 9 km north of Castaic, Los Angeles County, Calif. Named for Paradise Ranch on the west side of Highway I–5.

The Paradise Ranch Shale Member, here named, is in the Peace Valley Formation, redefined, of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif. Is the lowest member of the Peace Valley, which is separated into five members by clastic tongues of the Ridge Route Formation. Consists of poorly exposed dark-gray, unfossiliferous shale containing thin interbeds of sandstone. Extends laterally for 5,625 m and interfingers with the Violin Breccia to the southwest and the Ridge Route Formation undivided to the northeast. Conformably overlies the Marple Canyon Sandstone Member (new name) and conformably underlies the Fisher Spring Sandstone Member (new name), both of the Ridge Route Formation. Thickness is 549 m at the type section. Age is late Miocene based on its stratigraphic position above the marine Castaic Formation and the Marple Canyon Sandstone Member of the Ridge Route.

Paradox Lake Formation of the Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: None designated. Occurs in the eastern Adirondack Mountains, N.Y. Source of name not stated.

The name Paradox Lake Formation, used by Walton and deWaard (1963), is here assigned to the Lake George Group (new name) in the eastern Adirondack Mountains, N.Y. Consists of calcitic and dolomitic marble interlayered with amphibolite, quartzite, gneiss, schist, and granulite, some of which are locally mappable units. Overlies the Eagle Lake Gneiss (new name) of the Lake George Group or rocks of the Piseco Group (new name); underlies the Treadway Mountain Formation (new name) of the Lake George Group. Correlates with the Cedar River Formation of the Lake George Group and the Cranberry Lake Formation (new name) and Gouverneur Marble, both of the Oswegatchie Group, in other parts of the Adirondacks. Age is Proterozoic. [Although this name has not been formally proposed, it is included here because of its continued usage.]

Paragon Formation

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R. 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605-B, 37 p.

Type section: Roadcuts along the western side of Kentucky Highway 1274, 1.1 km north of the Licking River (Cave Run Lake), Bangor quadrangle, Rowan County, Ky. Named for the community of Paragon, 5.6 km east of the type section.

Strata of the Paragon Formation, here named, were previously assigned to the Pennington Formation or Newman Limestone, which are now restricted from the Cumberland Escarpment outcrop belt in Kentucky. The Paragon occurs throughout the outcrop belt south of Greenup County southward to an arbitrary cutoff against the Pennington at the southern border of Kentucky. Consists of a sequence of shale, dolostone, and limestone divided into a lower dark shale member, a clastic or dolomite member, a limestone member, and an upper shale member. Conformably overlies or intertongues with the Poppin Rock Member (new name) of the Slade Formation (new name) or the Bangor Limestone; disconformably underlies Pennsylvanian units. Thickness ranges from 0 to 60 m. Age is Late Mississippian.

Parr Branch Formation of the Snowbird Group of the Ocoee Supergroup

Middle Proterozoic
Georgia
Appalachian basin

McConnell, K.I., and Costello, J.O., 1984, Basement-cover rock relationships along the western edge of the Blue Ridge thrust sheet in Georgia: Geological Society of America Special Paper 194, p. 263–280.

Type locality: None designated. Occurs near Fort Mountain State Park, Murray County, Ga. Origin of name not stated.

The Parr Branch Formation of the Snowbird Group of the Ocoee Supergroup, here named, is in a small unnamed anticlinorium of Grenville-age basement rocks located along the western margin of the Blue Ridge thrust sheet in the Fort Mountain area of north-central Georgia. Consists of metamorphosed coarse, bouldery conglomerate derived from the nonconformably underlying Fort Mountain Gneiss. Conformably underlies the Wilhite Formation of the Walden Creek Group. Is the lithostratigraphic equivalent of the Pinelog Formation of the Snowbird Group in the Salem Church anticlinorium to the south. Age is Middle Proterozoic.

Patterson Lake Member of the Virginian Ridge Formation

Cretaceous (Aptian and Albian)
Washington
Northern Cascade Range-Okanogan province

Trexler, J.H., Jr., 1985, Sedimentology and stratigraphy of the Cretaceous Virginian Ridge Formation, Methow Basin, Washington: Canadian Journal of Earth Sciences, v. 22, no. 9, p. 1274–1285.

Type section: Exposures on hillside east of Patterson Lake, 4.8 km southwest of Winthrop in the southern Methow Basin, sec. 8, T. 34 N., R. 21 E., Okanogan County, Wash.

The Patterson Lake Member of the Virginian Ridge Formation, here named, occurs in a narrow belt in the southern part of the Methow Basin, the southernmost of a series of Mesozoic basins that rest with angular unconformity on older rocks in north-central Washington. Consists of braided stream deposits of massive, crudely stratified conglomerate and irregular, lenticular beds of coarse sandstone in the lower 100 m; massive to thick-bedded sandstone and conglomerate representing fluvial deposits of gentler gradient in the middle 250 m; and thickly bedded, fossiliferous marine sandstone in the upper 100 m. Unconformably overlies the Newby Group; interfingers laterally with and gradationally underlies the Slate Peak Member (new name) of the Virginian Ridge Formation. Thickness at the type section is about 450 m. Age is Cretaceous (Aptian and Albian) based on fossils.

Payne Cliffs Formation

Eocene
Oregon
Klamath Mountains province

McKnight, B.K., 1984, Stratigraphy and sedimentology of the Payne Cliffs Formation, southwestern Oregon, *in* Nilsen, T.H., ed., Geology of the Upper Cretaceous Hornbrook Formation: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 42, p. 187–194.

Type section: Exposures near Payne Cliffs, 4.5 km northwest of Phoenix, Bear Creek valley, Klamath Mountains, Jackson County, Oreg.

The Payne Cliffs Formation, here named, was informally named by McKnight (1971) and was previously mapped as the Umpqua Formation by Wells (1956). Is exposed along the northeast margin of the Klamath Mountains in the Medford-Ashland area of southwest Oregon and represents braided-stream deposits and fining-upward sequences of conglomerate and sandstone derived from the Klamath Mountains. Consists of informal Unit 1, a basal conglomerate unit of crudely bedded gravel and sand, 160 m thick, and Unit 2, an upper sandstone unit, containing conglomerate lenses, 2,150 m thick. Unconformably overlies the Late Cretaceous Hornbrook Formation; unconformably underlies volcanic and volcaniclastic rocks of the Cascade Range. Thickness at the type section is 27 m. Minimum age is late Eocene based on fossil leaves.

Peaks of Otter Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Exposures at the Peaks of Otter, lat 37°27′ N., long 79°35′ W., Peaks of Otter 7.5-minute quadrangle, Bedford County, Va.

The Peaks of Otter Suite, here named, is in the Pedlar massif in the Blue Ridge of Virginia. Typical exposures of mesocharnockite are found in the Peaks of Otter and Montvale quadrangles. Age is Middle Proterozoic.

Pedlar River Charnockite Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Sinha, A.K., and Bartholomew, M.J., 1984, Evolution of the Grenville terrane in the central Virginia Appalachians: Geological Society of America Special Paper 194, p. 175–186.

Type section: Outcrop 400 m S. 10° W. of Hog Camp Gap where the Appalachian Trail reaches the crest of Cole Mountain, lat 37°45′30″ N., long 79°11′30″ W., Montebello 7.5-minute quadrangle, Rockbridge County, Va. Named for the Pedlar River.

The Pedlar River Charnockite Suite, here named in the Pedlar massif in Virginia, consists of coarse-grained massive and foliated charnockites containing quartz, perthite, plagioclase, hypersthene, and ilmenite showing evidence of ductile deformation and mylonitization. Intrudes the Lady Slipper Granulite Gneiss (new name). Age is Middle Proterozoic based on a concordia intercept age of 1,075 Ma.

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

The Pedlar River Charnockite Suite, previously named the Pedlar River pluton by Bartholomew and others (1981), includes four main rock types: granite, leucocharnockite, mesocharnockite, and the informal Vesuvius megaporphyry, which crops out along Virginia Highway 56 about 2 mi east of the town of Vesuvius, Rockbridge County, Va. The Pedlar River intrudes the basal Nellysford Granulite Gneiss (new name) and the Lady Slipper Granulite Gneiss (new name).

Pelham Bay Member of the **Hartland Formation** of the **Hutchinson River Group**

Late Cambrian and Early Ordovician
New York
New England province

Baskerville, C.A., 1982, Adoption of the Hutchinson River Group and its subdivisions in Bronx and Westchester Counties, southeastern New York: U.S. Geological Survey Bulletin 1529–H, p. H1–H10.

Type locality: Outcrops in Pelham Bay Park, Flushing 7.5-minute quadrangle, Bronx County, N.Y.

The Pelham Bay Member, here named, of the Hartland Formation of the Hutchinson River Group (new name) is exposed in the Long Island Sound area of New York but may extend beneath the sound off the Connecticut coast. Consists of interbedded amphibolites, gneisses, and schists of very high metamorphic grade, granulite, and pegmatite.

Maximum thickness is 1,500 m. Age is probably Late Cambrian and Early Ordovician based on a potassium-argon age of 380 Ma.

Pelican Island Bed of the Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 4 of Morrison (1964), southeast of Pelican Island, 3.6 km east of Timber Lake, Churchill County, Nev.

The Pelican Island Bed, here named, is the lowermost of five beds of tephra in the Pyramid Lake Member (new name) of the Mount Mazama Formation. Consists of very fine grained, ashy parting and is more potassium-rich than the Timber Lake Bed (new name), the next higher bed in the Pyramid Lake Member. Interfingers with the lower member of the Sehoo Formation. Overlies the Marble Bluff Bed (new name) and underlies the Carson Sink Bed (new name) of the Mono Basin Formation (new name). Age is Pleistocene, 35–11.5 ka.

Perkins Bluff Member of the Rhems Formation of the Black Mingo Group

Paleocene (Danian, Midwayan)
South Carolina
Atlantic Coast basin

Van Nieuwenhuise, D.S., and Colquhoun, D.J., 1982, The Paleocene-lower Eocene Black Mingo Group of the east central Coastal Plain of South Carolina: South Carolina Geology, v. 26, no. 2, p. 47–67.

Type section: Exposures along Perkins Bluff on the Black River, Georgetown County, S.C.

The Perkins Bluff Member, here named, is the upper member of the Rhems Formation of the Black Mingo Group in the Coastal Plain of South Carolina. The revised Black Mingo Group includes all the strata from the base of the Paleocene to the unconformity at the top of the Ypresian Stage of the Eocene and is divided into the Rhems Formation of the Danian Stage, the Williamsburg Formation of the Thanetian Stage, and unnamed Ypresian strata. [In the Clubhouse Crossroads corehole Number 1, Gohn and others (1978) assigned the entire Paleocene section to the Black Mingo Formation, and Gohn and others (1983) named the Ypresian section the Fishburne Formation (new name).] The Perkins Bluff Member consists of imbricated, pelecypod-rich, partly silicified, argillaceous sand forming a prominent ridge that extends along the Black River and overhangs the Browns Ferry Member (new name) of the Rhems. Unconformably overlies the Browns Ferry Member with sharp erosional contact; unconformably underlies the Lower Bridge Member (new name) of the Williamsburg Formation. Thickness at the type section is 10 ft. Age is Paleocene (late Danian, middle Midwayan).

Pettus Lake Member of the Fort Rock Formation

Pliocene
Oregon
Southern Oregon basin

Colbath, G.K., and Steele, M.J., 1982, The geology of economically significant lower Pliocene diatomites in the Fort Rock basin near Christmas Valley, Lake County, Oregon: Oregon Geology, v. 44, no. 10, p. 111–118.

Type section: Exposure west of Seven Mile Ridge and Pettus Lake, SE¼NW¼ sec. 5, T. 28 S., R. 17 E., Lake County, Ore.

The Pettus Lake Member of the Fort Rock Formation, here named, occurs in the Fort Rock basin, Oregon. Includes the diatomite-dominated rocks of the informal tuffaceous sandstone and siltstone, tuff, and diatomite unit Tst, mapped by Walker and others (1967); the remainder of unit Tst is grouped with their palagonitic tuff unit QTps, here referred to informally as the volcaniclastic rocks of Seven Mile Ridge and Table Rock. Consists of white, pale-orange, or pale-gray, thick-bedded diatomite containing irregularly spaced tabular interbeds of volcanic ash and pumice. Overlies the Picture Rock Basalt; conformably underlies and is interbedded with volcaniclastic breccia of Seven Mile Ridge. Thickness is about 4 m at the type section and about 91 m in the central part of the Fort Rock basin. Age is early Pliocene based on diatoms.

Pflugerville Formation of the Austin Group

Late Cretaceous
Texas
Ouachita tectonic belt province

Garner, L.E., and Young, K.P., 1976, Environmental geology of the Austin area—An aid to urban planning: Texas Bureau of Economic Geology Report of Investigations 86, 39 p.

Type locality: None designated. Named for the town of Pflugerville, Travis County, Tex.

The Pflugerville Formation, here named, is in the Austin Group and occurs in the Austin, Tex., area. Consists of light-gray, chalky, clayey limestone containing hard limestone beds at the base and top. Overlies the Burditt Formation of the Austin; is equivalent to the McKown

Formation (new name) of the Austin, a beach rock facies; underlies the Sprinkle Formation of the Taylor Group. Thickness is 40 ft. Age is Late Cretaceous.

Pharaoh Mountain Gneiss of the Piseco Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Exposures on Pharaoh Mountain, on the east side of Schroon Lake, and in woods on the east side of the town road north from Adirondack toward Schroon Lake Village, Paradox Lake quadrangle, Essex County, N.Y.

Interlayered charnockitic and granitic gneisses in large domical massifs are here named the Pharaoh Mountain Gneiss, the basal unit of the Piseco Group (new name) in the Adirondack Mountains in New York. Underlies the Brant Lake Gneiss of the Piseco Group in the central and eastern Adirondacks, the Alexandria Bay Gneiss (new name) of the Piseco in the Northwest Lowlands, and leucogranitic gneiss in the western Adirondack Highlands. Age is Proterozoic.

Phelan Formation

Pliocene and Pleistocene
California
Mohave basin

Weldon, Ray, 1984, Implications of the age and distribution of the late Cenozoic stratigraphy in Cajon Pass, southern California, *in* San Andreas fault, Cajon Pass to Wrightwood: American Association of Petroleum Geologists, Pacific Section, and Los Angeles Basin Geological Society volume and guidebook 55, p. 9–16.

Type locality: None designated. Exposed southwest of Phelan Peak, about 5 km northeast of Wrightwood, western San Bernardino Mountains, San Bernardino County, Calif.

Magnetic stratigraphy demonstrates that the Crowder Formation in the Cajon Pass area of the San Bernardino Mountains, Calif., is Miocene. A younger unit to the west, formed as a narrow northwest trending basin parallel to and north of the San Andreas fault, that had previously been included in the Crowder as the western Crowder of Foster (1980), is here removed from the Crowder and named the Phelan Formation. Consists of tuff, sand, and gravel, and crops out over an area of 50 km^2. Overlies the Punchbowl and Crowder Formations;

underlies the Harold Formation of the Victorville Fan sequence. Age is Pliocene and Pleistocene, 4.2 to 0.9 Ma, based on magnetic polarity stratigraphy.

Picture Rock Member of the Hopkinton Dolomite

Early Silurian (Llandoverian, Telychian)
Iowa
Iowa shelf

Johnson, M.E., 1983, New member names for the Lower Silurian Hopkinton Dolomite of eastern Iowa: Iowa Academy of Science Proceedings, v. 90, no. 1, p. 13–18.

Type section: Exposures in natural bluffs along the Maquoketa River in Picture Rock Park, SE¼SW¼ sec. 32, T. 86 N., R. 2 W., Jones County, Iowa.

Previously divided on the basis of paleontologic units, the Hopkinton Dolomite is here divided into lithologic members to facilitate interregional correlations based on sea-level curves. Rocks formerly called the *Favosites* Beds of the Hopkinton are here named the Picture Rock Member of the Hopkinton Dolomite in eastern Iowa. Consists of tan to brown, very thick bedded or massive, medium crystalline, highly vuggy dolomite that has abundant tabulate coral colonies. Overlies the Farmers Creek Member (new name) of the Hopkinton; underlies the Johns Creek Quarry Member (new name) of the Hopkinton. Thickness at the type section ranges from 10.75 to 11.50 m. Age is Early Silurian (Llandoverian, Telychian).

Pierce Formation

Pleistocene (pre-Illinoian)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: West side of abandoned gravel pit, north of Highway 12, 1.0 km southwest of Hersey, SW¼SE¼SE¼ sec. 29, T. 29 N., R. 15 W., Wilson 7.5-minute quadrangle, St. Croix County, Wis. Named for Pierce County.
Subunits: Hersey Member, Kinnickinnic Member.

The Pierce Formation, here named, occurs in Pierce, St. Croix, Dunn, Pepin, and Buffalo Counties, Wis. Includes the lower Hersey Member (new name) and the upper Kinnickinnic Member (new name). Consists of gray calcareous till and associated yellowish-brown sand and gravel and laminated silt and clay of glacial lacustrine origin. Basal contact is unknown except where it overlies Paleozoic bedrock; sharply underlies the River Falls Formation (new name) in northern Pierce and St. Croix Counties, elsewhere it is the surficial unit. Thickness ranges from less than 1 m to 55 m. Age is Pleistocene (pre-Illinoian).

Pilgrim Conglomerate Member of the Colter Formation

Miocene
Wyoming
Yellowstone province

Barnosky, A.D., 1984, The Colter Formation—Evidence for Miocene volcanism in Jackson Hole, Teton County, Wyoming: Wyoming Geological Association, Earth Science Bulletin, v. 17, p. 49–97.

Type section: Exposures along Pilgrim Creek (the upper part of the Colter Formation type section), Two Ocean Lake 7.5-minute quadrangle, Teton County, Wyo.

The Pilgrim Conglomerate Member is here named the upper member of the Colter Formation and is exposed at Pilgrim Creek, Two Ocean Lake, Cunningham Hill, Shadow Mountain, and Ditch Creek, Teton County, Wyo. The major vent area for the member was a few kilometers northwest of Pilgrim Mountain. Consists of pink rhyolitic tuff, ignimbrite, and conglomerate, and differs from the underlying Crater Tuff Breccia Member (new name) of the Colter by the occurrence of conglomerate, sandstone, and claystone, its pink, white, blue-gray, tan-gray, or green color, the presence of angular to subrounded volcanic clasts, and the frequent occurrence of rounded quartz cobbles. Is older than the Huckleberry Ridge Tuff. Thickness is 1,000 m. Was deposited between 13 and 9.4 Ma during later Miocene volcanism.

Pilot Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Outcrops behind the Pilot Community Center, Pilot 7.5-minute quadrangle, Montgomery County, Va.

The Pilot Gneiss, here named in the Pedlar massif in the Virginia Blue Ridge, is an intrusive leucogranulite gneiss containing small hornblende granitoid bodies. Age is Middle Proterozoic.

Piney Branch Complex

Late Proterozoic and (or) Early Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Morgan, B.A., 1981, The Piney Branch Complex—A metamorphosed fragment of the Central Appalachian ophiolite in northern Virginia: American Journal of Science, v. 281, no. 4, p. 484–508.

Type locality: Exposures along Piney Branch between Robeys Mill and a point about 300 m north of Braddock Road, Fairfax 7.5-minute quadrangle, Fairfax County, Va.

The Piney Branch Complex, here named, crops out over an area of 9 km^2 for a length of 18 km from Oakton to near Yorkshire in Fairfax County, Va. Is a tectonic melange resulting from the deformation of a layered complex that contained repetitive cycles of ultramafic and mafic rocks that are now metamorphosed to serpentinite, soapstone, actinolite schist, and metagabbro. Is intruded by dikes and sheets of plagiogranite. A discontinuous underlying border of precursory ophiolitic melange, the Yorkshire Formation (new name), which is thought to record the first movement of the allochthonous Piney Branch slab. The allochthon consisting of the Piney Branch and Yorkshire was thrust upon the Peters Creek Schist and, together with it, forms a composite allochthon that was emplaced on the Sykesville Formation, perhaps by gravity sliding. Unconformably underlies the Popes Head Formation (new name). Movement of the Piney Branch began in the Late Proterozoic after the metamorphism of the Peters Creek and ended during the Taconic orogeny. Age is Late Proterozoic and (or) Early Cambrian.

Pippins Cemetery Formation

Holocene
Missouri
Ozark uplift

Haynes, C.V., Jr., 1985, Mastodon-bearing springs and late Quaternary geochronology of the lower Pomme de Terre valley, Missouri: Geological Society of America Special Paper 204, 35 p.

Type locality: None designated. Probably named for Pippins family cemetery, spelled Pippens on the Fristoe 15-minute quadrangle map, Benton and Hickory Counties, Mo.

The historic flood plain T–0 of the Pomme de Terre River, Benton and Hickory Counties, Mo., is here named the Pippins Cemetery Formation. This unit was called the informal Pippens formation by Brakenridge (1981). Consists of a compound, 4- to 6-m-thick terrace of two cut-and-fill deposits of gray silt or silty fine sand over brown chert pebble gravel. Unconformably overlies the Breshears Valley Formation (new name). Age is Holocene based on radiocarbon dates of 0.84 and 0.43±0.1 ka.

Piseco Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type area: Exposures in the Piseco dome near Piseco Lake, Hamilton County, N.Y.
Subunits: Pharaoh Mountain Gneiss, Brant Lake Gneiss, Alexandria Bay Gneiss.

Basement rocks of the Adirondack Mountains, N.Y., consisting of interlayered charnockitic, granitic, and leucogranitic gneisses, are here named the Piseco Group. Includes the basal Pharaoh Mountain Gneiss (new name), which is overlain by the Brant Lake Gneiss in the central and eastern Adirondacks, by leucogranitic gneiss in the western Adirondack Highlands, and by the Alexandria Bay Gneiss (new name) in the Northwest Lowlands. Basal quartzofeldspathic gneiss is the only unit of the Piseco Group in the southern Adirondacks. Unconformably underlies metasedimentary rocks of the Oswegatchie Group in the Northwest Lowlands and the Lake George Group (new name) in the central, eastern, and southern Adirondacks. Regional metamorphism occurred during the Grenville orogeny. Age is Proterozoic.

Pleasant Lake Gneiss of the Oswegatchie Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Exposures in and around Pleasant Lake and Rossie, St. Lawrence County, N.Y.

Gray hornblende-biotite-quartz-plagioclase gneiss and basal quartzite, previously named the Major Gneiss by Lewis (1969), are here named the Pleasant Lake Gneiss of the Oswegatchie Group in the Northwest Lowlands of the Adirondacks, N.Y. Overlies the Gouverneur Marble of the Oswegatchie; correlates with the Treadway

Mountain Formation of the Lake George Group (both new names) in the eastern Adirondacks. Maximum thickness is 1,050 m. Age is Proterozoic.

Pleasant Mills Formation of the Salina Group

Middle Silurian
Indiana
Cincinnati arch

Droste, J.B., and Shaver, R.H., 1982, The Salina Group (Middle and Upper Silurian) of Indiana: Indiana Geological Survey, Special Report 24, 41 p.

Type section: Meshberger Brothers Stone Corporation quarry, 3 mi south of Pleasant Mills, center sec. 4, T. 26 N., R. 15 E., Adams County, Ind.
Subunit: Limberlost Dolomite Member.

The Pleasant Mills Formation of the Salina Group, here named, includes all Silurian rocks that lie above the Salamonie Dolomite and below the Wabash Formation in central and northern Indiana northeast of the defined limit of the Salina Group. In the area within and south of the Fort Wayne Bank, the formation includes the Limberlost Dolomite Member, here reduced from formation rank, and overlying rocks formerly assigned to the Waldron and Louisville Formations, which are, in this area, interbedded and lacking typical lithologies. North of the Fort Wayne Bank the Limberlost Dolomite Member may be identified wherever an upper contact is provided by a recognizable Waldron equivalent. The formation has an arbitrary cutoff on the southeast at the Limberlost depositional limit; the Waldron and Louisville retain their formational status south of this limit. The Pleasant Mills consists of medium- to dark-brown, fine-grained dolomite containing nodular chert, and lighter brown, more granular, porous dolomite. A reef facies near the Fort Wayne Bank is termed the Huntington lithofacies. Two major depositional cyclic sequences are recognized. Thickness ranges from 0 to 300 ft. Age is Middle Silurian (Niagaran).

Ponderosa Way Member of the Chico Formation

Late Cretaceous (Coniacian)
California
Sacramento basin

Haggart, J.W., and Ward, P.D., 1984, Late Cretaceous (Santonian-Campanian) stratigraphy of the northern Sacramento Valley, California: Geological Society of America Bulletin, v. 95, no. 5, p. 618–627.

Type section: Exposures on Big Chico Creek near Ponderosa Way Bridge, sec. 1, T. 23 N., R. 2 E., Butte County, Calif. Named for the foothills road, Ponderosa Way.

The Ponderosa Way Member, informally named by Saul (1961), is here named the basal unit of the Chico Formation along Butte, Big Chico, and Deer Creeks in Butte and Tehama Counties, eastern Sacramento Valley, Calif. Consists of poorly sorted and moderately well rounded cobble conglomerate containing local sand lenses in the lower part; the upper parts become increasingly sandy through interbedding of sandstone lenses within the conglomerate. Unconformably overlies pre-Cretaceous metamorphic rocks; conformably underlies the Musty Buck Member (new name) of the Chico. Thickness is 200 m. Age is Late Cretaceous based on Coniacian ammonites in the upper part of the Ponderosa Way Member.

Pond Ridge Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: NE¼NW¼ sec. 3, T. 33 N., R. 3 E., Ironton quadrangle, Iron County, Mo. Exposed at Shepherd Mountain Lake dam on Pond Ridge.

Rocks previously mapped as the upper part of the Cedar Bluff felsite or undifferentiated felsite by Anderson (1962, 1970) are here named the Pond Ridge Rhyolite in the western St. Francois Mountains in southeast Missouri. Consists of dark-maroon to grayish ash-flow tuff containing white to pinkish feldspar phenocrysts, quartz phenocrysts, and large reddish fiamme. Overlies the Cedar Bluff Rhyolite (new name); underlies the Buck Mountain Shut-ins Formation (new name). Thickness is 130 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Pond Ridge Rhyolite.

Popes Creek Sand Member of the **Calvert Formation**

Miocene
Maryland, Virginia, Delaware
Atlantic Coast basin

Gibson, T.G., 1983, Stratigraphy of Miocene through lower Pleistocene strata of the United States central Atlantic Coastal Plain, *in* Ray, C.E., ed., Geology and paleontology of the Lee Creek Mine, North Carolina, I: Smithsonian Contributions to Paleobiology, no. 53, p. 35–80.

Type section: Outcrop on the north bank of the Potomac River, 300 ft southeast of the mouth of Popes Creek, Charles County, Md.

The basal transgressive beds of the Calvert Formation in the Salisbury embayment are here removed from the Fairhaven Member because of their lithologic distinction from the rest of the Fairhaven and are here named the Popes Creek Sand Member. Crops out in Maryland west of the Chesapeake Bay from near Fairhaven south to Popes Creek and into Virginia. Extends into Delaware in the subsurface. Consists of olive-brown and green to greenish-white glauconitic quartz sand having a basal layer of quartz and phosphate pebbles and phosphatized mollusk shells. Unconformably overlies the Nanjemoy Formation; overlies an older cycle of sand and diatomaceous clay beds, termed the Dunkirk beds of the Calvert Formation, along the Patuxent River in Maryland. Underlies the Fairhaven Member of the Calvert. Thickness at the type section is 10.5 ft. Age is early Miocene.

Popes Head Formation

Late Proterozoic and (or) Early Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Lyttle, P.T., 1981, The Accotink Schist, Lake Barcroft Metasandstone, and Popes Head Formation—Keys to an understanding of the tectonic evolution of the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1205, 16 p.

Type locality: Exposures along Popes Head Creek and adjacent tracks of the Southern Railroad between Station Hills, Fairfax 7.5-minute quadrangle, and the confluence of the creek with Bull Run, Manassas 7.5-minute quadrangle, Fairfax County, Va.
Subunits: **Old Mill Branch Metasiltstone Member, Station Hills Phyllite Member.**

The Popes Head Formation, here named, is a sequence of metasiltstone and phyllite in northern Virginia that was originally named the Clifton Phyllite by A.P. Bennison and Charles Milton (USGS, unpublished data, 1950). The unit is renamed the Popes Head Formation because the geographic name Clifton is preempted. Includes the Old

Mill Branch Metasiltstone Member (new name) and the Station Hills Phyllite Member (new name). Unconformably overlies all other metasedimentary and transported meta-igneous rocks of the Wissahickon terrane in northern Virginia including the allochthon consisting of the Yorkshire Formation and the Piney Branch Complex (both new names). Is intruded by Occoquan Granite. Age is Late Proterozoic and (or) Early Cambrian based on a radiometric age of Early Cambrian for the Occoquan Granite.

Poplar Hill Gneiss of the Oswegatchie Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: Road cut on Route 58 and exposures on adjacent Poplar Hill, 2.4 km west of Emeryville, between Balmat and Gouverneur, St. Lawrence County, N.Y.

The Poplar Hill Gneiss of the Oswegatchie Group, here named, was previously named the Major Paragneiss by Engel and Engel (1953). Occurs in the Northwest Lowlands of the Adirondack Mountains, N.Y. Consists of rusty-brown- or gray-weathering biotite-quartz-oligoclase gneiss that has thin layers and veins of pink to white granitic gneiss. Overlies the Baldface Hill Gneiss (new name) and unconformably underlies the Gouverneur Marble, both of the Oswegatchie Group. Correlates with the Eagle Lake Gneiss of the Lake George Group (both new names) in the eastern Adirondacks. Age is Proterozoic.

Poppin Rock Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut along the western side of Kentucky Highway 1274, 1.1 km north of the Licking River (Cave Run Lake), Bangor quadrangle, Rowan County, Ky. Named for Poppin Rock tunnel near Paragon, 5.5 km east of the type section.

The Poppin Rock Member, here named, is in the Slade Formation (new name) and was previously called the Glen Dean Limestone. Usage of the name Glen Dean is here restricted from the Cumberland Escarpment outcrop area of east-central and northeastern Kentucky, and the usage of the name Poppin Rock is restricted to the geographic limits of the Slade Formation. Occurs throughout the outcrop belt of the Slade south of Greenup County. Consists of thin- to thick-bedded calcarenite that has shale partings. Conformably or disconformably overlies the Maddox Branch Member (new name) of the Slade; conformably underlies or intertongues with the Paragon Formation (new name), or disconformably underlies the Paragon, Lee, or Breathitt Formations in the north. Thickness ranges from 0 to 12 m. Age is Late Mississippian.

Porvenir Formation of the **Madera Group**

Middle Pennsylvanian (Desmoinesian)
New Mexico
Palo Duro basin, Las Vegas-Raton basin

Baltz, E.H., and Myers, D.A., 1984, Porvenir Formation (new name)—And other revisions of nomenclature of Mississippian, Pennsylvanian, and Lower Permian rocks, southeastern Sangre de Cristo Mountains, New Mexico: U.S. Geological Survey Bulletin 1537–B, p. B1–B39.

Type section: Along U.S. Forest Service Johnson Mesa road on the ridge south of Canovas Canyon, a south tributary of Gallinas Creek, 12.5 mi northwest of Las Vegas, Santa Fe National Forest, center sec. 23, T. 17 N., R. 14 E., San Miguel County, N. Mex. Principal reference section specified for northern facies. Named for exposures in hogbacks near El Porvenir Campground.

Rocks previously called the lower gray limestone member of the Madera Formation are here named the Porvenir Formation, the lower unit of the Madera Group in the southeastern Sangre de Cristo Mountains, San Miguel and Mora Counties, N. Mex. Includes three laterally intergrading marine facies: a southern carbonate facies, a shale-carbonate facies, and a northern sandstone-shale-carbonate facies. Consists of limestone and interbedded gray shale and a minor amount of sandstone at the type section, characteristic of the southern carbonate facies deposited in shallow seas. Consists of shale, sandy and oolitic limestones, and arkosic sandstone to the northeast. Conformably overlies the Sandia Formation; disconformably underlies the Alamitos Formation of the Madera Group. Thickness at the type section is 1,065 ft and ranges from 700 to 1,615 ft. Age is Middle Pennsylvanian based on fusulinids of Desmoinesian Age.

Posey Canyon Shale Member of the Peace Valley Formation of the Ridge Basin Group

Miocene
California
Los Angeles basin

Link, M.H., 1982, Stratigraphic nomenclature and age of Miocene strata, Ridge basin, southern California, *in* Crowell, J.C., and Link, M.H., eds., Geologic history of Ridge basin, southern California: Society of Economic Paleontologists and Mineralogists, Pacific Section, guidebook, p. 5–12.

Type section: Outcrops on the southwest side of Pyramid Dam and Lake, Los Angeles County, Calif. Named for Posey Canyon, which is now covered by Pyramid Lake.

The Posey Canyon Shale Member, here named, is in the Peace Valley Formation, redefined, of the Ridge Basin Group in the central Ridge basin, Los Angeles County, Calif., where the Peace Valley is separated into five members by clastic tongues of the Ridge Route Formation. Consists of indurated gray shale, mudstone, dolomicrite, pyritic shale and siltstone, and gypsiferous siltstone and contains plant, fish, ostracode, and mollusk fossils. Lateral extent is 2,700 to 3,600 m; interfingers with the Violin Breccia to the southwest and the Ridge Route Formation undivided and its Apple Canyon Siltstone Member (new name) to the northeast. Conformably overlies the Piru Gorge Sandstone Member (redefined) of the Ridge Route Formation; conformably underlies the Alamos Canyon Siltstone Member (new name) of the Peace Valley and is separated from it by a distinctive tuff horizon. Thickness is 1,000 m at the type section and ranges from 730 to 1,000 m. Age is late Miocene based on fossil plants.

Poverty Flat Sandstone

Eocene
California
San Joaquin basin

Bartow, J.A., 1985, Revisions in the Tertiary stratigraphy of the east flank of the Diablo Range, central California: U.S. Geological Survey Bulletin 1605–A, p. A1–A6.

Type section: Along the California Aqueduct south of Orestimba Creek, secs. 20, 29, and 32, T. 7 S., R. 8 E., Newman 7.5-minute quadrangle, Stanislaus County, Calif. Reference section: Texaco Howard 1 well, 25 km east of the type section. Named for Poverty Flat, a valley east of the aqueduct.

The Poverty Flat Sandstone, here named, includes conglomerate and conglomeratic sandstone previously assigned to the undifferentiated Miocene between Garzas and Crow Creeks by Anderson and Pack (1915), the informally named Poverty Flat siltstone by Collins (1950), and the basal part of the San Pablo Formation of Anderson and Pack (1915) in the area south of Hospital Creek on the east flank of the Diablo Range. Consists of gray or blue-gray lithic sandstone in the lower part and interbedded gray to white kaolinitic quartzose sandstone and siltstone, carbonaceous shale, kaolinitic claystone, and conglomerate in the upper part. Red or orange mottling is characteristic in the upper part. Overlies, possibly unconformably, the Kreyenhagen Shale; unconformably underlies the Valley Springs Formation. Age is late middle and late Eocene based on diatoms and mollusks.

Pressmens Home Formation

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: Exposures on a hillside 3.2 km northeast of Camelot (Pressmens Home) and 244 m north of Laurel View Church, 0.5 km northwest of the intersection of Tennessee Highway 94 and Laurel Branch Road, Camelot quadrangle, Hawkins County, Tenn.

The Pressmens Home Formation, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., were previously named the Newman Limestone by Hardeman and others (1966), but are isolated from the type Newman Limestone in the Newman Ridge syncline. The Pressmens Home consists of siltstone, sandstone, limestone, and dolostone that grade into one another both horizontally and vertically. Overlies the Maccrady Formation; underlies the Laurel Branch Limestone (new name). Correlates with the Little Valley Formation of Averitt (1941). Thickness is 44.6 m at the type section. Age is Mississippian.

Proctor Creek Member of the Canton Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

German, J.M., 1985, The geology of the northeastern portion of the Dahlonega gold belt: Georgia Geologic Survey Bulletin 100, p. 1–41.

Type locality: Exposures along Proctor Creek near Dawsonville, Dawsonville 7.5-minute quadrangle, Dawson County, Ga.

The Proctor Creek Member of the Canton Formation, here named, is in the Dahlonega, Ga., area and was previously mapped as Carolina Gneiss by Keith (1909). Consists of fine- to medium-grained muscovite-garnet-biotite-quartz schist having a silvery luster. Sharply overlies iron formation or amphibolite of the Pumpkinvine Creek Formation; gradationally underlies darker garnet-poor biotite-quartz schist of the Palmer Creek Member (new name) of the Canton. Age is Late Proterozoic and (or) early Paleozoic.

Proffit Mountain Formation of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology Number 6, p. 81–90.

Type section: SW¼ sec. 16, T. 33 N., R. 2 E., Johnson Shut-ins quadrangle, Reynolds County, Mo. Derivation of name not stated.

Rocks previously mapped as the lower part of the tuff of Johnson Shut-ins by Anderson (1970) are here named the Proffit Mountain Formation. Occurs in the western St. Francois Mountains in southeast Missouri. Consists of six tuff units: A, red ash-flow tuff containing quartz and feldspar phenocrysts, 16 m thick; B, red or gray, crossbedded air-fall tuff, 5 m thick; C, deep-maroon ash-flow tuff containing quartz and feldspar phenocrysts, 39 m thick; D, rose-gray ash-flow tuff containing quartz and feldspar phenocrysts, 56 m thick; E, red, crossbedded air-fall tuff, 15 m thick; and F, gray, crossbedded air-fall tuff, 7 m thick. Overlies the Taum Sauk Rhyolite (new name); underlies the Johnson Shut-ins Rhyolite (new name). Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Proffit Mountain Formation.

Promised Land Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type section: Roadcuts along Georgia Highway 124 where it crosses the Yellow River, 1 km west of Promised Land, Snellville quadrangle, Gwinnett County, Ga.
Subunit: **Hannah Member.**

The Promised Land Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga. Consists of interlayered gneiss and amphibolite in the lower part and the Hannah Member (new name), composed of quartzite and schist, at the top. Is in gradational contact with the Wolf Creek Formation (new name), in sharp conformable contact with the Clairmont Formation (new name), both of the Atlanta, and in sharp, probably tectonic contact with the Lithonia Gneiss. Thickness ranges from 400 to 1,500 m. Age is Late Proterozoic and (or) early Paleozoic.

Prospect Mountain Hornblende Granitic Gneiss

Middle Proterozoic
New York
New England province

Fisher, D.W., 1984, Bedrock geology of the Glens Falls—Whitehall region, New York: New York State Museum Map and Chart Series no. 35, 58 p.

Type locality: Exposures along the Prospect Mountain Memorial Highway, Lake George quadrangle, Warren County, N.Y.

The Prospect Mountain Hornblende Granitic Gneiss is here named. Consists of dark-olive-brown- to gray- or pink-weathering, light- to medium-gray, medium- to coarse-grained, locally megacrystic, foliated gneiss containing biotite, garnet, graphite, augite, and hypersthene. Contains small unmappable bodies of meta-anorthosite. Age is Middle Proterozoic.

Pumpkin Bay Formation

Early Cretaceous (Coahuilan)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies Transactions, October (supplement), v. 31, p. 447–453.

Type section: Bass Collier Company 12–2 well P–778, depth interval 14,050–15,130 ft, sec. 12, T. 52 S., R. 27 E., Collier County, Fla. Named for Pumpkin Bay, 3 mi south of the type well.

The Pumpkin Bay Formation, here named, is in the subsurface of the South Florida basin, where it is one of four regionally persistent anhydrite units below the Punta Gorda Anhydrite of the Glades Group. Consists of anhydrite and dolomite in the lower part and cream, tan, and brown micritic limestone, occasionally oolitic, in the upper part. Overlies the Bone Island Formation (new name); the contact is at the top of a regionally persistent 200-ft anhydrite bed in the Bone Island; underlies the West Felda Shale Member (new name) of the Lehigh Acres Formation (new name) of the Glades. Thickness is 1,080 ft at the type well. Age is Early Cretaceous (late Coahuilan) based on stratigraphic position.

Put River Sandstone

Early Cretaceous
Alaska
Arctic Coastal Plains province

Jamison, H.C., Brockett, L.D., and McIntosh, R.A., 1980, Prudhoe Bay—A 10-year perspective, *in* Halbouty, M.T., ed., Giant oil and gas fields of the decade 1968–1978: American Association of Petroleum Geologists Memoir 30, p. 289–314.

Type section: ARCO-Exxon NGI–7 well, depth interval 8,027–8,091 ft, Prudhoe Bay field, T. 11 N., R. 14 E., Umiat Base Line, Alaska. Derivation of name not stated.

The Put River Sandstone, here named, is in the center of the Prudhoe Bay field and along the western shoreline of Prudhoe Bay, where it occupies the basal sections of channels eroded into the rocks underlying the Lower Cretaceous erosion surface. Consists of gray-brown, conglomeratic, quartzose chert sandstone containing lesser amounts of glauconite. Occurs directly above the Lower Cretaceous unconformity and unconformably overlies the Sag River Sandstone; underlies unnamed Lower Cretaceous shale. Is considered part of the Permo-Triassic Reservoir of the Prudhoe Bay field. Thickness at the type section is 64 ft. Age is Early Cretaceous based on micropaleontologic and palynologic data.

Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada, California
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: East shore of Pyramid Lake, 500 m southeast of Pyramid Island, center NE¼SW¼ sec. 3, T. 24 N., R. 22 E., Washoe County, Nev.

Subunits: Pelican Island, Timber Lake, Wono, Leter Ranch, and Trego Hot Springs Beds.

The Pyramid Lake Member of the Mount Mazama Formation, here named, is in the Lake Lahontan area, Nevada, and California. Contains five tephra beds, named above in ascending order (all new names), which are inferred to represent the products of a single body of magma that was becoming progressively more potassium rich and differentiated and whose source was Mount Mazama. Beds are intercalated with the lower member of the Sehoo Formation. Age is Pleistocene, 35 to 11.5 ka.

Quartet Group of the Wernecke Supergroup

Middle Proterozoic
Canada, Alaska
Yukon-Porcupine province

Delaney, G.D., 1981, The mid-Proterozoic Wernecke Supergroup, Wernecke Mountains, Yukon Territory, *in* Campbell, F.H.A., ed., Proterozoic basins of Canada: Geological Survey of Canada Paper 81–10, p. 1–23.

Type area: Extensive exposures in the Wernecke and Ogilvie Mountains and the Keele Range of the Porcupine Plateau, Yukon Territory, Canada. Derivation of name not stated.

The Quartet Group of the Wernecke Supergroup (new name), here named in the Yukon Territory, Canada, extends into Alaska in the Keele Range of the Porcupine Plateau. Is subdivided into two units of formational rank, informally designated Q–1 and Q–2. Consists of a monotonous succession of dark-gray-weathering siltstone, fine sandstone, mudstone, claystone, and minor silty dolomite. Basal part of the unit accumulated in a sediment-starved stagnant basin and the greater part was deposited in a shallow marine environment. Thickness is a minimum of 5 km. Age is Middle Proterozoic, 1,700 to 1,200 Ma.

Railroad Canyon Formation

Late Mississippian (Chesterian)
Idaho, Montana
Idaho Mountains province, Montana folded belt province

Wardlaw, B.R., and Pecora, W.C., 1985, New Mississippian-Pennsylvanian stratigraphic units in southwest Montana and adjacent Idaho, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–B, p. B1–B9.

Type section: Northwest of Railroad Canyon, NW1/4 sec. 31 and SE1/4 sec. 30, T. 17 S., R. 27 E., Bannock Pass 7.5-minute quadrangle, Lemhi County, Idaho.

The Railroad Canyon Formation, here named, is in the Beaverhead Range in east-central Idaho and southwest Montana. Consists of gray to black shale; gray, thin-bedded, flaggy, silty lime-mudstone; thin-bedded calcareous siltstone; olive-gray, flaggy claystone; mudchip, bioclastic conglomerate; yellow and gray, thin- to medium-bedded packstone; and gray, thin-bedded wackestone. Overlies the Scott Peak Formation; underlies the Bluebird Mountain Formation. Is equivalent to the Lombard Limestone (new name) and the Conover Ranch Formation (new name), both of the Snowcrest Range Group (new name), and the Surrett Canyon and Arco Hills Formations. Thickness is 205 m at the type section. Age is Late Mississippian (Chesterian) based on brachiopod and conodont faunas (Sando and Bamber Coral Zone V, or younger).

Rainbow Gardens Member of the **Horse Spring Formation**

Miocene
Nevada, Arizona
Great Basin province

Bohannon, R.G., 1984, Nonmarine sedimentary rocks of Tertiary age in the Lake Mead region, southeastern Nevada and northwestern Arizona: U.S. Geological Survey Professional Paper 1259, 72 p.

Type section: Exposures in Rainbow Gardens, lat 36°08′30″ N., long 114°57′30″ W., Henderson and Frenchman Mountain 7.5-minute quadrangles, Clark County, Nev.

The Rainbow Gardens Member, here named the lowermost of four members of the revised Horse Spring Formation, is recognized between Frenchman Mountain, Clark County, Nev., and Grand Wash Cliff, Mohave County, Ariz. Includes the oldest mappable unit in Longwell's (1963) Thumb Formation east of Frenchman Mountain, the oldest mappable Tertiary unit in the Bitter Spring Valley area, most of the Horse Spring Formation at Overton Ridge, and the lowest unit of the Horse Spring in the Virgin Mountains area. Consists of interbedded clastic sedimentary rocks ranging from conglomerate to claystone, carbonate rocks, evaporite beds, and chert. Gray and red-brown, blocky-weathering conglomerate occurs at the base at all exposures; the top is marked by a resistant limestone that forms a hogback through Rainbow Gardens. Represents a basal pediment gravel deposit overlain by a complex system of lake and playa deposits. Unconformably overlies the Kaibab Limestone and Moenkopi Formation through the Aztec Sandstone and Baseline Sandstone, depending on locality; underlies the revised Thumb Member of the Horse Spring Formation. Unit is wedge shaped, and thickness ranges from 50 to 400 m. Age is Miocene, about 20 Ma, based on fission-track ages of the Horse Spring Formation.

Ramey Creek Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut at the intersection of Kentucky Highways 1274 and 801, Bangor quadrangle, Rowan County, Ky. Named for Ramey Creek, west of the type section.

Strata previously assigned to the Cypress Sandstone, Golconda Formation, and other units that are now restricted from the Cumberland Escarpment area of east-central and northeastern Kentucky are here named the Ramey Creek Member of the Slade Formation (new name). Consists of interbedded limestone and shale containing abundant chert. Conformably overlies the Tygarts Creek Member (new name) and conformably underlies the Maddox Branch Member (new name), both of the Slade Formation. Thickness ranges from 0 to 10 m. Age is Late Mississippian.

Ramsey Member of the Bell Canyon Formation of the Delaware Mountain Group

Late Permian (Guadalupian)
Texas, New Mexico
Permian basin

Winner, Phil, 1985, Type section for the uppermost Bell Canyon Formation in the central Delaware basin of West Texas: West Texas Geological Society Bulletin, v. 24, no. 7, p. 7–10.

Type section: Gulf J.R. Grandin Number 1 well, sonic-gamma-ray log, SE¼ sec. 33, Block 29 PSL Survey, Loving County, Tex. Derivation of name not stated.

The Ramsey Member, here named, is in the informal A sand in the upper Bell Canyon Formation of the Delaware Mountain Group in the central Delaware basin of Texas and New Mexico. Was previously designated the informal unranked Ramsey sand by Nottingham (1960) and the Ramsey sandstone member by Grauten (1965). Is the uppermost and most prolific pay zone in the A sand and produces in the Two Freds, Monroe, Meridian, Paduca, Grice, El Mar, Pinal Dome, and Quito fields. Consists of very fine grained sandstone or coarse-grained siltstone and contains three informal sand units, in ascending order, R3, R2, and R1. R3 is absent in the Grice, El Mar, and Paduca fields and probably is absent west of these fields as well. R2 and R1 are regionally extensive and cover the entire central Delaware basin. Extends from the top of the Ford Member (new name) of the Bell Canyon to the third shale unit above the Ford Member; underlies the Trap Member (new name) of the Bell Canyon. Thickness ranges from 30 to 60 ft. [Age is Late Permian (Guadalupian).]

Rancheria Gulch Sandstone Beds of the **Blue Gulch Mudstone Member** of the **Hornbrook Formation**

Late Cretaceous (Campanian)
California
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Two low ridges directly southeast of Rancheria Gulch, center S½SW¼ sec. 20, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif.

The Rancheria Gulch Sandstone Beds, here named, are in the lower part of the Blue Gulch Mudstone Member (new name) of the Hornbrook Formation along the northeast margin of the Klamath Mountains between Ditch Creek and Osburger Gulch, Siskiyou County, Calif. Consists of gray, fine-grained sandstone that has thin interbeds of siltstone near the top. Molluskan fossils are present locally. Conformably overlies and underlies mudstone and siltstone of the Blue Gulch. Thickness is 85.8 m at the type section and ranges from 0 to 85.8 m. Age is Late Cretaceous (Campanian).

Ravencliff Member of the Hinton Formation

Late Mississippian (Chesterian)
West Virginia
Appalachian basin

Schalla, R.A., 1984, Deltaic deposits of the Upper Mississippian Ravencliff Member of the Hinton Formation, southern West Virginia: Southeastern Geology, v. 25, no. 1, p. 1–12.

Type locality: None designated. Origin of the name is unknown, but it is a generally accepted drillers' term in West Virginia, Kentucky, and Virginia.

A distinctive group of lithologies identified by geophysical and drillers' logs in the subsurface in McDowell and Wyoming Counties, W.V., is here named the Ravencliff Member of the Hinton Formation. Consists of a heterogeneous sequence of sandstone, quartz pebble conglomerate, and interbedded variegated shale. Is restricted to the strata that conformably overlie the Little Stone Gap Member and conformably underlie the radioactive Hot Shale marker bed of the Hinton Formation. Thickness ranges from 410 to 465 ft. Age is Late Mississippian (Chesterian).

Red Shirt Gabbro

Cretaceous
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Society of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Outcrops west of the portal of the Red Shirt mine, east side of the Methow Valley, T. 33 N., R. 23 E., Okanogan County, Wash.

The Red Shirt Gabbro, a postmetamorphic plutonic unit, here named, is in the Okanogan Range, Wash. Consists of massive, magmatic gabbro containing labradorite and green hornblende. Contact with the Wolf Canyon Quartz Diorite (new name) may be intrusive or gradational. Age is Cretaceous.

Rhodes Tuff

Miocene
California
Great Basin province

Wright, L.A., Kramer, J.H., Thornton, C.P., and Troxel, B.W., 1984, Appendix I—Type sections of two newly named volcanic units of the central Death Valley volcanic field, eastern California, *in* Wright, L.A., and Troxel, B.W., Geology of the northern half of

the Confidence Hills 15-minute quadrangle, Death Valley region, eastern California: the area of the Amargosa chaos: California Division of Mines and Geology Map Sheet 34, p. 21–24.

Type section: Composite of exposures extending for 12 km along the lower southwest sides of Salsberry Peak and Sheephead Mountain, from Rhodes Wash eastward to Salsberry Pass in the Black Mountains, Confidence Hills and Shoshone 15-minute quadrangles, Inyo County, Calif.

The Rhodes Tuff, here named, is in the Confidence Hills and Shoshone quadrangles in the central Death Valley volcanic field, California. Consists of a lower layer of air-fall lapilli tuff, a few meters thick, conformably overlain by more resistant, knob forming, ash-flow tuff displaying a lower zone of dense welding that has a basal layer of black obsidian, 1 to 2 m thick, grading upward into grayish-red vitrophyre; a middle zone of grayish-brown partially welded tuff; and an upper zone of grayish-pink tuff showing no welding. Overlies dacitic flows; conformably underlies the Sheephead Andesite (new name). Thickness is 450 m at Salsberry Pass. Age is Miocene based on potassium-argon ages of 10.4 Ma for the underlying dacitic flows and 8.7 to 7.6 Ma for the overlying Shoshone Volcanics.

Richard Russell Formation

Late Proterozoic
Georgia, North Carolina
Piedmont-Blue Ridge province

Nelson, A.E., and Gillon, K.A., 1985, Stratigraphic nomenclature in the Richard Russell and Helen thrust sheets, Georgia and North Carolina: U.S. Geological Survey Bulletin 1605–A, p. A59–A62.

Type locality: Exposures along Richard Russell Highway (Georgia Highway 348) extending for 0.3 mi northwest from Hogpen Gap, Cowrock 7.5-minute quadrangle, Union County, Ga.

The informal Richard Russell formation of Gillon (1982) is here named the Richard Russell Formation in the Richard Russell thrust sheet in Georgia and North Carolina. Consists of interlayered migmatitic biotite gneiss, metasandstone, aluminous biotite schist and biotite-muscovite schist, granofels, and amphibolite. Is bounded on the northwest by the Hayesville fault and on the southeast by the Shope Fork fault. Thickness is unknown. Age is probably Late Proterozoic.

Rincon Windmill Member of the Spears Formation of the Datil Group

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Exposures 14 mi northeast of Datil and 1.25 mi north-northwest of Rincon Windmill, NW¼NW¼ sec. 18, T. 1 N., R. 8 W., northeast Datil Mountains, Dog Springs 7.5-minute quadrangle, Socorro County, N. Mex.

The Rincon Windmill Member is here named the upper member of the Spears Formation of the Datil Group in the Orogrande basin and in the Gallinas Mountains, N. Mex. Consists of brown to light-brown, volcaniclastic sandstones and conglomerates, which have pebble to cobble conglomerates in the lower two-thirds and well-sorted, feldspathic, aeolian sandstone in the upper one-third. Overlies the Rock House Canyon Tuff (new name) of the Datil Group; is interbedded with and locally split into two tongues by the Blue Canyon Tuff (new name) of the Datil; underlies the Hells Mesa Tuff. Thickness is 411 ft at the type section and ranges from 275 to 500 ft. Age is Oligocene.

Rio Salado Tongue of the **Mancos Shale**

Late Cretaceous (Cenomanian to Turonian)
New Mexico
San Juan basin

Hook, S.C., Molenaar, C.M., and Cobban, W.A., 1983, Stratigraphy and revision of nomenclature of upper Cenomanian to Turonian (Upper Cretaceous) rocks of west-central New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 185, p. 7–28.

Type section: Exposures in the Rio Salado valley, NE¼ sec. 33, T. 3 N., R. 6 W., Puertocito quadrangle, Socorro County, N. Mex.
Subunit: **Bridge Creek Limestone Beds.**

The Rio Salado Tongue of the Mancos Shale, here named, is in the Orogrande basin, New Mexico. Defined as that part of the Mancos Shale separating the underlying Twowells Tongue of the Dakota Sandstone from the conformably overlying Atarque Sandstone Member of the Tres Hermanos Formation in west-central New Mexico or the Atarque Sandstone to the southwest, where the Tres Hermanos Formation is not used. Includes, in ascending order, (1) a lower shale and limestone unit consisting of calcareous fossiliferous shale and the Bridge Creek Limestone Beds, which are reduced in stratigraphic rank and replace the Greenhorn Limestone Member of the Mancos in this area, composed of gray fossiliferous shale, calcarenite, and limestone and (2) an upper light-olive-gray, noncalcareous clay-shale unit. Cannot be differentiated from Riley to Carthage and Truth or Consequences, except for limestones within the Bridge Creek Limestone Beds. Thickness ranges from 200 to 300 ft. Age is Late Cretaceous (late Cenomanian to middle Turonian) based on ammonites.

River Falls Formation

Pleistocene (Illinoian or Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: South side of abandoned gravel quarry, 300 m south of Road E, 4 km northeast of Baldwin, SE¼NE¼NE¼ sec. 18, T. 29 N., R. 16 W., Emerald 7.5-minute quadrangle, St. Croix County, Wis. Named for River Falls, Pierce County.

The informal Baldwin till of Baker and Simpson (1981) is here named the River Falls Formation in the Superior Lobe in Pierce, St. Croix, and Dunn Counties, western Wisconsin. Consists of yellowish-red to reddish-brown, structureless basal till, locally weakly stratified, containing lenses of fine sand. Is deeply weathered to sandy clay loam. Sharply overlies the Hersey Member or the Kinnickinnic Member of the Pierce Formation (all new names); sharply underlies till, sand, and gravel of the late Wisconsinan St. Croix moraine or is exposed at the surface. Thickness ranges from less than 1 to more than 10 m. Age is Pleistocene (Illinoian or early Wisconsinan).

Road Runner Rhyolite

Miocene
Arizona
Basin and Range province

Creasey, S.C., Peterson, D.W., and Gambell, N.A., 1983, Geologic map of the Teapot Mountain quadrangle, Pinal County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ–1559, scale 1:24,000.

Type locality: Exposures at Road Runner Mesa, S½ sec. 27 and N½ sec. 34, T. 2 S., R. 12 E., Teapot Mountain quadrangle, Pinal County, Ariz.

The Road Runner Rhyolite, here named, is in the Teapot Mountain quadrangle, Pinal County, Ariz., where it comprises both extensive flows and a semicircular plug 600 m in diameter. Consists of pinkish-gray, flow-banded, porphyritic volcanic rock having a vitrophyric groundmass in the flows and a microcrystalline groundmass in the plug. Phenocrysts consist of plagioclase, quartz, biotite, and magnetite. Vesicles, amygdules, and spherules occur in both flows and plug. Unconformably overlies the Sleeping Buffalo Rhyolite and its Arnett Member (both new names); unconformably underlies Quaternary gravel. Age is Miocene based on a potassium-argon age of 18.9 Ma.

Robertstown Formation of the **Helen Group**

Late Proterozoic and (or) Paleozoic
Georgia, North Carolina
Piedmont-Blue Ridge province

Nelson, A.E., and Gillon, K.A., 1985, Stratigraphic nomenclature in the Richard Russell and Helen thrust sheets, Georgia and North Carolina: U.S. Geological Survey Bulletin 1605–A, p. A59–A62.

Type locality: Exposures along the road on the west side of unnamed lake at Unicoi State Park, Helen 7.5-minute quadrangle, White County, Ga. Named for the nearby town of Robertstown.

The informal Unicoi Park formation of Gillon (1982) is here named the Robertstown Formation of the Helen Group (new name) in the Helen thrust sheet in Georgia and North Carolina. Consists of thinly layered, coarse-grained feldspathic metasandstone interlayered with mica schist, amphibolite, and pebbly quartz metasandstone, and is characterized by thin, aluminous schist partings between metasandstone beds. Is conformable to the southeast with the Horton Formation (new name) of the Helen Group; is truncated on the northwest by the Shope Fork fault. Age is tentatively determined to be Late Proterozoic and early Paleozoic.

Rock House Canyon Tuff of the Datil Group

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Exposures 15 mi northeast of Datil and 3 mi north of North Lake at the junction of Rock House Canyon and Long Canyon, SW1/4 sec. 13, T. 1 N., R. 8 W., northwest Gallinas Mountains, Dog Springs 7.5-minute quadrangle, Socorro County, N. Mex.

Rocks formerly called the tuff of Main Canyon and the tuff of Nipple Mountain are here named the Rock House Canyon Tuff of the Datil Group in the Datil, Gallinas, Crosby, and Magdalena Mountains, and Tres Montosas Magdalena area, in the Orogrande basin, New Mexico.

Consists of white, pink to purple-gray, or light-gray to tan, unwelded to moderately welded, crystal-poor, ash-flow tuff containing abundant elliptical pumice, sparse sanadine, and andesitic phenocrysts. Overlies the Chavez Canyon Member (new name) of the Spears Formation of the Datil Group; underlies the Blue Canyon Tuff (new name) of the Datil or the Rincon Windmill Member (new name) of the Spears. Thickness is 225 ft at the type section and ranges from 0 to 350 ft. Age is Oligocene.

Rock Mountain Conglomerate of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type locality: Outcrops on Rock Mountain and near the extreme northwestern limit of Precambrian outcrop, northern Medicine Bow Mountains, secs. 27 and 33, T. 19 N., R. 79 W., Carbon County, Wyo.

The Rock Mountain Conglomerate, here named, is in the Phantom Lake Metamorphic Suite and crops out in the northern Medicine Bow Mountains, Wyo. Consists of coarse-grained muscovitic quartzite containing beds of anomalously radioactive quartz, quartzite, amphibolite, and schist paraconglomerate ranging in thickness from less than 1 m to several hundred meters. Lithologically similar conglomerates occur as lenses in the Stud Creek Volcaniclastic Rocks (new name) of the Phantom Lake in the Stud Creek area of the Medicine Bow Mountains. Overlies the Stud Creek Volcaniclastic Rocks possibly gradationally; gradationally or sharply conformably underlies the Bow River Quartzite (new name) of the Phantom Lake. Stratigraphic thickness is 400 m. Age is Archean.

Rockwall Member of the Pecan Gap Formation of the Taylor Group

Late Cretaceous (Campanian)
Texas
Ouachita tectonic belt province

McNulty, C.L., Brezina, J.L., Dawson, W.C., and Maluf, F.W., 1981, Emendation of the Pecan Gap Chalk (Campanian) in northeast Texas: Gulf Coast Association of Geological Societies Transactions, v. 31, p. 353–358.

Type section: Gullied hillside along Farm-To-Market Road 740 between Rockwall and Interstate Highway I–30, 2 mi south of Rockwall, Rockwall County, Tex. (Maluf, 1975).

Rocks informally named by Maluf (1975) are here named the Rockwall Member of the revised Pecan Gap Formation of the Taylor Group in the north-south outcrop belt in Collin and Rockwall Counties, Tex. Can be traced with the Lavon Member (new name) of the Pecan Gap from Farmersville to southern Rockwall County. Consists of dark- to medium-olive-gray, yellowish-orange-weathering, silty marl containing beds of quartz siltstone and chalk. Gradationally overlies the Wolfe City Formation; disconformably underlies the Lavon Member. Thickness is 65 ft at the type section. Age is Late Cretaceous (Campanian).

Rocky Gulch Sandstone Member of the **Hornbrook Formation**

Late Cretaceous (Campanian)
California, Oregon
Klamath Mountains province

Nilsen, T.H., 1984, Tectonics and sedimentation of the Upper Cretaceous Hornbrook Formation, Oregon and California, *in* Crouch, J.K., and Bachman, S.B., eds., Tectonics and sedimentation along the California margin: Society of Economic Paleontologists and Mineralogists, Pacific Section, v. 38, p. 101–118.

Type section: Roadcuts along the northbound lane of Interstate Highway I–5, adjacent to and west of the Klamath River and 3 km south of Hornbrook, NE¼NE¼ sec. 32, T. 47 N., R. 6 W., Hornbrook 15-minute quadrangle, Siskiyou County, Calif. Named for outcrops in Rocky Gulch, 2 km southwest of Hornbrook.

The Rocky Gulch Sandstone Member of the Hornbrook Formation, here named, occurs along the northeast margin of the Klamath Mountains in Siskiyou County, Calif., and Jackson County, Oreg. Consists of beds of gray, fine- and medium-grained sandstone containing intervals of thin shale and local conglomerate and siltstone. Erosionally or gradationally overlies the Ditch Creek Siltstone Member (new name) and gradationally underlies the Blue Gulch Mudstone Member (new name), both of the Hornbrook. Thickness is 171.2 m at the type section and ranges from 115 to 225 m. Age is Late Cretaceous (Campanian) based on foraminifera.

Rodgers Shelter Formation

Pleistocene and Holocene
Missouri
Ozark uplift

Haynes, C.V., Jr., 1985, Mastodon-bearing springs and late Quaternary geochronology of the lower Pomme de Terre valley, Missouri: Geological Society of America Special Paper 204, 35 p.

Type locality: None designated. Named for Rodgers Shelter on the Pomme de Terre River, sec. 33, T. 39 N., R. 22 W., Fristoe 15-minute quadrangle, Benton County, Mo.

Intermediate terrace deposits T–1c in the lower Pomme de Terre Valley, Benton and Hickory Counties, Mo., called the informal Rodgers formation by Brakenridge (1981), are here named the Rodgers Shelter Formation. Four strata are defined on the basis of erosional and lithologic contacts: stratum 1 consists of a matrix of brown to dark-grayish-brown alluvial clayey silt and colluvial gravel containing Paleoindian and Early Archaic artifacts; stratum 2 consists of dark-grayish brown clayey silt containing Middle Archaic artifacts; stratum 3 consists of colluvial chert gravel; stratum 4 consists of alluvial silt and colluvial gravel containing Late Archaic to Woodland artifacts. Unconformably overlies the Boney Spring and Breshears Valley Formations (both new names) with an erosional hiatus; is exposed at the surface. Age is late Pleistocene and Holocene, 10.5 to 1.5 ka.

Rose Creek Schist Member of the Univeter Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures near Rose Creek Church, Kennesaw 7.5-minute quadrangle, Cherokee County, Ga.

The Rose Creek Schist Member of the Univeter Formation (new name) of the New Georgia Group (new name), here named, is in the Greater Atlanta region of northwest Georgia. Forms the center of a fold of which the limbs are formed by the Lost Mountain Amphibolite Member (new name) of the Univeter. Consists of garnet-biotite-muscovite schist. Age is Late Proterozoic and (or) early Paleozoic.

Roses Mill Plutonic Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Herz, Norman, and Force, E.R., 1984, Rock suites in Grenvillian terrane of the Roseland district, Virginia. Part 1: Lithologic relations: Geological Society of America Special Paper 194, p. 187–200.

Type locality: Road cut at Roses Mill, east side of the Roseland district, Arrington 7.5-minute quadrangle, Nelson County, Va.

The Roses Mill Plutonic Suite, here named in the Roseland district, Nelson and Amherst Counties, Va., includes the Roses Mill and Turkey Mountain plutons. Four dominant rock facies are present: primary charnockitic ferrodiorite, secondary biotite augen gneiss, dikes in older formations, and nelsonite. Plutons that intrude the anorthosite-granulite terrane include the Roseland Anorthosite and the charnockitic rocks of the Pedlar massif. Xenoliths of older rock are found in the Roses Mill pluton; the Turkey Mountain pluton is intruded by the Mobley Mountain Granite (new name). Age is Middle Proterozoic based on a uranium-lead date of 970 Ma.

Rosslyn Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Exposure in the abandoned Baker Quarry on a ridge 1.6 km southeast of Stanton, Ky., and north of Kentucky Highway 213, Stanton quadrangle, Powell County, Ky. Named for the community of Rosslyn, 2 km east of the type section.

Strata previously assigned to the Renault Formation and Reelsville-Beech Creek Limestone Member of the Newman Limestone, which are now restricted from the Cumberland Escarpment area of Kentucky, are here named the Rosslyn Member of the Slade Formation (new name) and are restricted to central Powell and southern Montgomery Counties. Consists of a basal conglomerate grading upward to thin-bedded calcarenite lenses interbedded with calcilutite. Disconformably overlies the Cave Branch Bed of the Slade; grades upward into the Tygarts Creek Member (new name) of the Slade. Thickness ranges from 0 to 2 m. Age is Late Mississippian.

Russell Mountain Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: NE¼SW¼ sec. 2, T. 33 N., R. 3 E., Ironton quadrangle, Iron County, Mo. Exposed on the east slope of Russell Mountain.

Rocks previously mapped as the Shut-ins banded ash flow by Anderson (1962) and Unit C of the tuff of Stouts Creek by Anderson (1970) are here named the Russell Mountain Rhyolite in the western St. Francois Mountains in southeast Missouri. Consists of brick-red to dark-maroon ash-flow tuff containing large fiamme and white feldspar phenocrysts. Overlies the Lindsey Mountain Rhyolite (new name); underlies the Wildcat Mountain Rhyolite (new name). Thickness is 300 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Russell Mountain Rhyolite.

Rye Patch Dam Bed of the Rye Patch Formation

Pleistocene (Illinoian)
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Exposure at the east abutment of Rye Patch Dam on the Humboldt River at Rye Patch Reservoir, Pershing County, Nev.

The Rye Patch Dam Bed, here named, is in the Rye Patch Formation in the Lake Lahontan area, Nevada. Tephra occurs in a lens of ash up to 2 m thick. Age is Pleistocene (Illinoian).

Sabattis Road Member of the Lost Pond Marble

Precambrian
New York
Adirondack uplift

Potter, D.B., Jr., 1984, Cross section of the Loon Pond syncline, Tupper Lake quadrangle, New York, *in* Potter, D.B., Jr., ed., Field trip guidebook: New York State Geological Association, 56th Annual Meeting, trip AB–2, p. 3–15.

Type locality: Exposures 0.5 km east of Bear Pond along Route 10, Tupper Lake 15-minute quadrangle, Hamilton County, N.Y. Derivation of name not stated.

The Sabattis Road Member of the Lost Pond Marble (new name), here named, is in the Loon Pond syncline of the Bog River synclinorium in the Adirondack Highlands, Hamilton and St. Lawrence Counties, N.Y. Consists of interbedded coarse graphitic marble, diopside-calcite granulite, and thin-bedded quartzite. Overlies the Hill 2292 Member (new name) and underlies the Loon Pond Mountain Member (new name), both of the Lost Pond. Is cut by the Otter Pond Dioritic Gneiss (new name). Thickness is at least 60 m. Age is Precambrian.

Sacony Member of the **Virginville Formation**

Late Cambrian and Early Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures along Sacony Creek, 1.6 km northeast of Virginville, Kutztown 7.5-minute quadrangle, Berks County, Pa.

Rocks described as the Martinsburg Shale by Miller (1937) are here named the Sacony Member of the Virginville Formation (new name) in the Richmond slice of the Hamburg klippe in Pennsylvania. Consists of massive, grayish-green and grayish-red, micaceous siltstone to sandstone intercalated with shale and mudstone. Outcrops form lenticular or ovoid masses. Tectonically overlies the Moselem Member (new name) of the Virginville; conformably underlies the Onyx Cave Member (new name) of the Virginville. Thickness is 245 m. Age is Late Cambrian and late Early Ordovician.

Saddleback Mountain Suite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Saddleback Mountain, lat 38°22′ N., long 78°30′ W., Swift Run 7.5-minute quadrangle, Rockingham County, Va.
Subunit: Old Rag Granite.

The Saddleback Mountain Suite, here named, is in the Pedlar massif in the Blue Ridge in northern Virginia. Contains the Old Rag Granite of Furcron (1934) and a mesocharnockite facies. Age is Middle Proterozoic based on uranium-lead ages.

Sadler Ranch Formation

Early and Middle Devonian
Nevada
Great Basin province

Kendall, G.W., Johnson, J.G., Brown, J.O., and Klapper, G., 1983, Stratigraphy and facies across Lower Devonian-Middle Devonian boundary, central Nevada: American Association of Petroleum Geologists Bulletin, v. 67, no. 12, p. 2199–2207.

Type section: Outcrops on a spur that extends up to the saddle directly north of Summit 7466, west of Sadler Ranch on the eastern side of the Sulphur Spring Range, Garden Valley 15-minute quadrangle, Eureka County, Nev.

Rocks previously described as the middle, crinoidal part of the Union Mountain Formation by Carlisle and others (1957) are here named the Sadler Ranch Formation. Crops out along the eastern flank of the Sulphur Spring Range, at Table Mountain in the Mahogany Hills, Modoc Peak, Lone Mountain, and Union Mountain, Eureka County, Nev. Is divided into lower and upper dolomites and a middle crinoidal dolomite. Lower unit is moderately well-bedded, medium- to thick-bedded, and finely crystalline, yellowish-gray- to olive-gray-weathering, olive-gray to brownish-black dolomite; middle crinoidal dolomite is crinoidal packstone; upper dolomite is similar to the lower dolomite. Was deposited in a shallow, nearshore, carbonate shelf and slope environment. Abruptly overlies the Bartine Limestone Member or the Coils Creek Member of the McColley Canyon Formation; conformably underlies the coarse crystalline member of the Oxyoke Canyon Formation. Thickness is 124 m at the type section. Age is Early and Middle Devonian based on the presence of conodont zones that define the Lower-Middle Devonian boundary.

Salinas Peak Member of the Contadero Formation

Late Devonian (Frasnian)
New Mexico
Orogrande basin

Sorauf, J.E., 1984, Devonian stratigraphy of the San Andres Mountains, Dona Ana, Sierra, and Socorro Counties, New Mexico: New Mexico Bureau of Mines and Mineral Resources Circular 189, 32 p.

Type section: Exposures in a gully above Montoya Plateau on the southwest flank of Salinas Peak, about 0.5 mi northeast of Route 12, Sweetwater Creek Canyon in White Sands Missile Range, NW¼NE¼SE¼ sec. 7, T. 12 S., R. 4 E., Salinas Peak quadrangle, Sierra County, N. Mex.

The Salinas Peak Member, here named, is the lowest of three members of the Contadero Formation in the northern San Andres

Mountains of southwestern New Mexico. Consists of a basal unit of soft, tan shale, which is red at the base; a middle silty unit of brown or green shale interbedded with thin-bedded, coarse siltstone or flaggy sandstone; and an upper unit of blue-gray, nodular, argillaceous limestone containing abundant solitary rugose corals. Overlies the Sly Gap Formation; underlies the Thoroughgood Formation, revised as the Thurgood [sic] Member, or the Rhodes Canyon Member, both of the Contadero Formation. Thickness at the type section is 10.8 m. Age is Late Devonian (late Frasnian) based on brachiopods and conodonts.

Salt Wells Member of the Mono Basin Formation

Holocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Road cut 1.3 km south of Weber Dam, on the west side of the Walker River north of Schurz, center W½W½ sec. 33, T. 14 N., R. 28 E., Weber Reservoir 15-minute quadrangle, Mineral County, Nev. [Probably named for the town of Salt Wells.]
Subunits: Walker Lake Bed, Turupah Flat Bed.

The Salt Wells Member of the Mono Basin Formation (new name), here named, is in the Lake Lahontan sequence in Nevada. Contains two tephra layers regarded as stratigraphic markers, the Walker Lake Bed (new name) and the Turupah Flat Bed (new name), composed of rhyolite that has similar glass chemistry. Source is attributed to Mono Basin because of its distribution south of Carson Sink and because rhyolitic tephra of similar age and petrography were erupted in the Mono Basin. Age is Holocene, about 2 to 0.6 ka.

Sand Hill Gneiss

Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures near Sand Hill, Villa Rica 7.5-minute quadrangle, eastern Carroll County, Ga.

The Sand Hill Gneiss, here named, is a pre- to synmetamorphic intrusive rock of the Piedmont in the Greater Atlanta region, Georgia. Consists of fine- to coarse-grained muscovite-biotite-oligoclase-quartz-microcline orthogneiss. Age is Paleozoic.

Sandy Creek Granulite Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Outcrop on State Road 619 along Sandy Creek, lat 37°15′30″ N., long 79°49′ W., Stewartsville 7.5-minute quadrangle, Bedford County, Va.

The Sandy Creek Granulite Gneiss, here named, is in the Lovingston massif in the Blue Ridge in southwestern Virginia and is a layered granulite gneiss. Age is Middle Proterozoic.

Santa Rosa Hills Limestone

Late Mississippian (Visean)
California
Great Basin province

Dunne, G.C., Gulliver, R.M., and Stevens, C.H., 1981, Correlation of Mississippian shelf-to-basin strata, eastern California: Geological Society of America Bulletin, v. 92, no. 1, pt. I, p. 1–4; pt. II, p. 1–38.

Type section: Northwest side of hill 6170 in Santa Rosa Hills, from 5,860 ft elevation to saddle at 6,035 ft elevation, T. 17 S., R. 40 E., lat 117°39′21″ N., long 36°28′41″ W., Darwin 15-minute quadrangle, Inyo County, Calif.

A previously unrecognized unit in the Santa Rosa Hills and a unit previously mapped as Lee Flat Limestone in the carbonate facies region of the Argus and Panamint Ranges to the east and southeast are here named the Santa Rosa Hills Limestone. Consists of medium- to light-gray, massive-appearing, thick- and thin-bedded limestone or marble containing pelmatozoan debris and interbedded chert. Gradationally overlies the Perdido Formation; sharply and disconformably underlies the Rest Spring Shale. Forms a northwestward-thinning wedge that varies from 245 to 610 ft thick. Thickness at the type section is 272 ft. Age is Late Mississippian (middle and perhaps late Visean) based on corals, conodonts, and foraminifera.

Sawmill Canyon Formation

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type area: Exposures along both sides of Sawmill Canyon, 16 mi southeast of Magdalena, secs. 3, 4, 9, 10, 11, 14, and 15, T. 5 S., R. 3 W., South Baldy 7.5-minute quadrangle, Socorro County, N. Mex.

Rocks called a unit of Sixmile Canyon or Sixmile Canyon andesite in earlier reports are here named the Sawmill Canyon Formation in the Magdalena Mountains, Orogrande basin, New Mexico. Informal members include the andesite of Landavaso Reservoir and, at the top, the tuff of Caronita Canyon, a thick, multiple-flow, simple cooling unit of ash-flow tuff. Is a complex cauldron-fill unit consisting of andesite flows, rhyolite flows and domes, ash-flow tuffs, conglomerates, and mudflow deposits. Overlies the La Jencia Tuff (new name); underlies the Lemitar Tuff (new name). Age is Oligocene based on potassium-argon biotite dates of 29.7 Ma on bedded tuff in cauldron fill and 30.2 Ma on the tuff of Caronita Canyon.

Schoolhouse Chert Member of the Moyers Formation of the Stanley Group

Late Mississippian
Oklahoma
Ouachita tectonic belt province

Pitt, W.D., Fay, R.O., Wilson, L.R., and Curiale, J.A., 1982, Geology of Pushmataha County, Oklahoma: Eastern New Mexico University Studies in Natural Sciences Special Publication 2, 101 p.

Type locality: None designated. Named for the schoolhouse in Moyers, Pushmataha County, Okla.

The Schoolhouse Chert Member of the Moyers Formation of the Stanley Group, here named, is in the Ouachita Mountains in Pushmataha County, southeastern Oklahoma. Consists of blue-gray to black banded siliceous shale and chert. Lies at the base of the Moyers, which overlies the Tenmile Creek Formation. Thickness ranges from 20 to 100 ft. Age is Late Mississippian.

Schoolhouse Member of the Snowshoe Formation

Middle Jurassic (Bajocian)
Oregon
Snake River basin

Smith, P.L., 1980, Correlation of the members of the Jurassic Snowshoe Formation in the Izee basin of east-central Oregon: Canadian Journal of Earth Sciences, v. 17, no. 12, p. 1603–1608.

Type section: Snowshoe Formation type section, South Fork of the John Day River near the former community of Izee, Izee 15-minute quadrangle, Grant County, Oreg. Named for Schoolhouse Gulch behind the former Izee schoolhouse.

Rocks previously called the middle member of the Snowshoe Formation by Dickinson and Vigrass (1965) are here named the Schoolhouse Member of the Snowshoe. Consists of gray, green, or buff laminated siltstone and sandstone alternating with argillaceous mudstone, shale, and siltstone. Transitionally overlies the Warm Springs Member of the Snowshoe; interfingers laterally with the Basey Member of the Snowshoe in the Suplee area to the west and interfingers and underlies the Silvies Member of the Snowshoe to the east; unconformably underlies the South Fork Member (new name) of the Snowshoe or the Trowbridge Formation to the west. Thickness is 300 m in the type area; wedges out to the northeast. Age is Middle Jurassic (Bajocian).

Scotch Grove Formation

Early Silurian (Llandoverian and Wenlockian)
Iowa
Iowa shelf

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

Type locality: Quarry area north of the town of Scotch Grove, NW¼SE¼SE¼ and SE¼NW¼SE¼ sec. 7, T. 85 N., R. 2 W., Jones County, Iowa. Reference core section: Near Walford, SE¼SW¼ SW¼SW¼ sec. 5, T. 81 N., R. 8 W., Johnson County, Iowa.
Subunits: Johns Creek Quarry Member, Welton Member, Buck Creek Quarry Member, Fawn Creek Member, Waubeek Member, Palisades-Kepler Member.

The Scotch Grove Formation, described as an informal rock unit by Witzke (1981) and here named, is in eastern Iowa and is defined as the interval of rocks above the Picture Rock Member (new name) of the Hopkinton Formation and below the base of the first laminated and mounded dolomites of the Gower Formation. The original definitions of both the Hopkinton and Gower are preserved with the introduction of the Scotch Grove Formation. Includes six members, in ascending order: the Johns Creek Quarry, Welton, and Buck Creek Quarry Members of Johnson (1983), here reassigned from the upper part of the revised Hopkinton Formation, and the Fawn Creek, Waubeek, and Palisades-Kepler Members (all new names). Consists of a variety of carbonate facies including flat-lying and mounded, dense and porous, cherty and noncherty, sparsely fossiliferous and crinoid-moldic dolomite. Lower and upper contacts are conformable and sharp; the upper contact may be locally disconformable. Thickness ranges from 100 to 300 ft. Age is Early Silurian (late Llandoverian and Wenlockian).

Senoia Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type section: Exposures along the first road running west from Georgia Highway 85, southwest of Keg Creek, in the city of Senoia, Senoia quadrangle, Coweta County, Ga.

The Senoia Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga., and consists of garnet-biotite-muscovite schist interlayered with fine-grained hornblende-plagioclase amphibolite. Lower contact has not been mapped; sharply and conformably underlies the Wahoo Creek Formation (new name) of the Atlanta. Correlates with most of the Clairmont Formation (new name) of the Atlanta. Age is Late Proterozoic and (or) early Paleozoic.

Sentinel Island Formation of the Spieden Group

Early Cretaceous (Valanginian and Hauterivian)
Washington
Puget Sound province

Johnson, S.Y., 1981, The Spieden Group: An anomalous piece of the Cordilleran paleogeographic puzzle: Canadian Journal of Earth Sciences, v. 18, no. 11, p. 1694–1707.

Type section: Northwest and southwest shorelines of Spieden Island and the western shoreline of Sentinel Island, sec. 2, T. 37 N., R. 4 W., San Juan Islands, San Juan County, Wash.

The Sentinel Island Formation of the Spieden Group, here named, is in the San Juan Islands, Wash. Includes lower and upper members, separated by an inferred unconformity. Lower member consists of gray, fine- to medium-grained, fossiliferous sandstone and siltstone, deposited in a shallow marine environment, 140 m thick; upper member consists of volcanic conglomerate, deposited as an alluvial fan, possibly more than 600 m thick. Disconformably overlies the Spieden Bluff Formation (new name) of the Spieden Group with a hiatus of 20 to 30 million years; top of the formation is not exposed. Age is Early Cretaceous (Valanginian and Hauterivian and possibly younger) based on fossils.

Shaeffer Hollow Granite

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Herz, Norman, and Force, E.R., 1984, Rock suites in Grenvillian terrane of the Roseland district, Virginia. Part 1. Lithologic relations: Geological Society of America Special Paper 194, p. 187–200.

Type locality: Exposures in and north of Shaeffer Hollow, Horseshoe Mountain 7.5-minute quadrangle, Nelson County, Va.

The Shaeffer Hollow Granite, here named, is in the Roseland district of Nelson and Amherst Counties, Va. Consists of coarse-grained, leucocratic, blue quartz granite having tabular feldspar phenocrysts and porphyritic texture. Forms xenoliths in and is cut by dikes of the Roses Mill pluton. Age is Middle Proterozoic based on uranium-lead ages of 1,787 and 980 Ma.

Shainin Lake Member of the **Kanayut Conglomerate**

Late Devonian
Alaska
Norton basin

Nilsen, T.H., and Moore, T.E., 1984, Stratigraphic nomenclature for the Upper Devonian and Lower Mississippian(?) Kanayut Conglomerate, Brooks Range, Alaska: U.S. Geological Survey Bulletin 1529-A, p. A1–A64.

Type section: Prominent cliff south of the confluence of Kayak and Alapah Creeks, about 8 km south-southeast of Shainin Lake, sec. 4, T. 14 S., R. 5 E., Chandler Lake quadrangle, Alaska.

Rocks previously designated the informal middle conglomerate member of the Kanayut Conglomerate are here named the Shainin Lake Member of the now revised Kanayut Conglomerate in the central and eastern Brooks Range, Alaska. Consists of fining-upward thick-bedded couplets of conglomerate and sandstone and little or no shale. Forms a broad wedge- to lens-shaped body, probably deposited by braided streams on a broad plain, that pinches out toward the west and south into the gradationally underlying Ear Peak Member (new name) and gradationally overlying Stuver Member of the Kanayut. Thickness at the type section is 526 m. Age is Late Devonian based on stratigraphic position.

Shale Hill Formation of the Pleasanton Group

Late Pennsylvanian (Missourian)
Missouri
Forest City basin

Howe, W.B., 1982, Stratigraphy of the Pleasanton Group, Pennsylvanian System in Missouri: Missouri Department of Natural Resources, Open File Report Series OFR-82-10-GI, 99 p.

Type section: Midland Brick and Tile Company quarry on Shale Hill, NE¼SE¼ sec. 18, T. 57 N., R. 24 W., north of Utica, Chillicothe 15-minute quadrangle, Livingston County, Mo.
Subunits: Weldon River Sandstone Member, Knobtown Limestone Member, Blue Mound Shale Member.

The Shale Hill Formation, here named, is the youngest of three formations in the Pleasanton Group in the Forest City basin in northwestern Missouri. Outcrops extend from Bates County northeastward to Adair and Putnam Counties. Includes the basal Weldon River Sandstone Member (new name), consisting of channel- and valley-fill sandstone, shale, and conglomerate; the Knobtown Limestone Member, consisting of littoral sandy limestone facies; and the upper Blue Mound Shale Member (new name), consisting of coal beds, underclay, and shale. Unconformably overlies the Unity Farm Shale Member (new name) of the Lees Summit Formation (new name); underlies rocks of the Kansas City Group. Thickness ranges from about 20 ft to more than 100 ft. Age is Late Pennsylvanian (early Missourian).

Sheephead Andesite

Miocene
California
Great Basin province

Wright, L.A., Kramer, J.H., Thornton, C.P., and Troxel, B.W., 1984, Appendix I—Type sections of two newly named volcanic units of the central Death Valley volcanic field, eastern California, *in* Wright, L.A., and Troxel, B.W., Geology of the northern half of the Confidence Hills 15-minute quadrangle, Death Valley region, eastern California: the area of the Amargosa chaos: California Division of Mines and Geology Map Sheet 34, p. 21–24.

Type section: Composite of exposures extending for 12 km along the lower southwest sides of Salsberry Peak and Sheephead Mountain, from

Rhodes Wash eastward to Salsberry Pass in the Black Mountains, Confidence Hills and Shoshone 15-minute quadrangles, Inyo County, Calif.

The Sheephead Andesite, here named, is in the Black Mountains, central Death Valley volcanic field, California. Consists of a lower unit of pale-red to grayish-red, vesicular andesite containing plagioclase phenocrysts and a basal flow breccia, 150 m thick; a poorly sorted volcaniclastic breccia unit, 3 to 10 m thick; and an upper pale-red to grayish-red, much less porphyritic andesite unit comprising a single flow, 60 m thick. Conformably overlies the Rhodes Tuff (new name); underlies the Shoshone Volcanics. Thickness is 210 m at Sheephead Mountain. Age is Miocene based on potassium-argon ages of 10.4 Ma for underlying dacitic flows and 8.7 to 7.6 Ma for overlying Shoshone Volcanics.

Sheep Spring Rhyolite

Oligocene
Nevada
Great Basin province

Hose, R.K., 1983, Geologic map of the Cockalorum Wash quadrangle, Eureka and Nye Counties, Nevada: U.S. Geological Survey Miscellaneous Investigations Map I–1410, scale 1:31,680.

Type section: Exposures on the west side of Ninemile Canyon, secs. 16 and 17, T. 15 N., R. 51 E., Cockalorum Wash 15-minute quadrangle, Eureka County, Nev. Named for Sheep Spring along the upper reaches of Ninemile Canyon.

The Sheep Spring Rhyolite, here named, is in the Antelope Range, Nev. Consists of several flows of brown, flow-banded, stony rhyolite having feldspar phenocrysts in a groundmass of devitrified glass, and contains lenticular bodies of black vitrophyre. Unconformably overlies rocks of Ordovician and Silurian age on erosional surfaces of considerable topographic and structural relief; unconformably underlies the Mulligan Canyon Rhyolite (new name). Thickness reaches 400 m. Age is Oligocene based on potassium-argon ages of 37 and 36.5 Ma.

Shelley Peak Tuff

Oligocene
New Mexico
Basin and Range province

Ratte, J.C., 1981, Geologic map of the Mogollon quadrangle, Catron County, New Mexico: U.S. Geological Survey Geologic Quadrangle Map GQ–1557, scale 1:24,000.

Type section: SE¼ sec. 11, T. 13 S., R. 17 W., Shelley Peak quadrangle, Catron County, N. Mex. Reference sections: S½ sec. 31, T. 8 S.,

R. 20 W., and SE¼ sec. 7, T. 9 S., R. 20 W., both in the Saliz Pass quadrangle. Named for Shelley Peak, Catron County.

The Shelley Peak Tuff, here named in Catron County, N. Mex., was formerly mapped as part of the Pacific Quartz Latite of Ferguson (1927). Consists of brick-red, compositionally zoned, crystal-rich, rhyolite ash-flow tuff. Contains sodic plagioclase and sanidine phenocrysts and accessory biotite, opaque oxides, green clinopyroxene, zircon, oxyhornblende, apatite, and sphene. Overlies the Davis Canyon Tuff (new name) or unnamed lava flows; underlies the Bloodgood Canyon Tuff or unnamed lava flows. Thickness is 200 m in the Shelley Peak quadrangle and 50 to 60 m in the Mogollon quadrangle. Age is Oligocene based on a zircon fission-track age of 28 Ma.

Shellrock Point Volcanics

Tertiary
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Society of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Shellrock Point on U.S. Highway 97 between Okanogan and Omak, T. 33 N., R. 26 E., Okanogan Range, Okanogan County, Wash.

The Shellrock Point Volcanics, here named, are exposed on Pogue Mountain and Pogue Flat in the Okanogan Range, Wash. Consists of quartz keratophyre flows containing medium-grained phenocrysts of quartz and pink albite in a dense white to pale-green groundmass. May be older than the Miocene Columbia River Basalt; may correlate with early Tertiary keratophyre flows to the north.

Shelton Member of the **Trap Falls Formation**

Early or Middle Ordovician
Connecticut
New England province

Rodgers, John, 1985, Bedrock geological map of Connecticut: Connecticut Geological and Natural History Survey, scale 1:125,000.

Type locality: None designated. Described in the Shelton anticline in the Long Hill 7.5-minute quadrangle, Fairfield County, Conn. (Crowley, 1968).

Rocks mapped as the Shelton facies of the Trap Falls Formation by Crowley (1968) are here named the Shelton Member of the Trap Falls in the Hartland belt of the Connecticut Valley synclinorium. Consists of white, light-gray, or buff, fine- to medium-grained, foliated granitic gneiss composed of sodic plagioclase, quartz, microcline, muscovite, and garnet in tiny grains, interlayered with mica schist, biotite, gneiss, and calc-silicate rock. Is thought to be the metavolcanic equivalent of granitic gneiss that has been termed Ansonia, Mine Hill, Tyler Lake, and Siscowit gneiss. Age is Early or Middle Ordovician.

Shelvin Rock Church Formation of the Sylacauga Marble Group

Cambrian
Alabama
Piedmont-Blue Ridge province

Tull, J.F., 1985, Stratigraphy of the Sylacauga Marble Group, *in* Tull, J.F., Bearce, D.N., and Guthrie, G.M., eds., Early evolution of the Appalachian miogeocline: upper Precambrian-lower Paleozoic: Alabama Geological Society guidebook, 22d annual field trip, November 22–23, 1985, p. 21–26.

Type locality: Exposures in hills around Shelvin Rock Church, 6 km west of Sylacauga, NW¼ sec. 4, T. 22 S., R. 3 E., Talladega County, Ala.

The Shelvin Rock Church Formation of the Sylacauga Marble Group, as revised by Tull (1982), here named, is in the Talladega slate belt, Alabama. Consists of interlayered pink and white pelitic marble and locally carbonaceous gray calcareous phyllite. Overlies the Fayetteville Phyllite (new name) and underlies the Gooch Branch Chert (new name), both of the Sylacauga Marble Group. Correlates with the Cambrian Conasauga Formation and possibly with the upper part of the Rome Formation and the lower part of the Knox Group. Age is Cambrian.

Shepherd Mountain Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: Sec. 31, T. 34 N., R. 4 E., Ironton quadrangle, Iron County, Mo. Exposed on Shepherd Mountain and Pond Ridge northwest of Ironton.

Rocks previously called Pilot Knob Felsite by Tolman and Robertson (1969) are here named the Shepherd Mountain Rhyolite in the western St. Francois Mountains, southeast Missouri. Consists of brick-red to dark-maroon ash-flow tuff containing white to pink plagioclase phenocrysts and fiamme. Is the oldest unit in the area; underlies the Cedar Bluff Rhyolite (new name). Thickness is 600 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Shepherd Mountain Rhyolite.

Signal Granite

Precambrian
Arizona
Plateau sedimentary province

Lucchitta, Ivo, and Suneson, Neal, 1982, Signal Granite (Precambrian), west-central Arizona: U.S. Geological Survey Bulletin 1529–H, p. H87–H90.

Type locality: Exposures in the northern part of the Artillery Mountains between the ghost town of Signal, SW¼ sec. 9, T. 13 N., R. 13 W., and Eagle Point, E½ sec. 7, T. 12 N., R. 13 W., Artillery Peak 15-minute quadrangle, Mohave County, Ariz.

A granitic batholith, at least 30 km in diameter, exposed in the northern part of the Artillery Mountains, Ariz., is here named the Signal Granite. Consists of gray, leucocratic to mesocratic, massive, locally jointed, spheroidally weathered, medium- to coarse-grained, porphyritic biotite granite or monzogranite. Is cut by veins of quartz, pegmatite, and aplite and by dikes of diabase, metarhyolite porphyry, and leucogranite. On the north the pluton is intrusive into gneiss, schist, and plutonic country rock typical of the Precambrian terrane of the southwestern Colorado Plateau; on the south it is sheared and altered and may form the protolith of the mylonitic quartz-feldspar gneiss of the Rawhide Mountains. The eastern contact is unknown; the western contact is poorly exposed and structurally complex. Age is Precambrian based on its similarity to other granites of known Precambrian age in Arizona.

Silver Cliff Member of the Kewaunee Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut at the crest of the Inner Mountain moraine on the north side of Eagle River Road, SW¼SW¼SW¼ sec. 9, T. 34 N., R. 18 E., Roaring Rapids 7.5-minute quadrangle, Marinette County, Wis. Named for the Township of Silver Cliff.

Following the informal usage of McCartney (1979), the Silver Cliff Member of the Kewaunee Formation (new name) is here named. Occurs on the west side of the Green Bay Lobe in Wisconsin. Consists of reddish-brown sand-silt-clay till and is thin, discontinuous, and poorly exposed. Unconformably overlies pre-Pleistocene bedrock or older till of the Horicon Formation (new name); unconformably underlies the Kirby Lake or Middle Inlet Members (both new names) of the Kewaunee, or is the surface unit. Contact with the equivalent Branch River and Ozaukee Members (both new names), both of the Kewaunee, on the east side of the Green Bay Lobe is an arbitrary vertical contact at the Fox River. Thickness at the type section is 2 m. Age is Pleistocene (late Wisconsinan).

Silverdale Formation

Miocene
North Carolina
Atlantic Coast basin

Baum, G.R., Harris, W.B., and Zullo, V.A., 1978, Stratigraphic revision of the exposed middle Eocene to lower Miocene formations of North Carolina: Southeastern Geology, v. 20, no. 1, p. 1–19.

Type section: Exposures in a quarry located at the intersection of County Roads 1434 and 1442, east of the city of Silverdale, Onslow County, N.C.

The Silverdale beds of Vokes (1967), here named the Silverdale Formation, are exposed only in quarries in a structural basin delineated by the Neuse fault to the northeast and the New River to the southwest in North Carolina. Represents a downdip offshore facies of the laterally equivalent Belgrade Formation and consists of a basal dense, sandy, pelecypod-mold biomicrudite grading upward into unconsolidated sandy, pelecypod biomicrudite. Disconformably overlies the Trent Formation; disconformably underlies the *Crassostrea gigantissima* facies oyster channels. Age is early Miocene.

Silver Lake Metavolcanic Rocks of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Flurkey, A.J., Houston, R.S., Karlstrom, K.E., and Kratochvil, T.L., 1981, The geology of Archean and Early Proterozoic terranes of the Sierra Madre, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 3, p. 403–531.

Type area: Cliffs between South Spring Creek Lake and Silver Lake, Sierra Madre, Carbon County, Wyo.

The Silver Lake Metavolcanic Rocks, here named in the Phantom Lake Metamorphic Suite in the Sierra Madre, include the informal Silver Lake conglomerate and Spring Lake volcanics of Graff (1978), here combined because of their interbedded relationship in outcrop. Consists of mafic and ultramafic(?) metavolcanic rocks, granite boulder paraconglomerate, biotite schist, metagraywacke, metatuff, quartzite, and metacarbonate. Rapid lateral and vertical facies changes are common and suggest deposition of sediments as alluvial fans, deltas, mud flows, or turbidity currents in an environment of scattered volcanic centers erupting flows and tuffs into surrounding basins. Overlies the Jack Creek Quartzite (new name) and underlies the Bridger Peak Quartzite, both of the Phantom Lake. Thickness is 300 m. Age is Archean.

Singer Peak Formation of the Deep Lake Group

Early Proterozoic
Wyoming
Green River basin

Flurkey, A.J., Houston, R.S., Karlstrom, K.E., and Kratochvil, T.L., 1981, The geology of Archean and Early Proterozoic terranes of the Sierra Madre, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 3, p. 403–531.

Type area: None designated. Occurs in the Sierra Madre, Carbon County, Wyo. Derivation of name not stated.

Rocks informally named the Singer Peak Formation by Graff (1978) and rocks assigned by him to the overlying Campbell Lake Formation extended from the Medicine Bow Mountains are here named the Singer Peak Formation of the Deep Lake Group in the Sierra Madre, Wyo. Is interpreted to be an offshore marine facies of fluvialglacial units in the

Medicine Bow Mountains. Consists of phyllite containing minor amounts of quartzite and a paraconglomerate layer near the top. Interfingers with the Magnolia Formation of the Deep Lake Group in the Dexter Peak area, but the contact is more obscure elsewhere; underlies the Cascade Quartzite of the Deep Lake. Correlates with the Lindsey Quartzite and Campbell Lake Formation of the Deep Lake Group in the Medicine Bow Mountains. Thickness ranges from 0 m in the east to 831 m in the west. Age is Early Proterozoic.

Six Lakes Limestone Member of the Hemlock Lake Formation of the Saginaw Group

Early Pennsylvanian (Morrowan)
Michigan
Michigan basin

Vugrinovich, Ray, 1984, Lithostratigraphy and depositional environments of the Pennsylvanian rocks and the Bayport Formation of the Michigan basin: Michigan Geological Survey Division, Report of Investigation 27, 33 p.

Type section: Michigan Consolidated Gas Company Number SL–425 well, NW1/4NW1/4SE1/4 sec. 13, T. 12 N., R. 7 W., Belvidere Township, Montcalm County, Mich. Named for Six Lakes gas storage field in Montcalm County.

The informal cream limestone of Tyler (1980) is here named the Six Lakes Limestone Member in the lower part of the Hemlock Lake Formation of the Saginaw Group in the subsurface of the Michigan basin. Consists of white to yellowish-gray to light-brown micritic limestone containing anhydrite, gypsum, and crystals of metallic sulfides. Is widespread in the western part of the Hemlock Lake study area and ranges from 0 to 30 ft thick. Age is Early Pennsylvanian (Morrowan).

Slade Formation

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R. 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Southwestern highwall of Natural Bridge Stone Company quarry near the Mountain Parkway, about 6.5 km northwest of Slade, Powell County, Ky.

Subunits:

Lower part: **Renfro, St. Louis, Ste. Genevieve, Warix Run, Mill Knob Members.**

Upper part: **Cave Branch Bed, Armstrong Hill, Holly Fork, Rosslyn, Tygarts Creek, Ramey Creek, Maddox Branch, Poppin Rock Members.**

The Slade Formation, here named, includes Upper Mississippian rocks of the Cumberland Escarpment outcrop belt in east-central and northeastern Kentucky, extending to the northern boundary of Kentucky, that formerly were named the Newman Limestone, now restricted from that area. Is divided into a lower part that includes the Renfro, St. Louis, Ste. Genevieve, Warix Run (new name), and Mill Knob (new name) Members and consists of thin- to thick-bedded carbonate units commonly bounded by disconformities and subaerial-exposure surfaces; and an upper part that includes the previously named Cave Branch Bed and the Armstrong Hill, Holly Fork, Rosslyn, Tygarts Creek, Ramey Creek, Maddox Branch, and Poppin Rock Members (all new names) and consists of thin- to thick-bedded carbonate units interbedded with shale. Conformably underlies or intertongues with the Paragon Formation (new name) or disconformably underlies the Paragon, Lee, or Breathitt Formations in the north. Thickness at the type section is 44 m; maximum thickness is 100 m at the arbitrary southwestern limit of the formation, where equivalent units are the Muldraugh Member of the Borden Formation and the Salem, Warsaw, St. Louis, Monteagle, Hartselle, and Bangor Formations. Age is Late Mississippian.

Slate Peak Member of the Virginian Ridge Formation

Cretaceous (Albian to Cenomanian)
Washington
Northern Cascade Range-Okanogan province

Trexler, J.H., Jr., 1985, Sedimentology and stratigraphy of the Cretaceous Virginian Ridge Formation, Methow Basin, Washington: Canadian Journal of Earth Sciences, v. 22, no. 9, p. 1274–1285.

Type section: Type section of Virginian Ridge Formation, the Virginian Ridge-Wolf Creek trail section of Barksdale (1975), 8 km west of Winthrop, secs. 35 and 36, T. 35 N., R. 20 E., Methow Basin, Okanogan County, Wash. Named for Slate Peak, T. 37–38 N., R. 17–18 E., Okanogan County.

The Slate Peak Member of the Virginian Ridge Formation, here named, is in the Methow Basin, the southernmost of a series of Mesozoic basins that rest with angular disconformity on older rocks in the Cascades, north-central Washington. Consists of thin-bedded, lithic sandstone, siltstone, and argillite containing thin chert-pebble conglomerate beds. Unconformably overlies the Harts Pass Group in the north-central part of the basin or gradationally overlies the Patterson Lake Member (new name) of the Virginian Ridge in the southern part of the basin; interfingers with and gradationally underlies the Devil's Pass Member (new name) of the Virginian Ridge along the western margin of the basin or conformably underlies the Winthrop Formation in the east. Thickness ranges from 1,000 m in the western part to 300 m in the eastern part of the basin. Age is Cretaceous (Albian to Cenomanian) based on fossils.

Sleeping Buffalo Rhyolite

Miocene
Arizona
Basin and Range province

Creasey, S.C., Peterson, D.W., and Gambell, N.A., 1983, Geologic map of the Teapot Mountain quadrangle, Pinal County, Arizona: U.S. Geological Survey Geologic Quadrangle Map GQ–1559, scale 1:24,000.

Type locality: Exposures on and near The Sleeping Buffalo, a hill in secs. 3, 4, T. 3 S., R. 12 E., Teapot Mountain 7.5-minute quadrangle, Pinal County, Ariz.
Subunit: **Arnett Member.**

The Sleeping Buffalo Rhyolite, here named, is in the Teapot Mountain quadrangle, Pinal County, Ariz. Contains porphyritic rhyolite flows, intrusive rocks, and breccias, including the Arnett Member (new name), a unit of light-gray to buff flow-banded rhyolite, and an informal tuff member that is a buff, yellow, or brown, locally well-bedded, water-deposited tuff having a thickness of 0 to 120 m. One mass is a plug that grades from intrusive to flow and includes agglomerates, glass borders, autobreccia, flow layering, and pumice. Flows are locally glassy, perlitic, and devitrified. Rhyolite contains phenocrysts of plagioclase, quartz, sanidine, biotite, and magnetite in a glassy, devitrified or aphanitic groundmass. Conformably overlies older Tertiary tuff; unconformably underlies the Road Runner Rhyolite (new name). Age is Miocene based on potassium-argon ages of 18 to 15.9 Ma for rhyolite in the Mineral Mountain quadrangle to the west.

Slide Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Composite of exposures on logging road S–1000 on Slide Mountain, secs. 4 and 9, T. 39 N., R. 6 E.; logging road 400 on the southeast side of Canyon Creek north of the North Fork Nooksack River, W½ sec. 36, T. 40 N., R. 6 E.; and logging road SP–410 on the northeast side of Canyon Creek, SE¼ sec. 25, T. 40 N., R. 6 E., Whatcom County, Wash.

The Slide Member of the Chuckanut Formation, here named, is in the eastern part of the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands into the foothills of the North Cascades, Wash. Consists of fining-upward cycles of lower coarse-grained units of arkosic sandstone and upper fine-grained units of mudstone and minor amounts of coal and sandstone, that are interpreted as meandering river and adjacent flood-plain deposits. Overlies the Bellingham Bay Member (new name); interfingers with the Padden Member (new name) to the west and is in fault contact with pre-Tertiary rock to the east; underlies the Warnick and Maple Falls Members (new names), all of the Chuckanut Formation. Thickness is 1,960 m at the type section. Age is middle Eocene based on zircon fission-track ages of the Bellingham Bay and Padden Members.

Smith Gut Member of the Flanner Beach Formation

Pleistocene
North Carolina
Atlantic Coast basin

Miller, William, III, 1985, The Flanner Beach Formation (middle Pleistocene) in eastern North Carolina: Tulane Studies in Geology and Paleontology, v. 18, no. 3, p. 93–122.

Type section: Measured section SG1, bluffs on the north bank of the Neuse River, 3.4 km southeast of the mouth of Beard Creek and 0.3 km northwest of Smith Gut, Cherry Point 7.5-minute quadrangle, Pamlico County, N.C.

Basal transgressive beds of the Flanner Beach Formation exposed in the Neuse River valley of the North Carolina Coastal Plain are here named the Smith Gut Member. Consists of an irregular blanket-shaped deposit of olive-brown to greenish-gray, pebbly, shelly, muddy sand. Disconformably overlies the James City Formation; gradationally underlies the Arapahoe Sand, Beard Creek, and Newport Sand Members (all new names) of the Flanner Beach Formation. Thickness is 0.5 m at the type section. Age is middle Pleistocene.

Smoke Creek Bed of the Windom Shale Member of the Moscow Formation of the Hamilton Group

Middle Devonian
New York
Appalachian basin

Baird, G.C., and Brett, C.E., 1983, Regional variation and paleontology of two coral beds in the Middle Devonian Hamilton Group of western New York: Journal of Paleontology, v. 57, no. 3, p. 417–446.

Type section: Exposures on the bank of the south branch of Smoke Creek, 0.25 mi south of Mile Strip Road at Windom, (Windom Shale Member type section), Buffalo SE 7.5-minute quadrangle, Erie County, N.Y.

The Coral-trilobite bed of Brett (1974) is here named the Smoke Creek Bed of the Windom Shale Member of the Moscow Formation of the Hamilton Group. Extends from Lake Erie east to Canandaigua Valley, New York, and consists of hard, calcareous mudstone. Overlies the Bay View Coral Bed (new name) in the lower part of the Windom; underlies the Fall Brook Coral Bed (new name) of the Windom. Thickness is 25 to 40 cm. Age is Middle Devonian.

Smugglers Pass Formation of the Thunderbird Group

Precambrian
Texas
Orogrande basin

Thomann, W.F., 1981, Ignimbrites, trachytes, and sedimentary rocks of the Precambrian Thunderbird Group, Franklin Mountains, El Paso County, Texas: Geological Society of America Bulletin, v. 92, no. 2, pt. I, p. 94–100.

Type section: Exposure 3,000 ft northeast of Smugglers Pass in Fusselman Canyon, Franklin Mountains, lat 31°53′06″ N., long 106°29′34″ W., El Paso County, Tex.

The Smugglers Pass Formation is here named the middle of three formations in the Thunderbird Group (new name) in the Franklin Mountains, Tex. Consists of four units: a lowermost dark-gray to olive-black, melanocratic porphyritic trachyte unit as much as 150 ft thick; a grayish-red porphyritic trachyte unit as much as 200 ft thick; a tuffaceous sandstone and conglomerate unit as much as 90 ft thick; and an uppermost silicified ignimbrite as much as 20 ft thick. Overlies the Coronado Hills Conglomerate (new name) and underlies the Tom Mays Park Formation (new name), both of the Thunderbird Group. Thickness is about 1,800 ft at the type section. Age is late Precambrian (950 Ma).

Snellville Formation

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Large roadcut outcrops on Lanier Mountain, Snellville quadrangle, Gwinnett County, Ga. Named for exposures within the city limits of Snellville.
Subunits: **Norris Lake Schist Member, Lanier Mountain Quartzite Member.**

The Snellville Formation, here named, is in the Newnan-Tucker synform near Atlanta, Ga., and includes the lower Norris Lake Schist Member (new name) and the upper Lanier Mountain Quartzite Member (new name). Discordantly overlies the Lithonia Gneiss and the Wolf Creek, Clairmont, and Wahoo Creek Formations (all new names) of the Atlanta Group (new name) and is probably younger than the Atlanta Group. The lower contact is either a folded thrust contact or a folded angular unconformity. Is intruded by the Stone Mountain and Panola Granites (325 Ma). Age is Late Proterozoic and (or) early Paleozoic based on an age of 1,100 Ma of detrital zircons from the Lanier Mountain Quartzite Member.

Snowcrest Range Group

Late Mississippian and Early Pennsylvanian (Meramecian, Chesterian, Morrowan)
Montana
Montana folded belt province

Wardlaw, B.R., and Pecora, W.C., 1985, New Mississippian-Pennsylvanian stratigraphic units in southwest Montana and adjacent Idaho, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–B, p. B1–B9.

Type area: Snowcrest Range, Beaverhead and Madison Counties, Mont.
Subunits: **Kibbey Sandstone, Lombard Limestone, Conover Ranch Formation**

Rocks in southwest Montana formerly assigned to the Big Snowy Group and Amsden Formation are here named the Snowcrest Range Group. Includes the basal Kibbey Sandstone, reassigned in this area from the Big Snowy Group, the Lombard Limestone (new name), and the upper Conover Ranch Formation (new name). The Kibbey consists of yellow siltstone, sandstone, and mudstone; the Lombard consists of a lower unit of lime-mudstone and packstone and an upper unit of lime-mudstone, wackestone, and packstone; the Conover Ranch consists of mudstone containing minor amounts of limestone and sandstone. Overlies the McKenzie Canyon Limestone (new name) of the Tendoy Group (new name) in the Tendoy Range, and the Mission Canyon Limestone of the Madison Group elsewhere; underlies and intertongues with the Quadrant Sandstone. Age is Late Mississippian and Early Pennsylvanian (middle Meramecian to early Morrowan) based on conodont, foraminifer, coral, and brachiopod faunas.

Snow Flake Formation

Mississippian
Tennessee
Appalachian basin

Brent, W.B., 1982, Mississippian stratigraphy of Greendale and Newman Ridge synclines and Middle Ordovician nomenclature in upper east Tennessee: Tennessee Division of Geology Report of Investigations 41, 37 p.

Type section: South side of county road, 1.6 km northeast of the locality of Snow Flake, 2.8 km east of Looneys Gap in Clinch Mountain, Looneys Gap quadrangle, Hawkins County, Tenn.

The Snow Flake Formation, informally named by Sanders (1952), is here named. These Mississippian strata in the Greendale syncline in Hawkins and Grainger Counties, Tenn., were previously named the Newman Limestone by Hardeman and others (1966) but are isolated from the type Newman Limestone in the Newman Ridge syncline. Consists of fossiliferous, calcareous shale, silty shale, and limestone. Overlies the Laurel Branch Limestone (new name); underlies the Clifton Creek Limestone (new name). Thickness is 36 m. Age is Mississippian.

Soapstone Ridge Complex

Paleozoic(?)
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54-A, p. 3–40.

Type locality: Soapstone Ridge, just south of South River, Atlanta, Southeast Atlanta quadrangle, De Kalb County, Ga.

The Soapstone Ridge Complex, here named, is in the Newnan-Tucker synform near Atlanta, Ga. Consists of metamorphosed mafic and ultramafic igneous rocks and is divided into six major lithologic units: basal sillimanite-quartz blastomylonite and epidosite, actinolite-chlorite-talc schist, interlayered metamorphosed mafic and ultramafic rocks, mixed amphibolite and actinolite-chlorite-talc schist, amphibolite, and metatroctolite. Is a multiply folded remnant of a disrupted ophiolite complex no more than 200 m thick, emplaced by low-angle thrusting in the early Middle Ordovician, and has many erosional windows exposing rocks of the Big Cotton Indian Formation (new name) of the Atlanta Group (new name). Age is early Paleozoic(?).

Socorro Peak Rhyolite of the Santa Fe Group

Miocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type area: On and south of Socorro Peak, 3 mi west and southwest of Socorro in a belt extending from the summit of Socorro Peak southward to the Grefco perlite mine, secs. 5, 8, 16, 17, 21, and 28, T. 3 S., R. 1 W., Socorro 7.5-minute quadrangle, Socorro County, N. Mex.

The Socorro Peak Rhyolite of the Santa Fe Group, here named, is in the Orogrande basin, New Mexico. Includes the informal rhyolite of Pound Ranch. Consists of rhyodacite and rhyolite domes and flows containing minor amounts of pyroclastic rocks. Overlies fanglomerate and playa mudstones of the Popotosa Formation and is interbedded with upper Popotosa mudstone. Age is Miocene based on potassium-argon dates of 12.1 Ma for Strawberry Peak, 10.8 Ma for Signal Flat Hill, 10.6 Ma for Stonewall Hill, 10.3 Ma for 6001 Mesa, 9.2 Ma for 6633 Peak, and 4.5 Ma for Radar Peak, all of which are rhyolite domes.

Soda Lake Bed of the Carson Desert Formation

Pleistocene and Holocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 10 of Morrison (1964), bluff on the southeast side of Soda Lake, Carson Desert, SW¼SW¼ sec. 8, T. 19 N., R. 28 E., Churchill County, Nev.

The Soda Lake Bed of the Carson Desert Formation (new name), here named, is in the Carson Desert of the Lake Lahontan area, Nevada. Brown tephra of the Soda Lake Bed are found only at the Soda Lake vent and are distinguishable from the older tephra of the Upsal Hogback Bed (new name) of the Carson Desert Formation under the microscope only by the larger olivine crystals and lower refractive index of the Soda Lake. Upsal Hogback and Soda Lake vents may have shared the same magma source. Age is Pleistocene and Holocene, 11 to 6 ka.

Solomon Temple Member of the Dox Formation of the Unkar Group

Middle Proterozoic
Arizona
Plateau sedimentary province

Stevenson, G.M., and Beus, S.S., 1982, Stratigraphy and depositional setting of the upper Precambrian Dox Formation in Grand Canyon: Geological Society of America Bulletin, v. 93, no. 2, p. 163–173.

Type section: Exposures 2.4 km northeast of Solomon Temple, a prominent butte in the eastern Grand Canyon, Vishnu Temple quadrangle, Coconino County, Ariz.

The Solomon Temple Member of the Dox Formation of the Unkar Group, here named, is in the eastern Grand Canyon, Ariz. Consists of a lower unit exposed as a monotonous slope-forming sequence of alternating red to reddish-brown, fine-grained sandstone and red to maroon, laminated, shaly, micaceous siltstone, 215 m thick; and an upper unit, a complex of dark-red, fine-grained, micaceous channel sandstones, 66 to 122 m thick. Is interpreted as a flood-plain complex grading upward into migrating fluvial or tidal-channel or point-bar deposits. Gradationally overlies the Escalante Creek Member (new name), and underlies the Comanche Point Member (new name), both of the Dox Formation. Thickness is 280 m at the type section. Age is Middle Proterozoic based on the age of the overlying Cardenas Lavas (1.1 Ma).

South Canyon Tuff

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Exposures on the northwest side of the mouth of South Canyon, 12 mi southwest of Socorro, SW¼ sec. 30, T. 3 S., R. 2 W., Magdalena SE 7.5-minute quadrangle, Socorro County, N. Mex.

Rocks formerly called Potato Canyon Rhyolite Tuff, now abandoned, are here named the South Canyon Tuff. Occurs in the northeast Mogollon-Datil volcanic field, except for the Datil area, northern Gallinas Mountains, and Bear Mountains. Is divided into lower and upper members and consists of a simple to compound thick and continuous cooling unit of crystal-poor to moderately crystal-rich, quartz-rich, rhyolite ash-flow tuff. Overlies the Lemitar Tuff (new name) and tongue "c" of the La Jara Peak Basaltic Andesite; underlies the Popotosa Formation. Thickness attains 650 ft. Age is Oligocene based on a potassium-argon date of 26.7 Ma on biotite.

South Crosby Peak Formation

Oligocene
New Mexico
Orogrande basin

Osburn, G.R., and Chapin, C.E., 1983, Nomenclature for Cenozoic rocks of northeast Mogollon-Datil volcanic field, New Mexico: New Mexico Bureau of Mines and Mineral Resources Stratigraphic Chart 1.

Type section: Exposure 1.8 mi northeast of South Crosby Peak and 4.3 mi southwest of Datil, NE¼ sec. 19, T. 2 S., R. 10 W., eastern Crosby Mountains, Sugarloaf Mountain 7.5-minute quadrangle, Catron County, N. Mex.

Rocks formerly called the tuff of Crosby Mountain and volcaniclastic rocks of South Crosby Peak are here named the South Crosby Peak Formation. Occurs in the eastern Crosby and Datil Mountains and in the Jornada del Muerto, N. Mex. Consists of grayish-pink, medium- to coarse-grained, tuffaceous volcaniclastic sandstone and conglomerate and pale-pink, unwelded to poorly welded, crystal poor, ash-flow tuff. Overlies the Hells Mesa Tuff; underlies the La Jencia Tuff (new name). Thickness at the type section is 595 ft and ranges from 0 to 200 ft in the Datil and western Gallinas Mountains. Age is Oligocene.

South Fork Member of the Snowshoe Formation

Middle Jurassic (Bathonian)
Oregon
Snake River basin

Smith, P.L., 1980, Correlation of the members of the Jurassic Snowshoe Formation in the Izee basin of east-central Oregon: Canadian Journal of Earth Sciences, v. 17, no. 12, p. 1603–1608.

Type section: Type section of the Snowshoe Formation, South Fork of the John Day River near the former community of Izee, Izee 15-minute quadrangle, Grant County, Oreg.

Rocks previously described by Dickinson and Vigrass (1965) as the upper member of the Snowshoe Formation are here named the South Fork Member of the Snowshoe in the Mowich upwarp of the John Day inlier in Washington. Consists of thin-bedded, dark mudstone and siltstone containing beds of gray, calcareous sandstone. Laminations and crossbedding indicate turbidite deposition. Unconformably overlies the Schoolhouse Member (new name) or the Silvies Member of the Snowshoe; unconformably underlies the Trowbridge Formation. Thickness is 500 m at Lewis Creek and thins southward. Age is Middle Jurassic (Bathonian).

South Mountains Granodiorite

Tertiary
Arizona
Basin and Range province

Reynolds, S.J., 1985, Geology of the South Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 195, 61 p.

Type locality: Exposures along Summit Road, 500 m northeast of Telegraph Pass, Main Ridge of the South Mountains, Maricopa County, Ariz. Reference localities are designated.

The South Mountains Granodiorite, here named, comprises most of the eastern half of the Main Ridge and Southern Foothills of the South Mountains near Phoenix, Ariz. Consists of gray, medium-grained, equigranular to slightly porphyritic granodiorite and contains numerous comagmatic aplitic dikes. Mylonitic fabric is present in most exposures and is darker due to streaking of biotite and a reduction in grain size. Chloritic breccia and microbreccia occupy zones of intense deformation. Is the oldest of three phases of a composite pluton and grades into or is intruded by the second phase Telegraph Pass Granite (new name). Underlies the third phase Dobbins Alaskite (new name) in places. Intrudes the overlying Precambrian Estrella Gneiss (new name) along a subhorizontal contact where it is strongly mylonitic. Age is middle Tertiary.

Spickert Knob Formation of the Borden Group

Early Mississippian (Keokuk)
Indiana
Cincinnati arch

Rexroad, C.B., and Lane, N.G., 1984, Spickert Knob Formation (new), Borden Group, in Indiana: Indiana Geological Survey Occasional Paper 43, 4 p.

Type section: Outcrops along Spickert Knob Road and in adjacent ravines to the northeast in the NE¼ sec. 21 and SE¼ sec. 16, T. 2 S., R. 6 E., New Albany 7.5-minute quadrangle, Floyd County, Ind.

The Spickert Knob Formation of the Borden Group, here named, was described in Floyd County, Ind., where the name was used by Stockdale (1931) for a facies of the Locust Point Formation. The Locust Point and Carwood Formations of the Borden Group do not have a recognizable mutual boundary that consistently separates them outside their type areas, and together they represent parts of a depositional event that resulted in a single mappable unit, designated the Spickert Knob Formation. The Locust Point and Carwood cannot be mapped separately and are abandoned. The Spickert Knob consists of silty shale, siltstone, sandstone, and lenticular limestone. Gradationally overlies the Kenwood Member of the New Providence Shale; gradationally underlies the Floyds Knob Limestone Member of the Edwardsville Formation. Thickness at the type section is 238 ft. Age is Early Mississippian (Keokuk) based on fossils.

Spieden Bluff Formation of the Spieden Group

Late Jurassic (Oxfordian or Kimmeridgian)
Washington
Puget Sound province

Johnson, S.Y., 1981, The Spieden Group: An anomalous piece of the Cordilleran paleogeographic puzzle: Canadian Journal of Earth Sciences, v. 18, no. 11, p. 1694–1707.

Type section: Spieden Bluff, north end of Spieden Island, sec. 2, T. 37 N., R. 4 W., San Juan Islands, San Juan County, Wash.

The Spieden Bluff Formation of the Spieden Group, here named, is in the San Juan Islands, Wash. Includes a lower member consisting of structureless, fine-grained sandstone and crystal tuff, 5 m thick, overlain by volcanic breccia-conglomerate, 75 m thick; and a gradationally overlying upper member consisting of gray, fine- to medium-grained, fossiliferous sandstone and siltstone, 20 m thick. Strata were deposited in subaerial and shallow marine environments near an active volcanic source. Base is not exposed; disconformably underlies the Sentinel Island Formation (new name) of the Spieden Group, with a hiatus spanning 20 to 30 million years. Age is Late Jurassic (Oxfordian or Kimmeridgian) based on fossils.

Spillville Formation

Middle Devonian (Eifelian)
Iowa, Minnesota
Iowa shelf

Klapper, Gilbert, and Barrick, J.E., 1983, Middle Devonian (Eifelian) conodonts from the Spillville Formation in northern Iowa and southern Minnesota: Journal of Paleontology, v. 57, no. 6, p. 1212–1243.

Type section: Abandoned quarry at Spillville (Pavlovec's Spillville quarry), SE¼ sec. 20, T. 97 N., R. 9 W., Fort Atkinson quadrangle, Winneshiek County, Iowa.

Basal Middle Devonian strata in northern Iowa and southern Minnesota, previously correlated with the Solon Member of the Cedar Valley Formation in east-central Iowa, are here named the Spillville Formation. Can be distinguished from the Solon Member because it is consistently a yellowish-orange to grayish-orange, medium- to fine-grained, fossiliferous, calcareous dolostone sequence containing sandstone or sandy carbonate developed locally at the base. Late Eifelian conodonts in the lower part suggest a correlation with the lower part of the Coggon Member of the Wapsipinicon Formation. Unconformably overlies the Maquoketa Shale; underlies a clastic interval correlated with the Kenwood Member of the Wapsipinicon. The clastic interval underlies a unit that is the lithostratigraphic equivalent of the combined Spring Grove and Davenport Members of the Wapsipinicon, and this unit underlies the informal Salisbury beds, which may correlate with the Solon Member of the Cedar Valley Formation. Thickness at the type section is 18 m. Age is Middle Devonian (Eifelian).

Split Rock Creek Formation

Late Cretaceous
South Dakota
Sioux uplift

Ludvigson, G.A., McKay, R.M., Iles, D., and Bretz, R.F., 1981, Lithostratigraphy and sedimentary petrology of the Split Rock Creek Formation, Late Cretaceous of southeastern South Dakota: Iowa Geological Survey Guidebook Series 4, p. 77–104.

Type section: None designated. Named for exposures along cut banks of Split Rock Creek, Minnehaha County, S. Dak. Principal surface and subsurface sections designated.

The Split Rock Creek Formation, here named, occurs in an 80 mi^2 area in the Sioux uplift of southeastern South Dakota. Is a basin-fill shallow water facies equivalent of a marine unit, probably the Niobrara Formation. Consists of sandy diamictites and friable quartz sandstone overlain by dark-gray, laminated, organic claystone that grades upward into opaline spiculite and massive chert. Contains land plant debris, fossils, and Precambrian rock detritus. Unconformably overlies late Precambrian Sioux Quartzite or, locally, Corson Diabase. Maximum thickness is about 300 ft. Age is Late Cretaceous based on regional relationships and fossil evidence, including sequoia twig molds, teleost fish scales, sponge spicules, radiolaria, gastropods, foraminifera, pelecypods, and crustaceans.

Springhill Pond Formation of the Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: None designated. Occurs in the eastern Adirondack Mountains, N.Y. Origin of name not stated.

The name Springhill Pond Formation of Walton and deWaard (1963) is here assigned to the Lake George Group (new name) in the eastern Adirondack Mountains in New York. Consists of garnet-sillimanite gneiss, quartzite, and marble. Alling (1917) divided the sequence, from base to top, into tentative units: Hague gneiss, Dixon schist, Faxon limestone, Swede Pond quartzite, (Bryant Lake) limestone, Catamount sillimanite schist, and Bear Pond schist. Structurally overlies the Lake Durant Formation; structurally underlies the Thunderbolt Mountain Formation (new name), both of the Lake George Group. Correlates with the Blue Mountain Lake Formation of the central Adirondacks. Age is Proterozoic. [Although this name has not been formally proposed, it is included here because of its continued usage.]

Spruce Creek Formation

Cretaceous
Alaska
Yukon-Koyukuck province

Sainsbury, C.L., 1974, Geologic map of the Bendeleben quadrangle, Seward Peninsula, Alaska: U.S. Bureau of Mines, U.S. Geological Survey, and The Mapmakers, 31 p., scale 1:150,000.

Type locality: Exposures at the head of Spruce Creek, a southwest tributary of Independence Creek, a tributary of the Kugruk River, Bendeleben quadrangle, Seward Peninsula, Alaska.

The Spruce Creek Formation, here named, is in the area along the east front of the Darby Mountains and northward along the Kugruk River, Seward Peninsula, Alaska. Consists of thick cobble conglomerate containing clasts of limestone and dolomite, Jurassic volcanic rocks, chloritic schist, and York Slate (new name). Weathers to bare hills covered by cobbles. Unconformably overlies Jurassic metavolcanic rocks or Paleozoic carbonate rocks; underlies a thrust sheet of Paleozoic rocks. Maximum thickness is at least 200 ft, but much has been removed by erosion. Age is Cretaceous.

Stage Crossing Gneiss

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type area: Northern Medicine Bow Mountains, Carbon County, Wyo. Named for the Overland Trail stage crossing of Rock Creek, near Arlington.

The Stage Crossing Gneiss, here named, is in the northern Medicine Bow Mountains, Wyo. Consists of hornblende gneiss and minor amounts of metasedimentary biotite gneiss. Gradationally underlies or may be in fault contact with the Stud Creek Volcaniclastic Rocks (new name) of the Phantom Lake Metamorphic Suite. Maximum thickness is 1,200 m but is probably much less because of repetition by folding. Age is Archean because it is cut by granite similar to the Baggot Rocks Granite (2,500 to 2,400 Ma).

Stage Road Layered Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Sinha, A.K., and Bartholomew, M.J., 1984, Evolution of the Grenville terrane in the central Virginia Appalachians: Geological Society of America Special Paper 194, p. 175–186.

Type section: Outcrops on U.S. Highway 29, 50 m west of its intersection with Virginia State Road 617, lat 37°51′ N., long 78°48′ W., Lovingston 7.5-minute quadrangle, Rockbridge County, Va. Origin of name not stated.

The Stage Road Layered Gneiss, here named, is in the Lovingston massif and includes augen gneisses and schists of the old Lovingston Formation of Jonas (1935). Consists of augen gneiss, biotite gneiss, and layered schists and gneisses. Age is Middle Proterozoic based on concordia intercept ages of 1,870 to 915 Ma.

Station Hills Phyllite Member of the **Popes Head Formation**

Late Proterozoic and (or) Early Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Lyttle, P.T., 1981, The Accotink Schist, Lake Barcroft Metasandstone, and Popes Head Formation—Keys to an understanding of the tectonic evolution of the northern Virginia Piedmont: U.S. Geological Survey Professional Paper 1205, 16 p.

Type locality: Exposures along the tracks of the Southern Railroad, from a point about 350 m west of Station Hills to a point about 900 m east of that village, Fairfax 7.5-minute quadrangle, Fairfax County, Va.

The Station Hills Phyllite Member of the Popes Head Formation (new name), here named, is in Fairfax County, Va. Consists of light-greenish-gray, dusky-yellow-weathering phyllite and lesser fine-grained metasiltstone occupying the core of the Popes Head synform in the Wissahickon terrane. Conformably overlies the Old Mill Branch Member (new name) of the Popes Head; is intruded by the Occoquan Granite. Maximum exposed thickness is about 300 m, but the top of the unit is covered. Age is Late Proterozoic and (or) Early Cambrian based on a radiometric age of Early Cambrian for the Occoquan Granite.

Stephens Forest Formation of the Marmaton Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Center of the east line, NW¼ sec. 18, T. 72 N., R. 22 W., Lucas County, Iowa. Named for Stephens State Forest, 1.5 mi southwest of the town of Lucas.
Subunits: Little Osage Shale Member, Houx Limestone Member, Higginsville Limestone Member.

The Stephens Forest Formation, here named, is in the Marmaton Group of the Des Moines Supergroup in southeastern and central Iowa. Includes in ascending order the revised Little Osage Shale Member, the Houx Limestone Member, an unnamed shale member, and the Higginsville Limestone Member. Consists of fissile, black phosphatic shale; calcareous, green-brown, fossiliferous shale; light-gray, silty shale; and light-gray, fine-grained, fossiliferous limestone. Encompasses the marine portion of the upper depositional cycle of the Marmaton.

Overlies the Summit Coal Member (new name) of the Morgan School Shale (new name) and underlies the Labette Shale, both of the Marmaton Group. Thickness is 11.5 ft at the type section. Age is Middle Pennsylvanian (Desmoinesian).

Stewarts Knob Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Outcrop along the Blue Ridge Parkway, 0.5 mi north of its junction with Virginia Highway 24, Stewartsville 7.5-minute quadrangle, Bedford County, Va.

The Stewarts Knob Gneiss, here named, is in the Pedlar massif in the Blue Ridge in Virginia. Consists of small intrusive bodies of light-gray to white porphyroblastic biotite-garnet leucogneiss with associated nelsonite dikes. Age is late Middle Proterozoic.

St. Francis Till

Pleistocene (Wisconsinan)
Maine
New England province

Genes, A.N., Newman, W.A., and Brewer, T.B., 1981, Late Wisconsinan glaciation models of northern Maine and adjacent Canada: Quaternary Research, v. 16, no. 1, p. 48–65.

Type locality: Exposures in river bluffs at Golden Rapids, Rankin Rapids, and Hammond Brook along the St. John River, Aroostook County, Maine. [Probably named for the town of St. Francis near Rankin Rapids.]

The oldest Pleistocene sediments in Aroostook County, Maine, exposed by the downcutting of the St. John River to bedrock, are here named the St. Francis Till. Consists of compact, silty to clayey, dark-gray till containing clasts derived from the underlying Seboomook Formation, 3.0 to 3.6 m thick, overlain by outwash or boulder pavement of similar lithology, 3.0 to 5.0 m thick, or stratified sediments associated with younger drift. Correlates with the middle Wisconsinan Chaudiere Till and Gayhurst Formation of southeastern Quebec. Unconformably underlies the Van Buren Till (new name) along the St. John River. Age is Pleistocene (middle Wisconsinan).

St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

Type area: St. Francois Mountains, southeast Missouri.
Subunits: Shepherd Mountain Rhyolite, Cedar Bluff Rhyolite, Pond Ridge Rhyolite, Buck Mountain Shut-ins Formation, Ironton Rhyolite, Lindsey Mountain Rhyolite, Russell Mountain Rhyolite, Wildcat Mountain Rhyolite, Bell Mountain Rhyolite, Royal Gorge Rhyolite, Taum Sauk Rhyolite, Proffit Mountain Formation, Johnson Shut-ins Rhyolite, Cope Hollow Formation.

The formal name St. Francois Mountains Volcanic Supergroup is here adopted for all the Precambrian volcanic rocks of the St. Francois Mountains in southeast Missouri. Includes the units defined by Berry (1976) in the western part of the St. Francois Mountains, listed above. All are new names except the revised Royal Gorge Rhyolite. Age is Middle Proterozoic.

Stonewall Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54-A, p. 3–40.

Type locality: Exposures in and around the community of Stonewall, Fairburn quadrangle, Fulton County, Ga.

The Stonewall Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga., and consists of medium-grained biotite gneiss and fine-grained hornblende-plagioclase amphibolite interlayered with sillimanite-biotite schist. Sharply and conformably overlies the Wahoo Creek Formation (new name), and sharply and conformably underlies the Clarkston Formation (new name), both of the Atlanta Group. Thickness ranges from 1,000 to 1,500 m. Age is Late Proterozoic and (or) early Paleozoic.

Stratford Mountain Till

Pleistocene (Wisconsinan)
New Hampshire
New England province

Koteff, Carl, and Pessl, Fred, Jr., 1985, Till stratigraphy in New Hampshire: Correlations with adjacent New England and Quebec, *in* Borns, H.W., Jr., and others, eds., Late Pleistocene history of northeastern New England and adjacent Quebec: Geological Society America Special Paper 197, p. 1–12.

Type locality: Composite of exposures along Nash Stream, Coos County, N.H. Named for nearby Stratford Mountain.

The upper till at Nash Stream in northern New Hampshire is here named the Stratford Mountain Till. Consists of light-olive-gray, loose to moderately compact, sandy till containing clasts of Ordovician and Devonian quartz monzonite, schist, and phyllite. Is oxidized to a depth of 1 m. Unconformably overlies the Nash Stream Till (new name) or sharply truncated glaciolacustrine outwash; underlies fluvial outwash. Correlates with surface tills throughout New England and with the Lennoxville Till in Quebec. Age is late Pleistocene (late Wisconsinan) based on its similarity to other surface tills.

Stroudsburg Member of the **Buttermilk Falls Limestone**

Middle Devonian (Onesquethawan and Cazenovian)
Pennsylvania
Appalachian basin

Epstein, J.E., 1984, Onesquethawan stratigraphy (Lower and Middle Devonian) of northeastern Pennsylvania: U.S. Geological Survey Professional Paper 1337, 35 p.

Type section: Railroad cut of Erie-Lackawanna Railroad, nearly 1 mi south of East Stroudsburg Post Office, Stroudsburg 7.5-minute quadrangle, Monroe County, Pa. Named for Stroudsburg, Pa.

The upper member of the Buttermilk Falls Limestone in the Godfrey Ridge area, Monroe County, Pa., is here named the Stroudsburg Member. Consists of irregularly bedded, medium-gray, fossiliferous, fine- to medium-grained, locally argillaceous limestone and dark-gray to grayish-black chert in irregular beds, lenses, and pods. Gradationally overlies the McMichael Member (new name) of the Buttermilk Falls; the upper boundary is not exposed but is probably in abrupt contact with the Union Springs Shale Member of the Marcellus Shale. The Tioga Ash Bed, which crops out 27 ft below the top of the member, marks the top of the Onesquethawan Stage. The upper 27 ft of the Stroudsburg is Cazenovian and correlates with the Seneca Member of the Onondaga Limestone. Thickness is 149 ft. Age is Middle Devonian (Onesquethawan and Cazenovian).

Stuart Creek Gneiss

Middle Proterozoic
Virginia
Piedmont-Blue Ridge province

Conley, J.F., 1985, Geology of the southwestern Virginia Piedmont: Virginia Division of Mineral Resources Publication 59, 33 p.

Type locality: Exposures along both sides of Stuart Creek, from State Road 632, northwest for 2 mi, Spray 7.5-minute quadrangle, Henry County, Va.

Granitic augen gneiss that occupies the cores of four structural domes in the Sauratown Mountains anticlinorium in Virginia is here named the Stuart Creek Gneiss. Texture varies from porphyroblastic gneiss to augen gneiss and flaser gneiss. Unconformably underlies metasedimentary rocks correlated with the Lynchburg Group. Age is Middle Proterozoic based on similar rocks dated at 1,192 Ma.

Stud Creek Volcaniclastic Rocks of the Phantom Lake Metamorphic Suite

Archean
Wyoming
Green River basin

Karlstrom, K.E., Houston, R.S., Coolidge, C.M., Flurkey, A.J., and Sever, C.K., 1981, The geology of Archean and Early Proterozoic terraines of the Medicine Bow Mountains, Wyoming, *in* Karlstrom, K.E., Houston, R.S., Flurkey, A.J., and others, eds., A summary of the geology and uranium potential of Precambrian conglomerates in southeastern Wyoming: U.S. Department of Energy National Uranium Resource Evaluation, v. 1, pt. 2, p. 197–399.

Type locality: Outcrops near Stud Creek, sec. 15, T. 18 N., R. 79 W., Medicine Bow Mountains, Carbon County, Wyo.

The Stud Creek Volcaniclastic Rocks, here named, is the oldest unit of the Phantom Lake Metamorphic Suite in the Medicine Bow Mountains, Wyo. Crops out in the core of the overturned, doubly plunging French Joes anticlinorium near Stud Creek in the south and Rock Mountain in the north. Consists of a heterogeneous assemblage of metavolcanic and metasedimentary rocks lumped into four groups: pelitic schists, amphibolitic schists, quartzites and conglomerates, and calcareous rocks. Depositional environments ranged from fluvial to shallow marine but subaerial deposition and volcanism may have predominated. Stratigraphic relationships with the underlying Stage Crossing Gneiss (new name) and the overlying Rock Mountain Conglomerate (new name) of the Phantom Lake are complicated and may be in part gradational. Overall thickness is difficult to estimate because of isoclinal folds and the inferred presence of large strike faults, but maximum exposed stratigraphic thickness ranges from 330 m in the north to 500 m in the south. Age is Archean.

Stumptown Member of the **Nassawadox Formation**

Pleistocene
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Borehole Ch-11, lower 141 ft of Nassawadox Formation type section, east end of Route 648, 0.5 mi east of Stumptown, west of Penn Central Railroad branch line, 10 mi south-southwest of the town of Nassawadox, Cheriton 7.5-minute quadrangle, Northampton County, Va.

The Stumptown Member, here named the lower member of the Nassawadox Formation (new name), fills the Eastville paleovalley in the subsurface of the Franktown plain and central upland south of the Ames Ridge shoreline in Northampton County, Va. Consists of sandy gravel, clay-silt, and muddy, fine sand that form three distinct lithofacies, named units A, B, and C. Unconformably overlies the Eastover or Yorktown Formations; conformably to disconformably underlies the Butlers Bluff Member (new name) of the Nassawadox. Thickness at the type section is 140 ft. Age is Pleistocene.

Summit Coal Member of the Morgan School Shale of the Marmaton Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: None designated. First described in Macon County, Mo. (McGee, 1885).

The Summit Coal Member, here named, is at the top of the Morgan School Shale (new name) of the Marmaton Group and was described as the Summit coal in Missouri by McGee (1885). Is poorly developed in Iowa, usually as a smut zone. Consists of black, carbonaceous shale with alternating bands of vitrain and calcareous fossil debris. Underlies the Stephens Forest Formation (new name). Correlates with the

Springfield (Number 5) coal of northwestern Illinois. Thickness is 8 in. at the Morgan School Shale type section. Age is Middle Pennsylvanian (Desmoinesian).

Summit-Frazer Trondhjemitic Gneiss

Mississippian
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Society of America Bulletin, v. 94, no. 4, p. 471–498.

Type area: Roadcuts along the Loup Loup Pass Highway (Washington State Highway 20), T. 33–34 N., R. 23–24 E., western part of the Okanogan Range, Okanogan County, Wash. Named for Summit and Frazer Creeks.

Premetamorphic basement gneisses in the western part of the Okanogan Range, Wash., are here named the Summit-Frazer Trondhjemitic Gneiss. Main phase includes 95 percent of the batholith and consists of trondhjemitic orthogneiss with metamorphic textures resulting from Mesozoic metamorphism. Older inclusion phase along the eastern margin contains altered metasedimentary and xenoliths of igneous rocks. Coyote Ridge quartz dioritic gneiss phase is a border phase in the southwestern part of the area. Represents a premetamorphic granitic basement mobilized as a gneiss dome during Mesozoic regional metamorphism. Intrudes the older Leecher Metamorphics on the west side; is intruded by the early Mesozoic Leader Mountain Granodioritic Gneiss and the Late Cretaceous Conconully Granodiorite (new name). Age is pre-Late Mississippian.

Summit Island Formation

Late Cretaceous
Alaska
Bristol Bay basin

Hoare, J.M., Coonrad, W.L., and McCoy, Scott, 1983, Summit Island Formation, a new Upper Cretaceous formation in southwestern Alaska: U.S. Geological Survey Bulletin 1529–B, p. B1–B18.

Type section: Exposures in the sea cliffs on the northwest end of Summit Island, sec. 25, T. 15 S., R. 66 W., Togiak Bay, Hagemeister Island D–1 quadrangle, Alaska.

The Summit Island Formation, here named, in southwestern Alaska, includes nonmarine strata that were previously included in the

Gemuk Group and in an unnamed unit thought to include strata of Cretaceous and early Tertiary age. Consists of thick-bedded conglomerate, sandstone, siltstone, and carbonaceous mudstone that has carbonized plant material and a few thin coal seams. Beds are folded and faulted. Lies with angular(?) unconformity on highly deformed older Mesozoic rocks; underlies Tertiary volcanic rocks with angular unconformity. No complete section is exposed; thickness is 850 m at the type section. Age is Late Cretaceous, probably Maastrichtian, based on palynomorphs, fossil leaves, and the radiometric age of a dike that cuts the unit.

Surprise Canyon Formation

Late Mississippian (Chesterian) and Early Pennsylvanian(?) (Morrowan(?))
Arizona
Plateau sedimentary province

Billingsley, G.H., and Beus, S.S., 1985, The Surprise Canyon Formation—An Upper Mississippian and Lower Pennsylvanian(?) rock unit in the Grand Canyon, Arizona: U.S. Geological Survey Bulletin 1605–A, p. A27–A33.

Type section: 1.6 km west of the Colorado River (mi 263), 2.4 km southwest of the mouth of Tincanebits Canyon, and 2.4 km southeast of Bat Tower viewpoint, lat 36° N., long 113°48′ W., western Grand Canyon, Amos Point quadrangle, Mohave County, Ariz. Named for Surprise Canyon, 18 km east of the type section.

Rocks previously considered to be part of the Redwall Limestone and the Watahomigi Formation, or part of a valley-fill sequence between the Redwall and Watahomigi, are here named the Surprise Canyon Formation. Crops out in isolated patches throughout much of the Grand Canyon and part of Marble Canyon to the northeast. Consists of fossiliferous nonmarine and marine sediments and is subdivided into a basal nonmarine unit of white, yellow, and red, chert cobble and pebble conglomerate, dark-gray to red-brown, medium- to coarse-grained, locally cross-stratified calcareous sandstone, and medium- to fine-grained siltstone; and an upper marine unit of brown to yellow-gray, coarse-grained, fossiliferous, cliff- and ledge-forming limestone overlain by red-brown, thin-bedded, ripple-laminated, slope-forming sandstone and siltstone. Cuts into and through the Mooney Falls and Horseshoe Mesa Members of the Redwall Limestone; unconformably underlies the Watahomigi Formation. Thickness is 91 m at the type section. Age is Late Mississippian (Chesterian) and locally Early Pennsylvanian(?) (Morrowan(?)) based on fossil spores, foraminifers, and corals.

Swamp Creek Member of the Saddle Mountains Basalt of the Columbia River Basalt Group

Miocene
Idaho
Idaho Mountains province

Camp, V.E., 1981, Geologic studies of the Columbia Plateau: Part II. Upper Miocene basalt distribution, reflecting source locations, tectonism, and drainage history in the Clearwater embayment, Idaho: Geological Society of America Bulletin, v. 92, no. 9, pt. I, p. 669–678.

Type locality: Swamp Creek, North Fork of the Clearwater River, Clearwater County, Idaho.

The Swamp Creek Member of the Saddle Mountains Basalt of the Columbia River Basalt Group, here named, is in the upper North Fork area of the Clearwater embayment, Idaho. Consists of medium- to coarse-grained olivine basalt containing abundant olivine phenocrysts. Lies above the basalt of Weippe of the Pomona Member of the Saddle Mountains. Age is late Miocene.

Swede Hollow Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures along a tributary to Whitebreast Creek in Swede Hollow, secs. 33 and 34, T. 73 N., R. 22 W., and sec. 3, T. 72 N., R. 22 W., Lucas County, Iowa.
Subunits: Whitebreast Coal Member, Oakley Shale Member, Ardmore Limestone Member, Wheeler Coal Member, Bevier Coal Member, Mulkey Coal Member.

The Swede Hollow Formation, here named, is the uppermost of four newly named formations of the Cherokee Group of the Des Moines Supergroup in southeastern and south-central Iowa. Includes in ascending order the basal Whitebreast Coal Member (new name), the Oakley Shale Member (new name), the Ardmore Limestone Member, the Wheeler Coal Member (new name), the Bevier Coal Member, extended from Missouri, and the Mulkey Coal Member, extended from Missouri. Represents a period of alternating marine and nonmarine cyclothemic deposition of limestones and shales characterized by laterally persistent, thin beds and uniform thickness. Forms the boundary between the

Cherokee and Marmaton Groups; overlies the Floris Formation (new name) of the Cherokee; underlies the Excello Shale Member of the Mouse Creek Formation (new name) of the Marmaton. Thickness at the type section is 107 ft and averages 100 ft. Age is Middle Pennsylvanian (Desmoinesian).

Sweetwater Creek Formation of the Great Smoky Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures along Sweetwater Creek on Lake Allatoona, South Canton 7.5-minute quadrangle, Cherokee County, Ga.

The Sweetwater Creek Formation of the Great Smoky Group, here named, is in the Murphy synclinorium in the Greater Atlanta region, Georgia. Consists of poorly sorted, coarse, blue-quartz conglomeratic sandstone and graphitic phyllite. Gradationally overlies the Etowah Formation (new name) of the Great Smoky, and the boundary is placed where coarse clastics constitute more than 50 percent of the unit; gradationally underlies the Dean Formation. Age is Late Proterozoic and (or) early Paleozoic.

Swisher Mountain Tuff

Miocene
Idaho
Snake River basin

Ekren, E.B., McIntyre, D.H., and Bennett, E.H., 1984, High-temperature, large-volume, lavalike ash-flow tuffs without calderas in southwestern Idaho: U.S. Geological Survey Professional Paper 1272, 76 p.

Type locality: Exposures on the northern wall of Wood Canyon, on the road between the De Lamar open-pit silver mine, Idaho, and the village of Jordan Valley, Oreg., SE1/4 sec. 29, T. 5 S., R. 5 W., Owyhee County, Idaho. Named for Swisher Mountain.

Rocks previously informally named the rhyolite of Poison Creek of Neill (1975) and welded tuff number 1 of Bennett (1976) are here named the Swisher Mountain Tuff. One or more cooling units of tuff, erupted from the Juniper Mountain volcanic center in the Owyhee Plateau of southwestern Idaho, have been traced over an area, 100 km in diameter. Consists of bluish- or brownish-gray, reddish-weathering, densely welded, calc-alkalic, rhyolite tuff containing phenocrysts of plagioclase, alkali feldspar, pigeonite, and hypersthene. Flow-layered and brecciated vitrophyres indicate compound cooling. Tuff was emplaced as high temperature ash flows that coalesced to liquids before final emplacement and cooling. Overlies tuffaceous sedimentary rocks of the Sucker Creek Formation; is overlapped to the east by the Little Jacks Tuff (new name) and underlies gravel and fanglomerate of Pliocene and Quaternary age. Thickness ranges from 50 to 200 m. Age is Miocene based on a potassium-argon age of about 13.8 Ma.

Switzer Creek Member of the **Windsor Township Formation**

Middle Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures along Switzer Creek, Topton and Kutztown 7.5-minute quadrangles, Lehigh County, Pa.

The Switzer Creek Member of the Windsor Township Formation (new name), here named, is in the Greenwich slice of the Hamburg klippe in Pennsylvania. Consists of thick-bedded, medium- to coarse-grained, calcareous graywacke interbedded with grayish-green shale, and local conglomerate beds that contain shale and limestone clasts. Is differentiated from graywacke of the Dreibelbis Member (new name) of the Windsor Township by amalgamated sequences and high porosity, resulting from weathering of limestone clasts and calcite cement. Deposits are turbidite and grain-flow channel facies incised into the underlying levee and open-fan mudstones and siltstones of the Weisenberg Member (new name) of the Windsor Township. Minimum thickness is 815 m. Age is Middle Ordovician based on graptolites in the graywacke.

Table Top Member of the Lake Valley Formation

Early Mississippian
New Mexico
Orogrande basin

Lane, H.R., and Ormiston, A.R., 1982, Waulsortian facies, Sacramento Mountains, New Mexico: Guide for an international field seminar, March 2–6, 1982, *in* Bolton, Keith, Lane, H.R., and LeMone, D.V., eds., Symposium on the paleoenvironmental setting and distribution of the Waulsortian facies: El Paso Geological Society and The University of Texas at El Paso, p. 115–182.

Type section: Exposures at the base of Table Top Mountain, NW¼SE¼NW¼ sec. 18, T. 19 S., R. 11 E., Otero County, N. Mex.

Rocks previously assigned to the Arcente Member of the Lake Valley Formation are here named the Table Top Member of the Lake

Valley in the Sacramento Mountains, N. Mex. Consists of dark-gray, argillaceous limestone and calcareous shale, sparsely fossiliferous except for a coarse, iron-rich crinoidal packstone occurring at the top of the member. Overlies the Alamogordo Member and underlies the Arcente Member of the Lake Valley Formation. Thickness at the type section is 15 ft. Age is Early Mississippian.

Tarantula Mesa Sandstone

Late Cretaceous (Campanian)
Utah
Paradox basin

Smith, Curtis, 1983, Geology, depositional environments, and coal resources of the Mt. Pennell 2 NW quadrangle, Garfield County, Utah: Brigham Young University Geology Studies, v. 30, pt. 1, p. 145–167.

Type section: Outcrops located 1.6 km southwest of Turn of the Bullfrog, below the Frog, NE¼SE¼ sec. 35, T. 33 S., R. 9 E., Mt. Pennell 2 NW quadrangle, Garfield County, Utah. Named for Tarantula Mesa.

The Tarantula Mesa Sandstone, here named in the Paradox basin, Utah, was formerly called the Masuk Sandstone by Gilbert (1877) and the Mesaverde Formation by Hunt (1946). Is a braided stream deposit and is divided into a lower member consisting of grayish-orange, very fine to fine-grained, subangular to angular, moderately well sorted sandstone, having quartz and chert as major constituents, and an upper member consisting of conglomerate containing well-rounded, poorly sorted chert granules, overlain by grayish-orange, fine to medium-grained, subangular sandstone containing quartz grains. Unconformably overlies the Masuk Shale Member of the Mancos Shale; unconformably underlies beds of late Campanian Age. Correlates with the upper sandstone member of the Wahweap Formation on the Kaiparowits plateau and with the Castlegate Sandstone and lower part of the Price River Formation on the Wasatch plateau. Thickness of the lower member ranges from 44.5 m at Spring Canyon to 65.5 m at the type section; the upper member ranges from 30 m at Spring Canyon to 47 m at the type section. Age is Late Cretaceous (late Campanian).

Tar Creek Member of the **Clarkston Formation** of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Outcrops along roads around Tar Creek, Fairburn quadrangle, Fayette County, Ga.

The Tar Creek Member is here named the upper member of the Clarkston Formation (new name) of the Atlanta Group (new name) in the area from East Point to Palmetto, Ga., in the northwest limb of the Newnan-Tucker synform. Consists of purple-pink-weathering muscovite schist and ocher-weathering amphibolite and, like the Clarkston Formation, is undivided. Gradationally overlies the Fairburn Member (new name) of the Clarkston; underlies the Camp Creek Formation (new name) with sharp and conformable contact. Is intruded by the Union City Complex (new name) and Palmetto Granite. Thickness is 400 to 1,500 m. Age is Late Proterozoic and (or) early Paleozoic.

Taum Sauk Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: Sec. 15, T. 33 N., R. 2 E., Johnson Shut-ins quadrangle, Reynolds County, Mo. Exposed on Taum Sauk Mountain.

Rocks previously called Taum Sauk Mountain ash flows by Anderson (1962) and tuff of Taum Sauk Mountain by Anderson (1970) are here named the Taum Sauk Rhyolite in the western St. Francois Mountains, southeast Missouri. Consists of red to dark-maroon ash-flow tuff containing alkali feldspar and quartz phenocrysts and fiamme. Overlies the Royal Gorge Rhyolite; underlies the Proffit Mountain Formation (new name). Thickness is greater than 1,000 m, but total thickness is unknown because the unit is not exposed continuously through its total thickness or may be faulted. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Taum Sauk Rhyolite.

Taunton Beds of the Windom Shale Member of the Moscow Formation of the Hamilton Group

Middle Devonian
New York
Appalachian basin

Baird, G.C., and Brett, C.E., 1983, Regional variation and paleontology of two coral beds in the Middle Devonian Hamilton Group of western New York: Journal of Paleontology, v. 57, no. 3, p. 417–446.

Type section: Exposures in the bed and banks of Taunton Gully, 0.4 km west of New York Route 36 overpass near Leicester, Leicester 7.5-minute quadrangle, Genesee County, N.Y.

The "Spirifer-coralline" zone of Stover (1956), here named the Taunton Beds of the Windom Shale Member of the Moscow Formation of the Hamilton Group, is a distinctive and widespread facies in the upper part of the Windom in Genesee, Livingston, and Ontario Counties, N.Y. Consists of 5 to 6 m of fossiliferous, calcareous mudstone, too thick and variable to be designated a single bed, and contains rugose corals, brachiopods, and bryozoa. Overlies the Fall Brook Coral Bed (new name) of the Windom. Age is Middle Devonian.

Telegraph Pass Granite

Tertiary
Arizona
Basin and Range province

Reynolds, S.J., 1985, Geology of the South Mountains, central Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 195, 61 p.

Type locality: Exposures along Summit Road, 300 m north-northwest of Telegraph Pass, near the center of the Main Ridge of the South Mountains, Maricopa County, Ariz. Reference localities are designated.

The Telegraph Pass Granite, here named, is in the Main Ridge and Southern Foothills of the South Mountains, near Phoenix, Ariz. Consists of light-gray, medium-grained granite having a variably developed mylonitic fabric and inclusions of metamorphic rocks near intrusive contacts with the Precambrian Estrella Gneiss (new name). Is the second of three phases of a composite pluton that occupies most of the eastern half of the range. Grades into or is intruded over the first-phase South Mountains Granodiorite (new name); the third-phase Dobbins Alaskite (new name) occurs along border zones of the granite. Intrudes Estrella Gneiss and intervenes between the Estrella and the South Mountains Granodiorite. Age is middle Tertiary.

Telsitna Formation

Middle and Late Ordovician
Alaska
Holitna basin

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic formations in the northern Kuskokwim Mountains, west-central Alaska: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Type section: High northeast-trending ridge along the divide between the head of the Telsitna River and Paradise Fork, secs. 17, 19, and 20, T. 18 S., R. 27 E., Medfra (D–2) quadrangle, Alaska.

The Telsitna Formation, here named, is the most widely distributed unit of the shallow-water carbonate sequence in the Nixon Fork terrane of the northern Kuskokwim Mountains, Alaska. At the type section, consists of variegated light-gray to dark-brown dolomite beds in the lower 300 m; fossiliferous, gray, thin-bedded limestone having silty, yellow-weathering interbeds, from 300 to 600 m; nonfossiliferous dolomite, from 600 to 1,000 m; and limestone containing black chert nodules, from 1,000 to 1,600 m. Conformably overlies the Novi Mountain Formation (new name); disconformably(?) underlies the Whirlwind Creek Formation (new name) or the Paradise Fork Formation (new name). Is in fault contact with the East Fork Hills Formation (new name) of the East Fork terrane. Total thickness attains 2,000 m. Age is Middle and Late Ordovician based on conodonts and other invertebrate fossils.

Tendoy Group

Early and Late Mississippian (Kinderhookian, Osagean, and Meramecian)
Montana
Montana folded belt province

Sando, W.J., Sandberg, C.A., and Perry, W.J., Jr., 1985, Revision of Mississippian stratigraphy, northern Tendoy Mountains, southwest Montana, *in* Sando, W.J., ed., Mississippian and Pennsylvanian stratigraphy in southwest Montana and adjacent Idaho: U.S. Geological Survey Bulletin 1656–A, p. A1–A10.

Type section: Composite section measured at Bell Canyon, sec. 17, T. 11 S., R. 10 W., and the divide between Bell and McKenzie Canyons, sec. 21, T. 11 S., R. 10 W., Tendoy Mountains, Red Rock and Kidd 7.5-minute quadrangles, Beaverhead County, Mont.
Subunits: **Paine Limestone, Middle Canyon Formation, Mission Canyon Limestone, McKenzie Canyon Limestone.**

Rocks formerly assigned to the Madison Group in the northern Tendoy Mountains between McKnight Canyon and the Clark Canyon Reservoir, southwest Montana, are here named the Tendoy Group.

Includes the basal Paine Limestone, raised in rank from member to formation, the Middle Canyon Formation, extended into Montana from Idaho, the Mission Canyon Limestone, and the McKenzie Canyon Limestone (new name). Consists mostly of limestone and some chert and represents a hitherto unrecognized facies belt near the craton margin. Overlies the Three Forks Formation; underlies the Kibbey Sandstone, reassigned from the Big Snowy Group to the Snowcrest Range Group (new name). Thickness is 810 m at the type section and is more than 1,000 m regionally. Age is Mississippian (Kinderhookian to early Meramecian) based on conodonts and corals.

Ten Mile Member of the Chico Formation

Late Cretaceous (Campanian)
California
Sacramento basin

Haggart, J.W., and Ward, P.D., 1984, Late Cretaceous (Santonian-Campanian) stratigraphy of the northern Sacramento Valley, California: Geological Society of America Bulletin, v. 95, no. 5, p. 618–627.

Type section: Exposures along Big Chico Creek, sec. 13, T. 23 N., R. 2 E., Butte County, Calif. Named for the site of the Ten Mile House located along old Highway 32, paralleling Big Chico Creek.

The Ten Mile Member, informally named by Saul (1961), is here named the stratigraphically highest member of the Chico Formation along Butte, Big Chico, Deer, and Mill Creeks in Butte and Tehama Counties, eastern Sacramento Valley, Calif. Forms tall bluffs and consists of greenish-gray to tan, fine-grained, moderately well sorted, bioturbated, fossiliferous, silty sandstone containing well preserved wood and mollusks in the matrix and as lag deposits. Conformably overlies the Musty Buck Member (new name) of the Chico; correlates with the middle of the Forbes Formation of the western Sacramento Valley. Thickness at the type section is about 575 m. Age is Late Cretaceous (early Campanian) based on ammonites.

Thatcher Till

Pleistocene (Wisconsinan)
New York
Appalachian basin

Calkin, P.E., Muller, E.H., and Barnes, J.H., 1982, The Gowanda Hospital Interstadial Site, New York: American Journal of Science, v. 282, p. 1110–1142.

Type locality: Exposures along Thatcher Brook at the highway bridge 1.8 km south of the Gowanda village limit, Erie County, N.Y.

The Thatcher Till, here named, is in Erie County, N.Y. Consists of gray clayey-silt till and interbedded stratified gray sand and silt. Overlies gravel; underlies silt and fine sand. Thickness is 5.1 m. Age is Pleistocene (late Wisconsinan).

Thatcher Creek Member of the Cool Creek Formation of the Arbuckle Group

Early Ordovician (Canadian)
Oklahoma
South Oklahoma folded belt province

Ragland, D.A., and Donovan, R.N., 1985, The Thatcher Creek Member: Basal unit of the Cool Creek Formation in southern Oklahoma: Oklahoma Geology Notes, v. 45, no. 3, p. 84–91.

Type section: Exposure in the valley of Thatcher Creek, a tributary of Blue Creek, sec. 11, T. 4 N., R. 13 W., Comanche County, Okla.

The Thatcher Creek Member of the Cool Creek Formation of the Arbuckle Group, here named, is in the Slick Hills, Comanche County, Okla. Consists of sandy limestone and blocky, limy sandstone containing fine to coarse quartz sand in beds that have parallel laminations, crossbedding, and symmetrical ripple marks. Is the basal member of the Cool Creek and overlies algal mounds of the McKenzie Hill Formation. Deposition was in a high intertidal or supratidal environment that inhibited the growth of algal colonies. Thickness is 12 ft at the type section. Age is Early Ordovician (Canadian).

The Forks Formation

Late Silurian
Maine
New England province

Marvinney, R.G., 1984, The Forks Formation of northwestern Maine: Evidence for a Late Ordovician to Late Silurian angular unconformity: Northeastern Geology, v. 6, no. 3, p. 151–160.

Type section: Composite of the (1) west bank of Cold Stream, 200 m upstream from its confluence with the Kennebec River and (2) section along Moxie Stream from Moxie Falls to northeastward turn 450 m upstream, The Forks 7.5-minute quadrangle, Somerset County, Maine. Named for the village of The Forks.

A prominent transgressive rock sequence in northwestern Maine is here named the The Forks Formation. Consists of a lower sequence of basal conglomerate and carbonate-rich, thin-bedded, silty limestone, and an upper sequence of clastic-rich siltstone, sandstone, and phyllite. Overlies the Cambrian or Ordovician Dead River Formation with angular unconformity, representing Taconian or Penobscottian tectonic events; gradationally underlies the Carrabassett Formation of Early Devonian age. Correlates with the Madrid Formation to the southeast. Thickness is 215 m. Age is Late Silurian based on estimated sedimentation rates.

Third Fork Formation

Early Permian (Wolfcampian)
Idaho
Great Basin province

Mytton, J.W., Morgan, W.A., and Wardlaw, B.R., 1983, Stratigraphic relations of Permian units, Cassia Mountains, Idaho, *in* Miller, D.M., and others, eds., Tectonic and stratigraphic studies in the eastern Great Basin: Geological Society of America Memoir 157, p. 281–303.

Type section; Ridge southwest of the confluence of A.H. Creek and Third Fork of Rock Creek, S½ sec. 17, T. 14 S., R. 19 E., Pike Mountain and Trapper Creek 7.5-minute quadrangles, Cassia County, Idaho.

The Third Fork sequence of Morgan (1980) is here named the Third Fork Formation in the central part of the Cassia Mountains, Idaho, where it is exposed in upthrown fault blocks. Consists of gray, buff, and pink sandy siltstone, composed of quartz and calcite cement, and three distinctive beds of argillaceous spiculitic black lime-mudstone and calcareous siltstone, characterized by trace fossils and extensive bioturbation. May be part of the depositional sequence of the northern Oquirrh basin. Gradationally overlies the Wahlstrom Hollow Formation (new name); gradationally underlies the Badger Gulch Formation (new name). Thickness at the type section is 331.2 m. Age is Early Permian (late Wolfcampian). The Third Fork and Badger Gulch Formations are poorly fossiliferous and difficult to date. The Wolfcampian-Leonardian boundary lies within the Third Fork-Badger Gulch sequence and is drawn, strictly for convenience, at the Third Fork-Badger Gulch contact.

Thorofare Mountain Formation of the Lynchburg Group

Late Proterozoic
Virginia
Piedmont-Blue Ridge province

Wehr, Frederick, 1985, Stratigraphy of the Lynchburg Group and Swift Run Formation, Late Proterozoic (730–570 Ma), central Virginia: Southeastern Geology, v. 25, no. 4, p. 225–239.

Type locality: Exposures on and immediately east of Thorofare Mountain, Brightwood 7.5-minute quadrangle, Madison County, Va.

The Thorofare Mountain Formation of the Lynchburg Group, here named in the Culpeper and Rockfish River areas in Virginia, was previously called the Loudoun Formation and Rockfish Conglomerate in the Rockfish River area. Consists of medium-grained to pebbly, poorly sorted feldspathic sandstone containing minor amounts of conglomerate, siltstone, and graphitic mudstone. Sharply overlies the Monumental Mills Formation (new name) of the Lynchburg Group in the Culpeper area; conformably overlies the Rockfish Conglomerate in the Rockfish River area. Unconformably underlies or is in fault contact with the Ball Mountain Formation (new name) of the Lynchburg. Age is Late Proterozoic based on ages for the Lynchburg Group (730 to 570 Ma)..

Thunderbird Group

Precambrian
Texas
Orogrande basin

Thomann, W.F., 1980, Ignimbrites, trachytes, and sedimentary rocks of the Precambrian Thunderbird Group, Franklin Mountains, El Paso, Texas: Geological Association of America Bulletin, v. 92, no. 2, pt. I, p. 94–100.

Type section: Exposure about 3,000 ft northeast of Smugglers Pass in Fusselman Canyon, Franklin Mountains, lat 31°53′06″ N., long 106°29′34″ W., El Paso County, Tex. Named for Thunderbird Mountain on the southwest flank of South Franklin Mountain.
Subunits: Coronado Hills Conglomerate, Smugglers Pass Formation, Tom Mays Park Formation.

The sequence of Precambrian volcanic and sedimentary rocks in the Franklin Mountains that was previously named the Franklin Mountains Rhyolite of Muehlberger and Denison (1964) and the Thunderbird rhyolite porphyry of Kottlowski and others (1973) is here named the Thunderbird Group. Is divided into three formations on the basis of distinct lithology: the lower Coronado Hills Conglomerate (new name); the middle Smugglers Pass Formation (new name), composed of volcanic and sedimentary rocks; and the upper Tom Mays Formation (new name), composed of rhyolitic ignimbrites. Unconformably overlies the Lanoria Quartzite; is intruded by the Red Bluff Granite. Thickness is 1,200 ft at the type section. Age is late Precambrian (950 Ma), the youngest of the Precambrian rocks in the Franklin Mountains.

Thunderbolt Mountain Formation of the Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: None designated. Occurs in the eastern Adirondack Mountains, N.Y. Origin of name not stated.

The name Thunderbolt Mountain Formation, used by Walton and deWaard (1963), is here assigned to the Lake George Group (new name) in the eastern Adirondack Mountains, N.Y. Consists of gray-green, charnockitic gneiss and pink, granitic gneiss interlayered with amphibolite, garnet granulite, garnet-biotite-quartz-plagioclase gneiss, and quartzite. Structurally overlies the Springhill Pond Formation (new name) of the Lake George Group and correlates with the Little Moose Mountain Formation in the central Adirondacks. Age is Proterozoic. [Although this name has not been formally proposed, it is included here because of its continued usage.]

Timber Lake Bed of the Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type Section: Measured section 3 of Morrison (1964), west bank of Carson River, 1 km north of Timber Lake, NE¼NW¼ sec. 30, T. 21 N., R. 30 E., Churchill County, Nev.

The Timber Lake Bed of the Pyramid Lake Member (new name) of the Mount Mazama Formation, here named, is in the Lake Lahontan area, Nevada. Is the most phenocryst-rich of the nonbasaltic tephra and contains less potassium than any other bed in the Mount Mazama. Interfingers with the lower member of the Sehoo Formation. Overlies the Carson Sink Bed (new name) of the Mono Basin Formation (new name); underlies the Wono Bed (new name) of the Pyramid Lake Member. Thickness is 1 cm. Age is Pleistocene, 35 to 11.5 ka.

Tom Mays Park Formation of the Thunderbird Group

Precambrian
Texas
Orogrande basin

Thomann, W.F., 1980, Ignimbrites, trachytes, and sedimentary rocks of the Precambrian Thunderbird Group, Franklin Mountains, El Paso, Texas: Geological Association of America Bulletin, v. 92, no. 2, pt. I, p. 94–100.

Type section: Exposure 3,000 ft northeast of Smugglers Pass in Fusselman Canyon, Franklin Mountains, lat 31°53′06″ N., long 106°29′34″ W., El Paso County, Tex. Named for Tom Mays Memorial Park.

The Tom Mays Park Formation is here named the upper of three formations in the Thunderbird Group (new name) in the Franklin Mountains, Tex. Consists of rhyolitic ignimbrites. Individual flow units have not been recognized due to the uniform texture of the groundmass produced partly by devitrification of glass and partly by subsequent contact metamorphism caused by intrusion of the Red Bluff Granite. Intruded by widely scattered dikes of porphyritic rhyolite. Overlies the Smugglers Pass Formation (new name) of the Thunderbird; the top of the formation is an erosional surface. Maximum thickness is 550 ft. Age is late Precambrian.

Tower Hill Quartzite of the **Merrimack Group**

Silurian
Massachusetts
New England province

Goldsmith, Richard, Grew, E.S., Hepburn, J.C., and Robinson, G.R., Jr., 1982, Formation names in the Worcester area, Massachusetts: U.S. Geological Survey Bulletin 1529-H, p. H43–H56.

Type locality: Tower Hill, Main Street, Boylston, Shrewsbury 7.5-minute quadrangle, Worcester County, Mass.

The informal Tower Hill quartzite member of the Boylston Formation of Grew (1970), also called unit B of Grew (1973), is here named the Tower Hill Quartzite of the Merrimack Group in the Worcester area, Massachusetts. Consists of orthoquartzite and interlayered pelite and may represent a proximal facies laterally equivalent to the distal facies of the Worcester Formation. Overlies the Boylston Schist; underlies the Oakdale Formation. Age is probably Silurian based on a tentative correlation with rocks in central Maine.

Trap Member of the Bell Canyon Formation of the Delaware Mountain Group

Late Permian (Guadalupian)
Texas, New Mexico
Permian basin

Winner, Phil, 1985, Type section for the uppermost Bell Canyon Formation in the central Delaware basin of West Texas: West Texas Geological Society Bulletin, v. 24, no. 7, p. 7–10.

Type section: Gulf J.R. Grandin Number 1 well, sonic-gamma ray log, SE¼ sec. 33, Block 29 PSL Survey, Loving County, Tex. Derivation of name not stated.

The Trap Member, here named, is in the upper Bell Canyon Formation of the Delaware Mountain Group in the central Delaware basin of Texas and New Mexico and was designated the informal Trap subdivision by Nottingham (1960) and the Trap member by Grauten (1965). This excellent and widespread regional nonproducing marker bed is restricted to a thin silt-sand marker below the base of the overlying Lamar Limestone Member of the Bell Canyon. Overlies the Ramsey Member (new name) of the Bell Canyon. [Age is Late Permian (Guadalupian).]

Trapper Creek Formation

Early Permian (Leonardian)
Idaho
Great Basin province

Mytton, J.W., Morgan, W.A., and Wardlaw, B.R., 1983, Stratigraphic relations of Permian units, Cassia Mountains, Idaho, *in* Miller, D.M., and others, eds., Tectonic and stratigraphic studies in the eastern Great Basin: Geological Society of America Memoir 157, p. 281–303.

Type section: Lower part: Exposures in Badger Gulch above the type section of the Badger Gulch Formation, sec. 20; upper part: Cliffs above Fall Creek, south of its confluence with Trapper Creek, center S½SE¼ sec. 9, T. 15 S., R. 20 S., Severe Spring 7.5-minute quadrangle, Cassia County, Idaho.

Rocks mapped as the Park City Group by Morgan (1980) are here named the Trapper Creek Formation in the Cassia Mountains, southern Idaho. Consists of brownish-gray, very fine grained, medium- to thick-bedded, fossiliferous limestone containing chert lenses alternating with buff, calcareous siltstone and very fine grained sandstone that resembles chert where it is silicified. Forms prominent ledges and cliffs. Deposits represent a fairly rapid shallowing of marine waters and a well-oxygenated, aerobic environment. Gradationally overlies the Badger Gulch Formation (new name); underlies the Grandeur Tongue of the Park City Formation. Thickness of composite section is 271 m. Age is Early Permian (early Leonardian) based on conodonts.

Treadway Mountain Formation of the Lake George Group

Proterozoic
New York
Adirondack uplift

Wiener, R.W., McLelland, J.M., Isachsen, Y.W., and Hall, L.M., 1984, Stratigraphy and structural geology of the Adirondack Mountains, New York: Review and synthesis: Geological Society of America Special Paper 194, p. 1–55.

Type locality: None designated. Occurs in the eastern Adirondack Mountains, N.Y. Origin of name not stated.

The name Treadway Mountain Formation, used by Walton and deWaard (1963), is here assigned to the Lake George Group (new name) in the eastern Adirondack Mountains, N.Y. Consists of migmatitic biotite-quartz-plagioclase gneiss, quartz-rich graphite-garnet-sillimanite gneiss, quartzite, and garnet-biotite gneiss. Overlies the Paradox Lake Formation (new name) of the Lake George Group; underlies the Barton Mountain Formation. In the central Adirondacks, biotitic and garnetiferous rocks similar to the Treadway Mountain are present in the Lake Durant Formation, suggesting that the Treadway Mountain may be present, but thinner, in the central Adirondacks. Correlates with the Pleasant Lake Gneiss (new name) of the Oswegatchie Group in the northwestern Adirondacks. Age is Proterozoic. [Although this name has not been formally proposed, it is included here because of its continued usage.]

Trego Hot Springs Bed of the Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada, California
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Trego Hot Springs, south of the Western Pacific Railroad, 200 m west of the intersection of Nevada Highway 49 and a dirt track on Black Rock Desert, 18 km east of Gerlach, sec. 3, T. 33 N., R. 25 E., Pershing County, Nev.

The Trego Hot Springs Bed of the Pyramid Lake Member (new name) of the Mount Mazama Formation, here named, is in the Lake Lahontan area. Is present in the Pyramid Lake area, Nevada, northwest to Surprise Valley, Calif. Is the most potassium-rich bed of tephra in the Pyramid Lake. Is interbedded with the lower member of the Sehoo Formation. Age is Pleistocene, 35 to 11.5 ka.

Trolinger Spring Formation

Pleistocene (Sangamonian and Wisconsinan)
Missouri
Ozark uplift

Haynes, C.V., Jr., 1985, Mastodon-bearing springs and late Quaternary geochronology of the lower Pomme de Terre valley, Missouri: Geological Society of America Special Paper 204, 35 p.

Type locality: None designated. Named for Trolinger Spring, Breshears Valley, near Avery, sec. 9, T. 38 N., R. 22 W., Fristoe 15-minute quadrangle, Hickory County, Mo.

Alluvial deposits of the T–2 terrace in the Breshears Valley, Hickory and Benton Counties, Mo., are here named the Trolinger Spring

Formation. Brakenridge (1981) named this unit the informal Trolinger Formation. Consists of 1 to 2 m of chert gravel, having a dark-gray patina, overlain by 9 m of gray silty clay and clayey silt and lenses of clayey sand and gravel. Fossil bones from associated peat deposits include mastodon, mammoth, horse, and bison. Forms a well-developed dark-gray soil. Unconformably overlies the Breshears Valley Formation (new name); unconformably underlies the Boney Spring Formation (new name) from which it is separated by an erosional hiatus of 2,000 to 3,000 years. Age is Pleistocene (Sangamonian and middle Wisconsinan) based on a uranium-series date of 160 ka on mastodon tooth enamel and radiocarbon dates of 32 ka on wood and plant fragments.

Truthville Slate or Formation

Cambrian(?)
New York
New England province

Rowley, D.B., Kidd, W.S.F., and Delano, L.L., 1979, Detailed stratigraphic and structural features of the Giddings Brook slice of the Taconic allochthon in the Granville area, *in* Friedman, G.M., ed., Guidebook: New England Intercollegiate Geological Conference, 71st Annual Meeting, p. 186–242.

Type locality: Exposures along the Mettawee River near Truthville, Washington County, N.Y. (Jacobi, 1977).

The Truthville Slate or Formation, informally named by Jacobi (1977), is described in the Giddings Brook slice of the Taconic allochthon in the Granville area, New York. Consists of olive-gray-green, tan-weathering, soft, well-cleaved, fissile, silty, micaceous slate. Gradationally overlies the Bomoseen Formation; sharply underlies the Browns Pond Formation (new name) at which the color changes from gray-green to black. Thickness is typically 45 m but ranges from 20 to 60 m. Age is Cambrian(?). [Although this name has not been formally proposed, it is included here because of its continued usage.]

Tsoyawata Bed of the Mazama Member of the Mount Mazama Formation

Holocene
California, Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Stream cut on the south side of Long Valley Creek, southwest of U.S. Highway 395, 1.1 km west of the California-Nevada State line, center NE¼NW¼ sec. 19, T. 21 N., R. 18 E., Loyalton

15-minute quadrangle, Sierra County, Calif. Tsoyawata is the Washo Indian word for Long Valley Creek.

The Tsoyawata Bed of the Mazama Member (new name) of the Mount Mazama Formation, here named, is in the Lake Lahontan area of Nevada and California. Occurs at Virgin Creek, Lone Mountain, and Stillwater, Nev., and west of the crest of the Sierra Nevada and south to Lake Tahoe, Calif. Is the lower bed of the Mazama and consists of 5 cm of white tephra containing masses of small green hornblende laths. Overlies the Osgood Bed (new name) at Osgood Swamp, Calif. Age is Holocene, 7 ka.

Tunnels Mill Member of the **Yorktown Formation**

Pliocene
Virginia, Maryland
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Borehole H–22, depth interval 18 to 80 ft, 6 to 68 ft below sea level, at the junction of county roads 693 and 706, about 0.6 mi southwest of Tunnels Mill, Accomack County, Va.

The Tunnels Mill Member, here named, is the middle member of the Yorktown Formation in a 10-mi-wide belt in the subsurface of Accomack County, Va., and Somerset and Worcester Counties, Md. Consists mainly of greenish- to brownish-gray, micaceous, clayey silt, silty clay, and fine quartz sand. Gradationally overlies the lower shelly sand member and gradationally underlies the upper shelly sand member of the Yorktown or unconformably underlies the Accomack Member (new name) of the Omar Formation. May be equivalent in part to the Morgarts Beach Member of the Yorktown west of the Chesapeake Bay. Thickness at the type section is 62 ft. Age is middle Pliocene.

Turner Mine Shale Member of the Carbondale Formation of the Kewaunee Group

Middle Pennsylvanian (Desmoinesian)
Illinois
Illinois basin

Nelson, W.J., 1983, The Turner Mine Shale Member: A newly named stratigraphic unit of the Carbondale Formation: Illinois State Geological Survey Circular 529, Geologic Notes, p. 11.

Type section: Core B–41, depth interval 52.7–56.7 ft, at the Turner Number 1 mine, SW¼NE¼ sec. 27, T. 9 S., R. 4 E., Crab Orchard 7.5-minute quadrangle, Williamson County, Ill.

The Turner Mine Shale Member of the Carbondale Formation of the Kewaunee Group, here named, is in the subsurface of the Illinois basin coal field. Consists of black, thinly laminated, hard, brittle, fissile shale containing pyrite, abundant organic matter, and high natural radioactivity. Spheroidal concretions of limestone occur near the base. Abruptly overlies the Springfield (Number 5) Coal Member or gradationally overlies the Dykersburg Shale Member and conformably underlies the St. David Limestone Member or the Canton Shale Member, all of the Carbondale Formation. Thickness at the type section is 5 ft and ranges from less than 1 in. to more than 8 ft. Age is Middle Pennsylvanian (Desmoinesian).

Turupah Flat Bed of the Salt Wells Member of the Mono Basin Formation

Holocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: On the edge of Turupah Flat, 0.2 km southeast of Salt Wells, NE¼SW¼NE¼ sec. 2, T. 17 N., R. 30 E., Churchill County, Nev.

The Turupah Flat Bed of the Salt Wells Member (new name) of the Mono Basin Formation (new name), here named, is in the Lake Lahontan area, Nevada. Is widespread in the Fallon area and occurs at Weber Dam on the Walker River. Rhyolite tephra bed is 1 cm thick and is poor in phenocrysts and lacks glass-encased biotite; may represent a crystal-poor fraction of the Walker Lake Bed (new name) of the Salt Wells. The Turupah Flat is the ash layer described by Morrison (1964) at the base of the Turupah Formation. Source is attributed to Mono Basin because of its southerly distribution and its similarity to rhyolitic tephra erupted in the Mono Basin. Age is Holocene, 1.5 to 0.6 ka.

Tusas Mountain Granite

Middle Proterozoic
New Mexico
San Juan basin

Wobus, R.A., and Hedge, C.E., 1982, Redefinition of the Precambrian Tusas Mountain and Tres Piedras granites, north-central New Mexico: The Mountain Geologist, v. 19, no. 4, p. 105–114.

Type locality: Shallow prospect pits about 100 m west of the road, west side of Tusas Mountain, NE¼ sec. 23, T. 28 N., R. 7 E., Rio Arriba County, N. Mex.

A 5-km^2 stock of massive granite porphyry at Tusas Mountain, previously described with granites exposed in Tusas Canyon and in the village of Tres Piedras as the Tusas Granite of Just (1937) and the Tusas Mountain pluton of the Tres Piedras Granite of Barker (1958), is here named the Tusas Mountain Granite. The term Tres Piedras Granite is applied only to the foliated granite of the older 1,700-Ma intrusive episode. Consists of white to pink, fine-grained, massive to faintly foliated, porphyritic granite containing phenocrysts of microcline, quartz, and oligoclase and noteworthy amounts of purple fluorite. Underlies nearly all of Tusas Mountain; is in intrusive contact with the Moppin Formation on the west and south and with the Maquinita Granodiorite on the north. Age is Middle Proterozoic based on rubidium-strontium and uranium-lead ages of 1,500 and 1,430 Ma of the Tusas Mountain stock.

Twelve Mile Member of the **Lehigh Acres Formation** of the **Glades Group**

Early Cretaceous (Comanchean)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies Transactions, v. 31 (supplement), October, p. 447–453.

Type section: Humble Number 1 Lehigh Acres well P–407, depth interval 12,460–12,760 ft, sec. 14, T. 45 S., R. 27 E., Lee County, Fla. Named for the Twelve Mile Slough.

The Twelve Mile Member is here named the middle member of the Lehigh Acres Formation (new name) of the Glades Group in the subsurface of the South Florida basin, where four regionally persistent anhydrite units are identified below the Punta Gorda Anhydrite of the Glades. Consists of cream to brown, micritic, or oolitic limestone beds overlain by a fine-grained, porous, brown dolomite about 75 ft thick, termed the brown dolomite zone, in the lower part, and gray argillaceous limestone in the upper part. Overlies the West Felda Shale Member (new name) and underlies the Able Member (new name) of the Lehigh Acres Formation. Thickness at the type well is 300 ft. Age is Early Cretaceous (earliest Comanchean).

Tygarts Creek Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Southeastern highwall of the Ken-Mor Stone Company's Olive Hill quarry, Grahn quadrangle, Carter County, Ky. Named for Tygarts Creek that flows adjacent to the quarry.

The Tygarts Creek Member, here named, is in the Slade Formation (new name) and was formerly called the Reelsville-Beech Creek Limestone by McFarlan and Walker (1956), which is now restricted from the Cumberland Escarpment area of east-central and northeastern Kentucky. Occurs throughout the outcrop belt of the Slade and consists of light-gray calcarenite containing local stringers of dolomite. Disconformably overlies or intertongues with the Armstrong Hill, Holly Fork, or Rosslyn Members (all new names) of the Slade; conformably underlies the Ramey Creek Member (new name) of the Slade. Thickness ranges from 1 to 10 m. Age is Late Mississippian.

Tygh Valley Formation of the Dalles Group

Miocene and Pliocene
Oregon
Eastern Columbia basin

Farooqui, S.M., Beaulieu, J.D., Bunker, R.C., Stensland, D.E., and Thoms, R.E., 1981, Dalles Group: Neogene formations overlying the Columbia River Basalt Group in north-central Oregon: Oregon Geology, v. 43, no. 10, p. 131–140.

Reference section: North-facing roadcut along Tygh Valley-Wamic road, sec. 4, T. 4 S., R. 13 E., Wasco County, Oreg. Named for the town of Tygh Valley, sec. 3, T. 4 S., R. 13 E.

Interbedded basaltic, andesitic, and pumiceous sandstone and conglomerate, tuffaceous sandstone and siltstone, tuff, breccia, and agglomerate in the Tygh basin are here named the Tygh Valley Formation of the Dalles Group. Disconformably overlies the Frenchman Springs Member of the Wanapum Basalt and the Grande Ronde Basalt; underlies Miocene and Pliocene andesite flows of the Cascade Range. Age is middle Miocene to Pliocene based on potassium-argon ages.

Ugnuravik Group

Early Cretaceous (Valanginian to Albian)
Alaska
Arctic Coastal Plains province

Carman, G.J., and Hardwick, Peter, 1983, Geology and regional setting of Kuparuk oil field, Alaska: American Association of Petroleum Geologists Bulletin, v. 67, no. 6, p. 1014–1031.

Type section: Ugnu State 1 well, depth interval 5,580–6,793 ft b.r.t., Kuparuk field, Colville-Prudhoe basin, T. 12 N., R. 9 E., Umiat Base Line, Alaska. Named for the Ugnuravik River, which flows through the field.
Subunits: Miluveach Formation, Kuparuk Formation, Kalubik Formation.

The Ugnuravik Group, here named, is mappable over more than 600 mi^2 in the Colville-Prudhoe basin, Alaska. Is divided into four lithostratigraphic units, which are recognized in the type section and are correlated across the basin in ascending order: the Miluveach, Kuparuk, and Kalubik Formations (all new names) and the informal HRZ unit, a highly radioactive zone. Consists of mudstone, shale, sandstone, and siltstone. Unconformably overlies the Kingak Shale; unconformably underlies the Colville Group. Probably correlates with the Nanushuk Group and Kongakut-Okpikruak Formations. Thickness is more than 1,500 ft. Age is Early Cretaceous (early Valanginian to Albian) based on dinoflagellates and other microfauna.

Union City Complex

Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Exposures around Shannon Shopping Mall at the intersection of Georgia Highway 138 and Interstate Highway I–85, Union City, Fairburn 7.5-minute quadrangle, Fulton County, Ga.

The Union City Complex, here named, is mapped in the Newnan-Tucker synform near Atlanta, Ga. Consists of a complex of porphyritic muscovite-biotite granites and granite gneisses, foliated and unfoliated, that intrudes the Atlanta Group (new name). Age is probably Paleozoic.

Union Wash Formation

Early and Middle Triassic
California
Great Basin province

Mount, J.D., 1971, Stratigraphy and paleontology of the marine Triassic Inyo Mountains, Inyo County, California: Southern California Paleontological Society Bulletin, v. 3, no. 7, p. 1–4, 9.

Type locality: Outcrops on the south side of Union Wash, Inyo Mountains, northeast part of Union Wash 7.5-minute quadrangle, Inyo County, Calif.

The informal Ceratite limestone of Smith (1898) is here named the Union Wash Formation in the Inyo Mountains, Calif. Consists of gray to dark-brown, fissile and platy shale and calcareous shale, platy thin-bedded limestone and argillaceous limestone, and occasional lenticular beds of massive, gray limestone. Disconformably overlies the Owens Valley Formation; conformably underlies unnamed volcanic breccia, conglomerate, and tuff. Thickness is about 2,500 ft. Age is Early to late Middle Triassic (Ladinian) based on cephalopods and conodonts.

Unity Farm Shale Member of the Lees Summit Formation of the Pleasanton Group

Late Pennsylvanian (Missourian)
Missouri
Forest City basin

Howe, W.B., 1982, Stratigraphy of the Pleasanton Group, Pennsylvanian System in Missouri: Missouri Department of Natural Resources, Open File Report Series OFR–82–10–GI, 99 p.

Type section: Section in Acme Brick and Tile Company shale quarry at Vale, NE¼NW¼ sec. 27, T. 48 N., R. 32 W., Jackson County, Mo. Named for Unity Farm, sec. 25, T. 48 N., R. 32 W.

The Unity Farm Shale Member of the Lees Summit Formation (new name) of the Pleasanton Group, here named, is in the Forest City basin in northwestern Missouri. Represents the last episode of marine sedimentation prior to withdrawal of the sea and the development of stream valleys and clastic sedimentation. Consists of gray, silty, micaceous, thinly laminated shale containing clay-ironstone concretions. Overlies the Exline Limestone Member of the Lees Summit, to which it is closely related; unconformably underlies the Weldon River Sandstone Member (new name) of the Shale Hill Formation (new name). Equivalent shales in Iowa, Illinois, and Kansas have the same lithology. Thickness at the type section is 65 ft but generally ranges from a few feet to 50 ft. Age is Late Pennsylvanian (early Missourian).

Univeter Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Type locality: Exposures at Univeter, Canton and South Canton 7.5-minute quadrangles, Cherokee County, Ga.
Subunits: Lost Mountain Amphibolite Member, Rose Creek Schist Member.

The Univeter Formation of the New Georgia Group (new name), here named, occurs in the Greater Atlanta region of northwest Georgia. Includes the Lost Mountain Amphibolite Member (new name), which forms two limbs of a fold, and the intervening Rose Creek Schist Member (new name). Consists of amphibolite, hornblende gneiss, garnet-chlorite schist, and thin-banded iron formation associated with precious-metal deposits. On the southeast the Univeter is in fault contact with the Sandy Springs Group. Age is Late Proterozoic and (or) early Paleozoic.

Upsal Hogback Bed of the Carson Desert Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Measured section 6 of Morrison (1964), 2.4 km south of Upsal Hogback, Carson Desert, NW1/4 sec. 14, T. 20 N., R. 28 E., Churchill County, Nev.

The Upsal Hogback Bed of the Carson Desert Formation (new name), here named, is in the Carson Desert, Lake Lahontan area, Nevada. Consists of brown, potassium-poor, basaltic tephra containing blocky shards. Eruption may have continued over a considerable time and there may be several beds of similar composition. Some of the tephra included in the Upsal Hogback may be from the younger Soda Lake Bed (new name) of the Carson Desert because the two vents may have shared the same magma source and therefore early Soda Lake tephra might resemble late Upsal Hogback tephra. Overlies the lower member of the Sehoo Formation and the Wono and Leter Ranch Beds of the Pyramid Lake Member (all new names) of the Mount Mazama Formation. Age is Pleistocene, 35 to 11.5 ka.

Van Buren Till

Pleistocene (Wisconsinan)
Maine
New England province

Genes, A.N., Newman, W.A., and Brewer, T.B., 1981, Late Wisconsinan glaciation models of northern Maine and adjacent Canada: Quaternary Research, v. 16, no. 1, p. 48–65.

Type locality: Van Buren, northern Aroostook County, Maine.

The Van Buren Till, here named, is the surface unit throughout northern Aroostook County, Maine. Drift is present in Canada and extends southward to the moraines extending from Winterville to Caribou. Consists of clayey to silty, compact, buff to dark-brown till and stratified drift containing clasts of granite-gneiss. Was deposited by the Laurentide ice sheet and correlates with the Mars Hill Till (new name) of southern Aroostook County and the Lennoxville Till of southeastern Quebec. Unconformably overlies the St. Francis Till (new name) along the St. John River; underlies a 4-m-thick section of younger identical till at Golden Rapids, thought to represent an ablation facies or minor fluctuation during deposition of the Van Buren drift. Age is Pleistocene (late Wisconsinan).

Vang Formation of the Coleharbor Group

Pleistocene (Wisconsinan)
North Dakota
Williston basin

Bluemle, J.P., 1984, Geology of Towner County, North Dakota: North Dakota Geological Survey Bulletin 79, pt. I, p. 1–44.

Type locality: Outcrop near Vang, eastern Cavalier County, N. Dak.

The Vang Formation of the Coleharbor Group, here named, was informally named by Howard Hobbs in an unpublished study of the glacial stratigraphy of northeastern North Dakota. Is the next to lowest of five glacial till formations representing separate advances of glacial ice in Towner County and occurs sporadically over northeastern North Dakota. Consists of sand, gravel, and buff and light-gray sandy till containing pebbles and cobbles of crystalline rocks. Unconformably overlies the Cretaceous Pierre Formation or the Pleistocene Cando (new name) or Tiber Formations of the Coleharbor. Does not directly underlie any other unit. Thickness ranges from 20 to 35 ft in Towner County to 150 ft elsewhere. Age is Pleistocene (Wisconsinan).

Villa Rica Gneiss Member of the Mud Creek Formation of the New Georgia Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Abrams, C.E., and McConnell, K.I., 1981, Stratigraphy of the area around the Austell-Frolona antiform; west-central Georgia, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 55–67.

Type locality: Exposures around the town of Villa Rica, Villa Rica 7.5-minute quadrangle, Carroll and Douglas Counties, Ga.

The Villa Rica Gneiss Member of the Mud Creek Formation (new name) of the New Georgia Group (new name), here named, is in the Villa Rica antiform on the northwest flank of the Austell-Frolona antiform in west-central Georgia. Consists of biotite-quartz-plagioclase gneiss containing minor amounts of muscovite and epidote and is interpreted to be a felsic metavolcanic metadacite. Is interlayered with the Cedar Lake Quartzite Member (new name) of the Mud Creek. Grades into the stratigraphically overlying but structurally underlying Andy Mountain and Bill Arp Formations (both new names) of the informal Roosterville group. Age is Proterozoic(?).

McConnell, K.I., and Abrams, C.E., 1984, Geology of the Greater Atlanta region: Georgia Geologic Survey Bulletin 96, 127 p.

Age of the Villa Rica Gneiss Member is Late Proterozoic and (or) early Paleozoic.

Viola Springs Formation of the Viola Group

Middle and Late Ordovician (Champlainian and Cincinnatian)
Oklahoma
South Oklahoma folded belt province

Amsden, T.W., 1983, Welling-Fite-Corbin Ranch strata, *in* Amsden, T.W., and Sweet, W.C., Upper Bromide Formation and Viola Group (Middle and Upper Ordovician) in eastern Oklahoma: Oklahoma Geological Survey Bulletin 132, pt. I, p. 1–23.

Type section: 1.5 mi southeast of Viola Springs, NW¼NE¼ sec. 19, T. 2 S., R. 8 E., Connerville NE quadrangle, Johnston County, Okla.

Over much of western Oklahoma, where the Viola Formation cannot be readily distinguished from the Welling Formation, the Viola is here raised to Group status, and encompasses all Ordovician strata between the Bromide Formation and the Sylvan Shale. Pre-Welling Viola strata, the Viola Limestone of Wengerd (1948) and stratigraphic units 1 and 2 of Glaser (1965), are here named the Viola Springs Formation of the Viola Group. Consists of siliceous, laminated calcareous mudstones and bedded cherts containing sponge spicules, graptolites, and other fossils in the lower 137 ft and light-gray, nodular, bedded muddy limestone containing nodular chert in the upper 173 ft. Sharply overlies the Pooleville Member of the Bromide Formation; gradationally underlies the Welling Formation of the Viola Group. Maximum thickness is 800 ft in the southwestern Arbuckle Mountains. Wedges out to the east. Age is Middle and Late Ordovician (Champlainian and Cincinnatian).

Virginville Formation

Late Cambrian and Early Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type area: Outcrops in the southwest corner of the Kutztown and the southern part of the Hamburg 7.5-minute quadrangles, Berks County, Pa. Named for the town of Virginville.
Subunits: **Sacony Member, Onyx Cave Member, Moselem Member.**

The Virginville Formation, here named in the Richmond slice of the Hamburg klippe in Pennsylvania, was called Martinsburg Shale by Miller (1937). Includes the Sacony, Onyx Cave, and Moselem Members (all new names). Consists of quartzose rocks, micrite, calcarenite, peloidal limestone, carbonate-clast conglomerate, and black shale and mudstone. Tectonically overlies the younger Windsor Township Formation (new name) in the Greenwich slice. Thickness is 565 m. Age is Late Cambrian to late Early Ordovician based on conodonts.

Volcano Peak Group

Late Triassic and Early Jurassic
Nevada
Great Basin province

Taylor, D.G., Smith, P.L., Laws, R.A., and Guex, Jean, 1983, The stratigraphy and biofacies trends of the lower Mesozoic Gabbs and Sunrise formations, west-central Nevada: Canadian Journal of Earth Sciences, v. 20, no. 10, p. 1598–1608.

Type locality: Volcano Peak, Gabbs Valley Range, Mineral County, Nev.
Subunits: Gabbs Formation and its Nun Mine, Mount Hyatt, and Muller Canyon Members; Sunrise Formation and its Ferguson Hill, Five Card Draw, New York Canyon, Joker Peak, and Mina Peak Members.

The Volcano Peak Group, here named in the Gabbs Valley Range, Nev., includes the revised Late Triassic Gabbs and Early Jurassic Sunrise Formations and their members, listed above (all new names). Conformably overlies the Luning Formation; gradationally underlies the Dunlap Formation. Provides a record of nearly continuous marine sedimentation across the Triassic-Jurassic boundary and probably yields the most complete ammonite-bearing sequence anywhere. The Muller Canyon-Ferguson Hill section at Ferguson Hill is proposed as the stratotype for the Triassic-Jurassic System boundary.

Wachapreague Formation

Pleistocene (Sangamonian and Wisconsinan)
Virginia
Atlantic Coast basin

Mixon, R.B., 1985, Stratigraphic and geomorphic framework of uppermost Cenozoic deposits in the southern Delmarva Peninsula, Virginia and Maryland: U.S. Geological Survey Professional Paper 1067–G, 53 p.

Type section: Borehole W–1, depth interval 0–37 ft, on the crest of relict Upshur Neck barrier ridge, 1 mi north-northeast of the center of the town of Wachapreague, Accomack County, Va.

The Wachapreague Formation, here named, underlies the narrow coastal lowland of the Bell Neck sand-ridge complex, which extends from the southern tip of the Delmarva Peninsula northeastward to the vicinity of Metomkin Bay, Va. Contains distinctive floral and faunal assemblages that indicate deposition during cool climatic conditions. Consists of a lower lithic unit of fine-grained, gray sand and clay-silt, 20 ft thick, and an upper lithic unit of medium- to coarse-grained gravelly, yellowish-gray sand containing pebbles of black chert and quartz, 17 ft thick. Unconformably overlies the Yorktown Formation or truncates and (or) overlaps the Omar Formation and Nassawadox Formation (new name). Thickness attains 40 ft. Age is Pleistocene (Sangamonian and early Wisconsinan) based on uranium-isotope and amino-acid-racemization ages.

Wadsworth Bed of the Eetza Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Wadsworth Amphitheatre north of Wadsworth, Washoe County, Nev.

The Wadsworth Bed, here named, is in the Eetza Formation in the area between Wadsworth and Nixon, Lake Lahontan area, Nevada. Is a 1-cm-thick layer of tephra of intermediate chemical composition. Age is Pleistocene, 75 to 35 ka.

Wahlstrom Hollow Formation

Early Permian (Wolfcampian)
Idaho
Great Basin province

Mytton, J.W., Morgan, W.A., and Wardlaw, B.R., 1983, Stratigraphic relations of Permian units, Cassia Mountains, Idaho, *in* Miller, D.M., and others, eds., Tectonic and stratigraphic studies in the eastern Great Basin: Geological Society of America Memoir 157, p. 281–303.

Type section: Exposures south of the confluence of Third Fork and Fourth Fork of Rock Creek and south of Rock Creek Road and up the ridge toward Wahlstrom Hollow, from NE¼SW¼NE¼ to SW¼NE¼SW¼ sec. 32, T. 13 S., R. 19 E., Grand View Peak, Rams Horn Ridge, Trapper Peak, and Pike Mountain 7.5-minute quadrangles, Cassia County, Idaho.

The Wahlstrom Hollow sequence of Morgan (1980), here named the Wahlstrom Hollow Formation, is exposed in valleys and upthrown fault blocks in the central and northeastern Cassia Mountains, Idaho. Consists of gray, brown, or reddish, fine-grained, medium- to thick-bedded, fossiliferous silty limestone and calcareous siltstone containing spicules, pyrite, siliceous nodules and laminae, and zones of recumbently folded, laterally discontinuous beds; interpreted as subaqueous soft-sediment slumps. Laminations and scoured surfaces indicate deposition by turbidity currents. May be part of the depositional sequence of the northern Oquirrh basin. Lower contact is covered; gradationally underlies the Third Fork Formation (new name). Thickness at the type section is 500 m. Age is Early Permian (Wolfcampian, mostly late) based on conodonts and fusulinids.

Wahoo Creek Formation of the Atlanta Group

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–40.

Type locality: Exposures along Wahoo Creek, Newnan North quadrangle, Coweta County, Ga.

The Wahoo Creek Formation of the Atlanta Group (new name), named in the Newnan-Tucker synform near Atlanta, Ga., consists of nearly white, fine- to medium-grained, slabby gneiss. Distinctive lithologies in the Wahoo Creek are purple-pink-weathering schist and amphibolite in the lower 15 to 30 m and very thinly layered slabby calc-silicate gneiss. Sharply and conformably overlies the Clairmont and Senoia Formations (both new names) of the Atlanta Group; sharply and conformably underlies the Stonewall and Clarkston Formations (both new names) of the Atlanta. Thickness is estimated at 300 to 800 m. Age is Late Proterozoic and (or) early Paleozoic.

Walker Lake Bed of the Salt Wells Member of the Mono Basin Formation

Holocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Core E, from 180 to 182 cm, at the south end of Walker Lake, Mineral County, Nev.

The Walker Lake Bed of the Salt Wells Member (new name) of the Mono Basin Formation (new name), here named, is in the Lake Lahontan area, Nevada. Consists of a layer of rhyolitic tephra about 1 cm thick that contains glass-encased biotite phenocrysts and has a high silica, low magnesium content. May represent a dense, crystal-rich fraction of the Turupah Flat Bed (new name) of the Salt Wells. Source is believed to be Mono Basin because of its geographic distribution south of Carson Sink. Age is Holocene, about 1.2 ka.

Walworth Formation

Pleistocene (Wisconsinan)
Wisconsin, Illinois
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut and test hole along Highway 15 (Beloit-Milwaukee Road), 3.2 km northeast of Clinton, NE¼SW¼ sec. 3, T. 1 N., R. 14 E., Clinton 7.5-minute quadrangle, Rock County, Wis. Named for Walworth County, Wis.
Subunits: Foxhollow Member, Allens Grove Member, Clinton Member.

The Walworth Formation, here named in south-central Wisconsin and northern Illinois, consists of sandy, gray to brown till and associated sand and gravel deposits. Is subdivided into the lower, clayey Foxhollow Member (new name), the sandy Allens Grove Member (new name), and the upper, sandier Clinton Member (new name). Unconformably overlies pre-Pleistocene rocks; sharply underlies the Capron Member of the Zenda Formation (new name) in eastern Walworth County and the

Horicon Formation (new name) to the north, and is the surficial unit in western Walworth and eastern Rock Counties, Wis. Thickness ranges from a few meters to 80 m. Age is Pleistocene (early Wisconsinan or older).

Wantagh Formation

Pleistocene (Wisconsinan)
New York
Atlantic Coast basin

Rampino, M.R., and Sanders, J.E., 1981, Upper Quaternary stratigraphy of southern Long Island, New York: Northeastern Geology, v. 3, no. 2, p. 116–128.

Type section: Silty-clay facies: Borehole 200–C, Wantagh Pollution Control Plant, Wantagh. Sand facies: Borehole 238, Wantagh Pollution Control Plant outfall pipe, Jones Beach State Park, Nassau County, N.Y.

Widespread nearshore marine deposits in the subsurface of south-central Long Island and the inner continental shelf off southern Long Island, N.Y., previously called the Gardiners Clay and the twenty-foot clay, are here named the Wantagh Formation. Consists of an olive-gray, fine-grained, silty clay facies, which occurs as a blanket deposit, and a white to tan, dense, shelly sand facies, which forms a lens beneath the Jones Beach barrier island. Unconformably overlies the Merrick Formation (new name); unconformably underlies the Bellmore Formation (new name). Thickness of the silty clay facies is 14.5 ft; thickness of the sand facies is 50 ft. Age is late Pleistocene (middle Wisconsinan).

Warix Run Member of the **Slade Formation**

Late Mississippian
Kentucky
Cincinnati arch

Ettensohn, F.R., Rice, C.L., Dever, G.R., Jr., and Chesnut, D.R., 1984, Slade and Paragon Formations—New stratigraphic nomenclature for Mississippian rocks along the Cumberland Escarpment in Kentucky: U.S. Geological Survey Bulletin 1605–B, 37 p.

Type section: Roadcut along Kentucky Highway 801, north of the intersection of Kentucky Highways 801 and 1274, near the head of Warix Run, a tributary of Licking River (Cave Run Lake), Bangor quadrangle, Rowan County, Ky.

The Warix Run Member of the Slade Formation (new name), used informally by Dever (1977) and here named, is in the Cumberland Escarpment area of east-central and northeastern Kentucky. Strata of the Warix Run were previously assigned to the Newman Limestone and other units, which are now restricted from the Cumberland Escarpment area. Consists of light-olive-gray quartzose calcarenite and lesser calcilutite. Disconformably overlies the Borden Formation or Renfro, St. Louis, or Ste. Genevieve Members of the Slade Formation; intertongues with or conformably underlies the Mill Knob Member (new name) of the Slade. Thickness ranges from 0 to 31 m. Age is Late Mississippian.

Warner Formation

Silurian
New Hampshire
New England province

Nielson, D.L., 1981, The bedrock geology of the Hillsboro quadrangle, New Hampshire: New Hampshire Department of Resources and Economic Development, Bulletin 8, 76 p.

Type locality: Outcrops along Interstate Highway I–89, south of the village of Warner, Mt. Kearsarge 7.5-minute quadrangle, Merrimack County, N.H.

Metasedimentary rocks previously mapped as the Littleton Formation in the Hillsboro quadrangle, New Hampshire, are here named the Warner Formation. Consists of dark-gray to brown calc-silicate granofels and sillimanite-biotite schist containing calc-silicate boudins. Overlies the Francestown Formation; underlies the Littleton Formation. Thickness is 3,000 ft. Age is Silurian based on lithologic similarities to the Silurian Madrid Formation in the Merrimack Synclinorium in Maine.

Warnick Member of the Chuckanut Formation

Eocene
Washington
Bellingham basin

Johnson, S.Y., 1984, Stratigraphy, age, and paleogeography of the Eocene Chuckanut Formation, northwest Washington: Canadian Journal of Earth Sciences, v. 21, no. 1, p. 92–106.

Type section: Logging road SP–410 above Canyon Creek, SE1/4 sec. 24, T. 39 N., R. 6 E., Whatcom County, Wash. Named for the town of Warnick.

The Warnick Member of the Chuckanut Formation, here named, is in the easternmost part of the largest outcrop belt of the Chuckanut, which extends from the San Juan Islands into the foothills of the North Cascades, Wash. Consists of intervals of conglomeratic coarse-grained sandstone alternating with fine-grained massive to laminated mudstone, interpreted as alluvial plain and fan deposits. Overlies the Slide Member (new name) of the Chuckanut; is bounded on the north by faults. Thickness is 1,000 m at the type section. Age is middle to late(?) Eocene based on stratigraphic correlation with the Maple Falls and Padden Members (both new names) of the Chuckanut.

Waste Gate Formation of the Potomac Group

Early Cretaceous (Neocomian)
Maryland, Delaware, New Jersey, Virginia
Atlantic Coast basin

Hansen, H.J., 1984, Hydrogeologic characteristics of the Waste Gate Formation, a new subsurface unit of the Potomac Group underlying the eastern Delmarva Peninsula: Maryland Geological Survey Information Circular 39, 21 p.

Type section: Ohio Oil Company L.G. Hammond Number 1 (Wi-Cg 37*) well, depth interval 4,745–5,360 ft, near the crossroads of Waste Gate, Wicomico County, Md.

The Waste Gate Formation of the Potomac Group, here named, occurs at depths from 3,500 to 5,670 ft in the subsurface of the eastern Delmarva Peninsula of Somerset, Wicomico, and Worcester Counties, Md., Accomack County, Va., and probably Sussex County, Del., and Cape May Point, N.J. Previously included in the Potomac Group, undivided, or the lower Patuxent Formation. Consists of nonmarine alluvial, unconsolidated to moderately lithified, gray to white, arkosic to feldspathic sandstone interbedded with drab, silty shale or clay. Unconformably overlies Jurassic rocks; unconformably underlies the Patuxent and Arundel Formations, undivided, of the Potomac Group. Thickness at the type section is 615 ft. Age is Early Cretaceous (Neocomian).

Watauga River Gneiss of the Forge Creek Suite

Middle Proterozoic
North Carolina, Tennessee
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Along Bethel Church Road, 0.5 mi north of where it crosses the Watauga River, lat 36°17′ N., long 81°52′ W., Sherwood quadrangle, Watauga County, N.C.

The Watauga River Gneiss of the Forge Creek Suite (new name), here named, is in the Watauga massif in the Blue Ridge of North Carolina and Tennessee. Consists of a granitoid lacking abundant biotite and is gradational into the Comers Gneiss of the Forge Creek Suite. Age is Middle Proterozoic based on a rubidium-strontium age of 1,175 Ma.

Waubeek Member of the Scotch Grove Formation

Early Silurian (Wenlockian)
Iowa
Iowa shelf

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

Type locality: Exposures along the Wapsipinicon River 1 mi northeast of Waubeek, SE¼SW¼NE¼ sec. 17, T. 85 N., R. 5 W., Linn County, Iowa. Reference core section: Near Walford, SE¼SW¼SW¼SW¼ sec. 5, T. 81 N., R. 8 W., Johnson County, Iowa.

The informal Waubeek facies of Witzke (1981) is here named the Waubeek Member in the upper Scotch Grove Formation (new name) in eastern Iowa. Consists of dense to vuggy, chert-free, sparsely fossiliferous, finely crystalline to microcrystalline dolomite. Fossil molds are locally common in some beds. Overlies the Buck Creek Quarry Member (new name), reassigned from the revised Hopkinton Formation, or the Fawn Creek Member (new name), both of the Scotch Grove in the western portion of the study area; is replaced laterally by the Buck Creek Quarry, Fawn Creek, and Palisades-Kepler (new name) Members; sharply underlies the Anamosa Member of the Gower Formation. Thickness averages 40 ft but attains a maximum of 56 ft. Age is Early Silurian (early and middle Wenlockian).

Wausau Member of the Marathon Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84-1, p. 1–15.

Type section: Gravel pit on west side of Ryan Street, 1.5 mi south of Highway 29, SW¼SW¼NE¼ sec. 27, T. 28 N., R. 8 E., Wausau 15-minute quadrangle, Marathon County, Wis. Named for Wausau, Marathon County.

The lower member of the Marathon Formation (new name) in the Chippewa sublobe in Marathon and Wood Counties, Wis., is here named the Wausau Member, following the informal usage of LaBerge and Myers (1971). Consists of brown pebbly loam to clay loam till in which more than 30 percent of the clasts are rotted. Unconformably overlies Precambrian bedrock; is the surficial unit in much of the area or underlies the Edgar Member (new name) of the Marathon or the Merrill Member of the Lincoln Formation (both new names) to the north.

Thickness is less than 10 m. Age is Pleistocene (early Wisconsinan or older) based on organic deposits on top of the overlying Merrill Member.

Waweig Formation

Early to Late Silurian (Llandoverian to Pridolian)
New Brunswick, Maine
New England province

MacKenzie, G.S., 1940, The St. Stephen map-area, Charlotte County, N.B.: New Brunswick Department of Lands and Mines, Mining Section, 46 p.

Type locality: Outcrops on Waweig peninsula and the east shore of Oak Bay in the St. Croix River, extending for 3 mi south from the head of the bay, St. Stephen map-area, Charlotte County, N.B., Canada.

The Waweig Formation, here named, crops out on the Waweig peninsula in Charlotte County, N.B., and includes sediments on the east and west shores of Oak Bay. Consists of gray, fine-grained, cherty quartzite and purplish graywacke, siltstone, and siliceous argillite. Faulting and lack of outcrop obscure the relationship to the underlying Dennis Formation; unconformably underlies the Oak Bay Formation. Grades laterally into the facies equivalent Digdeguash Formation (new name). Age is Late Silurian based on fossils.

Ruitenberg, A.A., and Ludman, Allan, 1978, Stratigraphy and tectonic setting of early Paleozoic sedimentary rocks of the Wirral-Big Lake area, southwestern New Brunswick and southeastern Maine: Canadian Journal of Earth Science, v. 15, p. 22–32.

The Waweig Formation is here traced from the Wirral to the Calais area, where it is truncated by Devonian plutons west of the St. Croix River in Maine. In this area, consists of dense, fine-grained sandstone and siltstone of graywacke composition and nongraphitic slate. Transitionally overlies the Oak Bay Formation or unconformably overlies the Cookson Formation (new name); interfingers with the partially equivalent Digdeguash Formation (new name); grades upward into the overlying Flume Ridge Formation (new name). Age is Early to Late Silurian (Llandoverian to Pridolian) based on brachiopods, cephalopods, corals, and other fossil fauna.

Weisenberg Member of the **Windsor Township Formation**

Middle Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures 1 km south of Weisenberg Church, Slatedale 7.5-minute quadrangle, Lehigh County, Pa.

The Weisenberg Member, here named, is in the Windsor Township Formation (new name) in the Greenwich slice of the Hamburg klippe in Pennsylvania. Consists of poorly cleaved to fissile gray shale, mudstone, claystone, and siltstone and the informal Werleys conglomerate, lenticular channel fill deposits thought to be debris flows, best exposed near Werleys Corner in the Slatedale 7.5-minute quadrangle. Deposits are interpreted as open-fan or levee mudstones and siltstones cut by channel and interchannel facies of the Dreibelbis and Switzer Creek Members (both new names) of the Windsor Township. Maximum thickness is 1,740 m. Age is Middle Ordovician based on graptolites.

Weiser Basalt of the Columbia River Basalt Group

Miocene
Idaho
Snake River basin

Fitzgerald, J.F., 1982, Geology and basalt stratigraphy of the Weiser embayment, west-central Idaho, in Bonnachsen, Bill, and Breckenridge, R.M., eds., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 103–128.

Type locality: Basalt flows in the Weiser embayment at the eastern edge of the Columbia Plateau, Washington and Payette Counties, Idaho.

Post-Grande Ronde basalt flows in the Weiser embayment, here named the Weiser Basalt of the Columbia River Basalt Group, are characterized by pumice breccia, scoria, volcaniclastic debris, and ash. Four informal members are defined on the basis of combined outcrop characteristics and unconformable relations with the underlying Imnaha and Grande Ronde flows. From oldest to youngest these members are the basalts of Cambridge, Sugarloaf, Star Butte, and the geographically isolated basalt of Black Canyon. Age is middle and late Miocene.

Weldon River Sandstone Member of the Shale Hill Formation of the Pleasanton Group

Late Pennsylvanian (Missourian)
Missouri
Forest City basin

Howe, W.B., 1982, Stratigraphy of the Pleasanton Group, Pennsylvanian System in Missouri: Missouri Department of Natural Resources, Open File Report Series OFR-82-10-GI, 99 p.

Type area: Exposures along Weldon River, Mercer and Grundy Counties, Mo.

The Weldon River Sandstone Member is here named the basal member of the Shale Hill Formation (new name) of the Pleasanton Group in the Forest City basin in northwestern Missouri. Consists of channel- and valley-fill deposits of conglomerate, sandstone, and shale. Unconformably overlies the Unity Farm Shale Member (new name) of the Lees Summit Formation (new name); underlies the Locust Creek coal in the Blue Mound Shale Member (new name) of the Shale Hill. Age is Late Pennsylvanian (early Missourian).

Welton Member of the Scotch Grove Formation

Early Silurian (Llandoverian, Telychian)
Iowa
Iowa shelf

Johnson, M.E., 1983, New member names for the Lower Silurian Hopkinton Dolomite of eastern Iowa: Iowa Academy of Science Proceedings, v. 90, no. 1, p. 13–18.

Type section: Behr quarry, 5 km south of Welton, NW¼SW¼ sec. 2, T. 81 N., R. 3 E., Clinton County, Iowa.

Previously divided on the basis of paleontologic units, the Hopkinton Dolomite is here divided into lithologic members to facilitate interregional correlations based on sea-level curves. Rocks formerly called the *Cyrtia* Beds of the Hopkinton are here named the Welton Member of the Hopkinton Dolomite in eastern Iowa. Consists of tan, poorly bedded, very finely crystalline dolomite having a diversity of brachiopods, crinoids, trilobites, and bryozoans. Overlies both the patch-reef and inter-reef facies of the Johns Creek Quarry Member (new name) of the Hopkinton; underlies the Buck Creek Quarry Member (new name) of the Hopkinton. Thickness is 12.5 m or more. Age is Early Silurian (Llandoverian, Telychian).

Bunker, B.J., Ludvigson, G.A., and Witzke, B.J., 1985, The Plum River fault zone and the structural and stratigraphic framework of eastern Iowa: Iowa Geological Survey Technical Information Series 13, 126 p.

The Johns Creek Quarry, Welton, and Buck Creek Quarry Members, all new names of Johnson (1983), are here reassigned from the upper part of the Hopkinton Dolomite to the lower part of the Scotch Grove Formation (new name), a unit defined between the Hopkinton and the Gower Formation, for the purpose of preserving the original definitions of these units.

Wenatchee Formation

Oligocene
Washington
Northern Cascade Range-Okanogan province

Gresens, R.L., Naeser, C.W., and Whetten, J.W., 1981, Stratigraphy and age of the Chumstick and Wenatchee Formations: Tertiary fluvial and lacustrine rocks, Chiwaukum graben, Washington: Geological Society of America Bulletin, v. 92, no. 5, pt. I, p. 233–236; pt. II, p. 841–876.

Type section: Outcrop on the northwest flank of Squilchuck Canyon in the foothills southwest of Wenatchee, SE¼ sec. 21, SW¼ sec. 22, NW¼ sec. 27, and NE¼ sec. 28, T. 22 N., R. 20 E., Chelan County, Wash. Four reference sections are designated.

The Wenatchee Formation, here named following the informal usage of Buza (1976) and Gresens (1977), is in the Chiwaukum graben in the eastern foothills of the central Cascade Range in Washington. May be present below the Columbia Plateau basalt flows to the east; is absent to the west, due partly to erosion. Is divided into two members at the type section: a lower sandstone and shale member subdivided into lower shale-dominated fluvial beds, sandstone-dominated fluvial beds, and shale and sandstone beds of lacustrine origin; and an upper white conglomerate member. Unconformably overlies crystalline basement rocks of the Swakane Biotite Gneiss or the Chumstick Formation (new name); unconformably underlies post-Miocene diamictite derived from the Yakima Basalt. Thickness at the type section is about 155 m; the maximum observed thickness is 300 m. Age is early Oligocene based on an age of 34 Ma on zircon from tuff.

Wernecke Supergroup

Middle Proterozoic
Canada, Alaska
Yukon-Porcupine province

Delaney, G.D., 1981, The mid-Proterozoic Wernecke Supergroup, Wernecke Mountains, Yukon Territory, *in* Campbell, F.H.A., ed., Proterozoic basins of Canada: Geological Survey of Canada Paper 81–10, p. 1–23.

Type area: Wernecke Mountains, lat 64°30′–65° N., long 133°–135° W., Yukon Territory, Canada.
Subunits: Fairchild Lake Group, Quartet Group, Gillespie Lake Group.

Rocks previously referred to as the Wernecke type Proterozoics or the Wernecke Assemblage are here named the Wernecke Supergroup in the Wernecke Mountains, Yukon Territory. Is divided into the lower Fairchild Lake Group, Quartet Group (new name), and upper Gillespie Lake Group. The Quartet Group, a monotonous succession of dark-gray-weathering siltstone, fine sandstone, mudstone, and claystone at least 5 km thick, extends into Alaska in the Keele Range of the Porcupine Plateau. Wernecke Supergroup is correlated with the lower three groups of the Belt-Purcell Supergroup of the southern Cordillera. Age is Middle Proterozoic, 1,700 to 1,200 Ma.

West Felda Shale Member of the **Lehigh Acres Formation** of the **Glades Group**

Early Cretaceous (Comanchean)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies Transactions, October (supplement), v. 31, p. 447–453.

Type section: Humble Number 1 Lehigh Acres well P–407, depth interval 12,760–12,800 ft, sec. 14, T. 45 S., R. 27 E., Lee County, Fla. Named for the West Felda oil field.

The West Felda Shale Member is here named the lower member of the Lehigh Acres Formation (new name) of the Glades Group in the subsurface of the South Florida basin, where four regionally persistent anhydrite units are identified below the Punta Gorda Anhydrite of the Glades. Consists of dark-gray, micaceous, calcareous shale and shaly limestone. Overlies the Pumpkin Bay Formation (new name); underlies the Twelve Mile Member (new name) of the Lehigh Acres. Thickness at the type well is 40 ft. Age is Early Cretaceous (earliest Comanchean).

West Sak Sands

Late Cretaceous
Alaska
Arctic Coastal Plains province

Jamison, H.C., Brockett, L.D., and McIntosh, R.A., 1980, Prudhoe Bay—A 10-year perspective, *in* Halbouty, M.T., ed., Giant oil and gas fields of the decade 1968–1978: American Association of Petroleum Geologists Memoir 30, p. 289–314.

Type section: ARCO West Sak River State 1 well, depth interval 3,742–3,842 ft, Prudhoe Bay field, T. 11 N., R. 10 E., Umiat Base Line, Alaska.

The West Sak Sands, here named, is in the Prudhoe Bay field and consists of two sand units, each about 40 ft thick, separated by a 25-ft-thick mudstone unit. Consists of fine-grained, friable, quartzose, argillaceous, and glauconitic, oil-bearing sands that are transitional from the underlying Upper Cretaceous Seabee Formation to the overlying Upper Cretaceous Prince Creek Formation. Age is Late Cretaceous.

Whaley Gneiss of the Cranberry Suite

Middle Proterozoic
North Carolina
Piedmont-Blue Ridge province

Bartholomew, M.J., and Lewis, S.E., 1984, Evolution of Grenville massifs in the Blue Ridge geologic province, southern and central Appalachians: Geological Society of America Special Paper 194, p. 229–254.

Type locality: Along North Carolina State Road 1316 for about 0.5 mi north of Cannon Gap, which is 1 mi south of the community of Whaley, lat 36°13′30″ N., long 82°56′ W., Elk Park quadrangle, Avery County, N.C.

The Whaley Gneiss, here named, is in the Cranberry Suite, the revised Cranberry Granite of Keith (1903), which is now restricted to the plutonic rocks of the Elk River massif in the Blue Ridge in North Carolina. Color is red or pink due to abundant pink feldspar. Forms numerous small igneous bodies within the Elk River massif. Age is Middle Proterozoic.

Wheeler Coal Member of the Swede Hollow Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Outcrop at the former Wheeler Bridge spanning the Swede Hollow tributary to Whitebreast Creek, NW¼NE¼ sec. 33, T. 73 N., R. 22 W., Lucas County, Iowa.

The Wheeler Coal Member, here named, is in the Swede Hollow Formation (new name) of the Cherokee Group in southeastern and south-central Iowa. Is closely related to the overlying Bevier Coal Member of the Swede Hollow; the interval between them is generally less than 20 ft, and they appear to coalesce in some areas. Together they may be considered as the biostratigraphic equivalent of the Lowell Coal [Member of the Carbondale Formation] of Illinois. Thickness rarely exceeds 2 ft. Age is Middle Pennsylvanian (Desmoinesian).

Whirlwind Creek Formation

Late Silurian to Late Devonian (Ludlovian to Frasnian)
Alaska
Holitna basin

Dutro, J.T., Jr., and Patton, W.W., Jr., 1982, New Paleozoic formations in the northern Kuskokwim Mountains, west-central Alaska: U.S. Geological Survey Bulletin 1529–H, p. H13–H22.

Type section: Exposures on the ridge between Whirlwind and Soda Creeks, sec. 23, T. 24 S., R. 23 E.; supplemental section: secs. 29 and 30, T. 23 S., R. 25 E., Medfra (B–3) quadrangle, Alaska.

The Whirlwind Creek Formation, here named, is in the Nixon Fork terrane of the Kuskokwim Mountains, Alaska, where it was deposited in a shallow-water carbonate environment. Consists of 300- to 400-m-thick cycles of algal dolomite and pelletoidal, silty, and reefy limestone. Overlies the Paradise Fork Formation (new name) north of Stone Mountain and disconformably overlies the Telsitna Formation (new name) through most of the region; unconformably underlies Permian through Lower Cretaceous strata west of White Mountain Creek. Is in fault contact with the East Fork Hills Formation (new name) of the East Fork terrane. Thickness ranges from 1,000 to 1,500 m. Age is Late Silurian to Late Devonian (Ludlovian to Frasnian) based on ostracodes, brachiopods, and corals.

Whitebreast Coal Member of the Swede Hollow Formation of the Cherokee Group of the Des Moines Supergroup

Middle Pennsylvanian (Desmoinesian)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Swede Hollow type section, exposures along a tributary to Whitebreast Creek in Swede Hollow, secs. 33 and 34, T. 73 N., R. 22 W., and sec. 3, T. 72 N., R. 22 W., Lucas County, Iowa.

The Whitebreast Coal Member, here named, is at the base of the Swede Hollow Formation (new name) of the Cherokee Group in southeastern and south-central Iowa. Is laterally persistent over a 14-county area and has a uniform thickness of about 1 ft. Is equivalent to the Colchester (Number 2) Coal in Illinois and the Croweburg Coal in Kansas and Missouri. Age is Middle Pennsylvanian (Desmoinesian).

Whitney Granodiorite

Late Cretaceous
California
San Joaquin basin

Moore, J.G., 1981, Geologic map of the Mount Whitney quadrangle, Inyo and Tulare Counties, California: U.S. Geological Survey Geologic Quadrangle Map GQ–1545, scale 1:62,500.

Type locality: Exposures 200 m north of the summit of Mount Whitney, Mount Whitney 15-minute quadrangle, Tulare County, Calif.

The Paradise-Whitney nested sequence extends 83 km southeastward from the central part of the Marion Peak quadrangle on the northwest, through the Mount Whitney quadrangle, to the southeastern part of the Olancha quadrangle on the southeast in Inyo, Tulare, and Fresno Counties, Calif. Includes the Whitney pluton, here named the Whitney Granodiorite, which intrudes the center of the nested sequence, and the Paradise pluton, named the Paradise Granodiorite (new name). Consists of porphyritic granodiorite and granite having large phenocrysts of potassium feldspar. Is domical in profile, and the present level of exposure is apparently near its top. The Paradise-Whitney sequence was emplaced as a single intrusion about 85 Ma, but before complete solidification occurred, the partly molten and more differentiated siliceous Whitney Granodiorite core burst through the solidified wall of the Paradise Granodiorite on the southeast side. Western and eastern contacts of the Whitney dip under the Paradise, and its axis plunges north beneath the Paradise. Granite porphyry dikes and sills, probably originating from the deeper, still molten parts of the pluton, intrude the Whitney. Age is Late Cretaceous based on a potassium-argon biotite age of 83 Ma.

Wildcat Basin Rhyolite Member of the Strawberry Volcanics

Miocene
Oregon
Snake River basin

Thayer, T.P., Case, J.E., and Stotelmeyer, R.B., 1981, Mineral resources of the Strawberry Mountain wilderness and adjoining areas, Grant County, Oregon: U.S. Geological Survey Bulletin 1498, 67 p.

Type locality: Exposures extending southwest from a vent complex in the head of Indian Creek, just north of and into Wildcat Basin, Strawberry Range, Grant County, Oreg.

The Wildcat Basin Rhyolite Member of the Strawberry Volcanics, here named, is in the Strawberry Mountain block in Grant County, Oreg. Consists of white or pale-gray to pinkish rhyolitic tuffs and flows that extend southwestward from a vent complex in the head of Indian

Creek and includes two or more platy rhyolites having spherulitic glassy tops that appear to be about 300 m thick and obsidian breccia flows. Overlies beds of the Strawberry Volcanics; interfingers with and underlies andesite flows from the main Strawberry vent. The Wildcat Basin eruptive center appears to have been located at the intersection of two faults, now buried under younger flows and tuffs. Age is late Miocene (12 Ma).

Wildcat Den Coal Member of the Caseyville Formation of the Morrow Supergroup

Middle Pennsylvanian (Morrowan)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Exposures at Wildcat Den State Park, SW¼ sec. 17 and SE¼ sec. 18, T. 77 N., R. 1 E., Muscatine County, Iowa.

The Wildcat Den Coal Member, here named, is the lowermost and most widely traceable of the coals in the Caseyville Formation in southeastern and south-central Iowa. Consists of shaly, pyritic coal 1.5 ft thick at the type section. Age is Middle Pennsylvanian (Morrowan).

Wildcat Mountain Rhyolite of the St. Francois Mountains Volcanic Supergroup

Middle Proterozoic
Missouri
Ozark uplift

Berry, A.W., Jr., 1976, Proposed stratigraphic column for Precambrian volcanic rocks, western St. Francois Mountains, Missouri, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 81–90.

Type section: Exposures along the north slope of Wildcat Mountain, S½NE¼ sec. 6, T. 33 N., R. 3 E., Johnson Shut-ins quadrangle, Reynolds County, Mo.

Rocks exposed on Lee, Bell, North Bell, Wildcat, Taum Sauk, Russell, and Crane Mountains and on College Hill in the western St. Francois Mountains, southeast Missouri, are here named the Wildcat Mountain Rhyolite. Includes rocks previously called the Shut-ins fragmental ash flow of Anderson (1962) and all but the upper part of Unit D of the tuff of Stouts Creek of Anderson (1970). Consists of deep-maroon ash-flow tuff containing quartz and feldspar phenocrysts and white stringers of microcrystalline quartz and feldspar. Overlies the Russell Mountain Rhyolite (new name); underlies the Bell Mountain Rhyolite (new name). Thickness is 90 m. Age is Middle Proterozoic.

Kisvarsanyi, E.B., 1976, Missouri Precambrian revisited: Progress in studies of Precambrian geology, 1961–1976, *in* Kisvarsanyi, E.B., ed., Studies in Precambrian geology of Missouri with a guidebook to parts of the St. Francois Mountains: Missouri Geological Survey Report of Investigations 61, Contribution to Precambrian Geology 6, p. 66–80.

The formal name St. Francois Mountains Volcanic Supergroup, here adopted for all the Precambrian volcanic rocks of southeast Missouri, includes the Wildcat Mountain Rhyolite.

Wildhorse Meadows Quartzite of the Big Bear Group

Precambrian
California
Mohave basin

Cameron, C.S., 1982, Stratigraphy and significance of the upper Precambrian Big Bear Group, *in* Cooper, J.D., Geology of selected areas in the San Bernardino Mountains, western Mohave desert, and southern Great Basin, California: Geological Society of America, Cordilleran Section, 78th Annual Meeting, guidebook, field trip 9, p. 5–20.

Type section: Northwest of Wildhorse Meadows, SW1/4 sec. 4, T. 1 N., R. 2 E., Moonridge 7.5-minute quadrangle, San Bernardino County, Calif.

The lowermost unit of the Big Bear Group (new name), widely exposed near Sugarloaf Mountain in the Big Bear area of the San Bernardino Mountains, Calif., and informally named the Wildhorse Quartzite by Cameron (1981), is here named the Wildhorse Meadows Quartzite. Includes two informal members. Basal conglomerate of the lower member, W1, overlies Precambrian basement gneisses with spectacular angular unconformity and grades rapidly upward into clast-free quartzite. The upper member, W2, consists of cliff-forming, light-gray or white, fine- to medium-grained orthoquartzite, and an uppermost conglomerate that directly underlies the Lightning Gulch Formation (new name) of the Big Bear Group. At the type section member W1 is 244 m thick and member W2 is 151 m thick. Age is late Precambrian.

Wilson Grove Formation

Miocene and Pliocene
California
Northern Coast Range province

Fox, K.F., Jr., 1983, Tectonic setting of late Miocene, Pliocene, and Pleistocene rocks in part of the Coast Ranges north of San Francisco, California: U.S. Geological Survey Professional Paper 1239, 33 p.

Type locality: Area between Wilson Grove and Mark West Creek, 2.5 km due south, 11 km north of Sebastopol, T. 8 N., R. 9 W., Sonoma County, Calif.

Rocks previously assigned to the Merced(?) Formation in the Sebastopol block in Sonoma County, Calif., are here named the Wilson Grove Formation. Consists of unconsolidated, fine-grained, massive sand and minor amounts of gravel and tuff deposited under beach and shallow-marine conditions. A conspicuous but discontinuous interbed of pumice lapilli tuff 15 to 75 m above the base of the Wilson Grove was erupted from the Sonoma Volcanics and probably correlates with a tuff in the Petaluma Formation. Local deposits of sand and gravel of alluvial origin overlying the marine beds and previously included with them in the Merced(?) Formation are here treated as a separate unit, the informal sand and gravel of Cotati. Overlies a surface of low to moderate relief beveled across Franciscan and Great Valley basement rocks; contact with the Petaluma Formation to the east is concealed by younger alluvial deposits. Correlates with the lower Merced of Glen (1959) at the Merced Formation type section. Thickness attains 150 m. Age is late Miocene and Pliocene and spans the revised boundary between the Miocene and Pliocene, based on potassium-argon ages of 6.1 and 5.7 Ma on tuff in the Wilson Grove and Pliocene molluskan faunas.

Winchester Creek Member of the Tiger Formation

Eocene, Oligocene, and Miocene
Washington
Northern Cascade Range-Okanogan province

Gager, B.R., 1983, Stratigraphy of the Tiger Formation, northeastern Washington: Northwest Geology, v. 12, p. 25–41.

Type section: Outcrop in roadcut on west side of Winchester Creek, southeast corner NE1/4 sec. 5, T. 32 N., R. 42 E., Pend Oreille County, Wash.

The Winchester Creek Member, here named, is in the revised Tiger Formation in the Cusick region of northeastern Washington. Consists of fine-grained sandstone, siltstone, and shale in 1- to 5-mm-thick fining-upward sequences, and subordinate medium- to coarse-grained sandstone. Base is not exposed but probably unconformably overlies the Sanpoil Volcanics east of the Pend Oreille River and older strata west of the river; is a facies equivalent of, intertongues with, and is separated by a vertical arbitrary boundary from the Gibraltar Rock Member (new name) of the Tiger; conformably and unconformably underlies the Calispell Lake Member (new name) of the Tiger. Thickness is 40 m at the type section; inferred total thickness is 900 m. Age ranges from early middle Eocene, based on inclusions of late early to early middle

Eocene volcanic rock clasts, through middle Miocene, based on middle Miocene regional faults that bound the Tiger Formation, although the age determination of middle Miocene is less definite.

Windsor Township Formation

Early and Middle Ordovician
Pennsylvania
Appalachian basin

Lash, G.G., and Drake, A.A., Jr., 1984, The Richmond and Greenwich slices of the Hamburg klippe in eastern Pennsylvania—Stratigraphy, sedimentology, structure, and plate tectonic implications: U.S. Geological Survey Professional Paper 1312, 40 p.

Type locality: Exposures along the east and west banks of Maiden Creek, between the towns of Dreibelbis and Kempton, Windsor Township, Kutztown and Hamburg 7.5-minute quadrangles, Berks County, Pa.
Subunits: **Weisenberg Member, Switzer Creek Member, Dreibelbis Member.**

The Windsor Township Formation, here named, was mapped as Lithotectonic Unit A by Alterman (1972). Is an allochthonous unit in the Greenwich slice of the Hamburg klippe, Berks County, Pa., deposited in the middle fan area of a large submarine fan. Includes the Weisenberg Member (new name), a shale, siltstone, and mudstone unit, and the Switzer Creek and Dreibelbis Members (both new names), graywacke and gray-green shale units. Locally contains older units of boulder conglomerate and limestone, chert, and variegated shale and mudstone that are not restricted to any particular member but are found throughout the formation. Underlies the Virginville Formation (new name) in the tectonically overlying, but older, Richmond slice of the Hamburg klippe. Minimum thickness is 6,215 m. Age of the graywacke and shale members is Middle Ordovician based on graptolites. Age of the limestone, chert, and variegated shale units may be Early and Middle Ordovician based on graptolites and conodonts; if the age determination is correct, these units may be allochthonous with respect to the graywacke and shale.

Windy Hill Quartz Dioritic Orthogneiss

Late Triassic or Early Jurassic
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Association of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Outcrops on the slopes of Windy Hill east of Buzzard Lake, T. 34 N., R. 25 E., Okanogan County, Wash.

The Windy Hill Quartz Dioritic Orthogneiss, a late synmetamorphic plutonic unit, here named, is in the Okanogan Range, Wash. Intrudes the Salmon Creek schists and gneisses; is intruded by the Late Cretaceous Conconully Granodiorite (new name). Is of the same general age as the Leader Mountain Granodioritic Gneiss and the Reed Creek Quartz Dioritic Gneiss and is similar to them in mineralogy, texture, and structure. Age is Late Triassic or Early Jurassic.

Winn Formation of the Saginaw Group

Early and Middle Pennsylvanian (Morrowan to Desmoinesian)
Michigan
Michigan basin

Vugrinovich, Ray, 1984, Lithostratigraphy and depositional environments of the Pennsylvanian rocks and the Bayport Formation of the Michigan basin: Michigan Geological Survey Division, Report of Investigation 27, 33 p.

Type section: McClure Oil Company Number 1–20 Paul and Karen Bigelow well, depth interval 573–706 ft, SE¼SE¼NW¼ sec. 30, T. 13 N., R. 4 W., Lincoln Township, Isabella County, Mich. Derivation of name not stated.
Subunit: Verne Member.

The Winn Formation of the Saginaw Group, here named, occurs in the subsurface of the Michigan basin. Includes the Verne Member, reassigned from the Saginaw Formation. Consists of gray, soft, clayey shale, siltstone, and sandstone and, in the upper part, the Verne Member, a persistent thin bed of calcareous black shale or argillaceous limestone containing brachiopods and molluscs. Gradationally overlies the Lake George Formation (new name) of the Saginaw Group; unconformably underlies unnamed Jurassic red beds or unconsolidated post-Jurassic deposits. The lower part of the Winn represents channel deposits of fluvial origin, and the Verne Member represents a return to marine conditions. Thickness is 133 ft at the type well. Age is Early and Middle Pennsylvanian (late Morrowan to late Desmoinesian).

Winterhaven Formation

Jurassic(?)
Arizona, California
Salton basin, Basin and Range province

Haxel, G.B., Tosdal, R.M., and Dillon, J.T., 1985, Tectonic setting and lithology of the Winterhaven Formation: A new Mesozoic stratigraphic unit in southeasternmost California and southwestern Arizona: U.S. Geological Survey Bulletin 1599, 19 p.

Type section: Exposures on the northern limb of an anticline just west of Little Picacho Wash, lat 33° N., long 114°37′30″ W., southeast corner of the Picacho SW 7.5-minute quadrangle, Imperial County, Calif. Derivation of name not stated.

The Winterhaven Formation, named informally by Haxel (1977) and here named, is in the Picacho-Peter Kane Mountain area, Imperial County, Calif., and Yuma County, Ariz. Consists of a basal dacite member, 80 m thick; a medial quartz arenite member, 60 m thick; and an upper argillitic siltstone member, 300 m thick. Was originally part of the upper plate of the Chocolate Mountains thrust and was subsequently placed directly over the late Mesozoic Orocopia Schist. Depositionally overlies and interfingers with Jurassic(?) rhyodacitic metavolcanic rocks along the Mesozoic Chocolate Mountains thrust fault; unconformably underlies Oligocene to Holocene volcanic and sedimentary rocks. Thickness at the type section is more than 440 m. Age is Jurassic(?) based on field relations and lithologic correlation with the lower part of the Jurassic and (or) Cretaceous McCoy Mountains Formation.

Wolf Canyon Quartz Diorite

Cretaceous
Washington
Northern Cascade Range-Okanogan province

Menzer, F.J., Jr., 1983, Metamorphism and plutonism in the central part of the Okanogan Range, Washington: Geological Association of America Bulletin, v. 94, no. 4, p. 471–498.

Type locality: Exposures south of Wolf Canyon, east side of the Methow Valley, T. 34–35 N., R. 22–23 E., Okanogan County, Wash.

The Wolf Canyon Quartz Diorite, a postmetamorphic plutonic unit, here named, is in the Okanogan Range, Wash. Consists of massive, magmatic diorite and quartz diorite. Plagioclase is andesine; green hornblende is the principal mafic mineral. Contact with the Red Shirt Gabbro (new name) may be intrusive or gradational; intrudes the Lower Cretaceous Newby Formation. Age is Cretaceous.

Wolf Creek Formation of the **Atlanta Group**

Late Proterozoic and (or) Paleozoic
Georgia
Piedmont-Blue Ridge province

Higgins, M.W., and Atkins, R.L., 1981, The stratigraphy of the Piedmont southeast of the Brevard Zone in the Atlanta, Georgia, area, *in* Wigley, P.B., ed., Latest thinking on the stratigraphy of selected areas in Georgia: Georgia Geologic Survey Information Circular 54–A, p. 3–4

Type section: Exposures along and near Wolf Creek, Luxomni quadrangle, Gwinnett County, Ga.

The Wolf Creek Formation of the Atlanta Group (new name), here named, is in the Newnan-Tucker synform near Atlanta, Ga., and consists of interlayered laminated amphibolite and biotite-muscovite button schists. Grades into button schists of the Brevard Zone to the northwest, and into the Promised Land Formation (new name) of the Atlanta Group to the southeast. Is in sharp contact with the Clairmont Formation and Norcross Gneiss (both new names) of the Atlanta to the southwest. Thickness is 1,200 m. Age is Late Proterozoic and (or) early Paleozoic.

Wono Bed of the Pyramid Lake Member of the Mount Mazama Formation

Pleistocene
Nevada
Great Basin province

Davis, J.O., 1978, Quaternary tephrochronology of the Lake Lahontan area, Nevada and California: Nevada Archeological Survey Research Paper 7, 137 p.

Type section: Agency Bridge on the east side of the Truckee River, NW¼NW¼NE¼ sec. 1, T. 22 N., R. 23 E., Nixon 15-minute quadrangle, Washoe County, Nev. Named for the Paiute Indian word for Pyramid Island.

The Wono Bed of the Pyramid Lake Member (new name) of the Mount Mazama Formation, here named, is in the Lake Lahontan area where it occurs in many localities from Pyramid Lake to the Carson Desert. Consists of three or more graded beds of white tephra, at least 10 cm thick, and represents several airfall events. Characteristic of the Wono is the presence of long thin pipes among the glass shards. Is interbedded with the lower member of the Sehoo Formation. Overlies the Timber Lake Bed (new name) and underlies the Leter Ranch Bed (new name), both of the Pyramid Lake. Age is Pleistocene, 35 to 11.5 ka.

Wood River Formation

Late Jurassic(?)
Florida
South Florida province

Applegate, A.V., Winston, G.O., and Palacas, J.G., 1981, Subdivision and regional stratigraphy of the Pre-Punta Gorda rocks (Lowermost Cretaceous-Jurassic(?)) in south Florida: Gulf Coast Association of Geological Societies, Transactions, October (supplement), v. 31, p. 447–453.

Type section: Bass Collier Company 12–2 well P–778, depth interval 16,510–18,610 ft, sec. 12, T. 52 S., R. 27 E., Collier County, Fla. Named for Wood River, a creek 4 mi southeast of the type well.

The Wood River Formation, here named, is in the subsurface of the South Florida basin, where it is the lowermost of four regionally persistent anhydrite units below the Punta Gorda Anhydrite of the Glades. Consists of basal coarse clastic rocks overlain by anhydrite and microcrystalline brown dolomite and minor amounts of micritic limestone. Overlies Jurassic (189 Ma) rhyolite porphyry; underlies the Bone Island Formation (new name). Thickness at the type well is 2,100 ft. Age is Late Jurassic(?) based on the estimated time interval between rhyolite emplacement and deposition of the basal clastic rocks.

Wyoming Hill Coal Member of the Caseyville Formation of the Morrow Supergroup

Middle Pennsylvanian (Morrowan)
Iowa
Iowa shelf

Ravn, R.L., Swade, J.W., Howes, M.R., Gregory, J.L., Anderson, R.R., and Van Dorpe, P.E., 1984, Stratigraphy of the Cherokee Group and revision of Pennsylvanian stratigraphic nomenclature in Iowa: Iowa Geological Survey Technical Information Series 12, 76 p.

Type section: Escarpment along Iowa Highway 22, NE¼ sec. 34, T. 77 N., R. 1 W., Muscatine County, Iowa. Named for Wyoming Hill.

The Wyoming Hill Coal Bed, here named, occurs near the top of the Caseyville Formation in southeastern and south-central Iowa. Consists of two coal beds separated by a narrow detrital clastic split. Lies only a few feet below the "Spoon" Formation sandstones. Thickness is 1.5 ft. Age is Middle Pennsylvanian (Morrowan).

Yahoo Clay of the **Snake River Group**

Pleistocene
Idaho
Snake River basin

Malde, H.E., 1982, The Yahoo Clay, a lacustrine unit impounded by the McKinney Basalt in the Snake River canyon near Bliss, Idaho, *in* Bonnichsen, Bill, and Breckenridge, R.M., ed., Cenozoic geology of Idaho: Idaho Bureau of Mines and Geology Bulletin 26, p. 617–628.

Type locality: Exposures near the mouth of Yahoo Creek, which joins the Snake River 4 mi south-southwest of Hagerman, secs. 3, 4, 5, 8, 9, and 10, T. 8 S., R. 13 E., Yahoo Creek quadrangle, Twin Falls County, Idaho. Eleven reference localities listed.

Clay previously correlated with and mapped as the Bruneau Formation by Malde and Powers (1972) is here named the Yahoo Clay of the Snake River Group. The Yahoo accumulated in McKinney Lake behind a lava dam formed by the McKinney Basalt and occupies a much younger canyon than that occupied by the Bruneau. Consists of pinkish-white to light-yellowish-brown compact, laminated clay. Overlies the McKinney Basalt; underlies surficial sand and silt deposits related to the Crowsnest Gravel of the Snake River Group. Thickness attains 280 ft. Age is Pleistocene.

York Slate

Late Proterozoic
Alaska
Yukon-Koyokuck province

Sainsbury, C.L., 1974, Geologic map of the Bendeleben quadrangle, Seward Peninsula, Alaska: U.S. Bureau of Mines, U.S. Geological Survey, and The Mapmakers, 31 p., scale 1:150,000.

Type locality: None designated. Crops out widely over the Bendeleben quadrangle, York region of the Seward Peninsula, Alaska.

Rocks of the Seward Peninsula previously called the Slate of the York region, Hurrah Slate, Puckmummie Slate, and Kuzitrin Series are here named the York Slate. Is metamorphosed in varying degrees and consists of weakly lineated, calcareous quartz siltite, graywacke, and limestone; graphitic slate; metamorphosed quartz gneiss; black phyllite with quartz veins; and quartz-biotite-graphite schist. Placer gold deposits are associated with the York Slate. Conformably underlies the Kanauguk Formation (new name) with a transitional boundary several hundred feet thick. Age is Late Proterozoic based on a rubidium-strontium minimum age of 750 Ma for gneiss derived from the York.

Yorkshire Formation

Late Proterozoic and (or) Early Cambrian
Virginia
Piedmont-Blue Ridge province

Drake, A.A., Jr., and Morgan, B.A., 1981, The Piney Branch Complex—A metamorphosed fragment of the Central Appalachian ophiolite in northern Virginia: American Journal of Science, v. 281, no. 4, p. 484–508.

Type locality: Exposure on the east bank of Bull Run, directly opposite the village of Yorkshire, Manassas 7.5-minute quadrangle, Prince William County, Va.

The Yorkshire Formation, here named, is a thin discontinuous precursory ophiolitic melange underlying the Piney Branch Complex-(new name) in Fairfax County, Va. Consists of quartz-plagioclase-chlorite granofels that has a pronounced scaly foliation, and contains fragments of quartz, serpentinite, metagabbro, plagiogranite, and mafic volcanic rock. The Yorkshire is thought to record the first movement of the allochthonous Piney Branch slab. The Yorkshire and Piney Branch allochthon was thrust upon the Peters Creek Schist, and, together, they form a composite allochthon that was emplaced on the Sykesville Formation, perhaps by gravity sliding. The discontinuous nature of the Yorkshire is attributed to partial shearing-out during transport. Age is Late Proterozoic and (or) Early Cambrian, as movement of the allochthon began in Late Proterozoic and ended during the Taconic orogeny.

Zenda Formation

Pleistocene (Wisconsinan)
Wisconsin
Wisconsin arch

Mickelson, D.M., Clayton, Lee, Baker, R.W., and others, 1984, Pleistocene stratigraphic units of Wisconsin: Wisconsin Geologic and Natural History Survey, University of Wisconsin Extension, Miscellaneous Paper 84–1, p. 1–15.

Type section: Road cut on south side of Highway B, east of its intersection with Hillside Road, 1.8 km northeast of the locality of Zenda, NW¼NW¼SW¼ sec. 26, T. 1 N., R. 17 E., Lake Geneva 7.5-minute quadrangle, Walworth County, Wis.
Subunits: Capron Member, Tiskilwa Member.

The Zenda Formation, here named, is in the Lake Michigan Lobe in Walworth County, southeastern Wisconsin. Is divided into the Capron and Tiskilwa Members, both named in Illinois by Wilman and Frye (1970). Both members consist mainly of pink, calcareous, medium-grained till. Sharply overlies the Clinton Member (new name) of the Walworth Formation (new name); sharply to gradationally underlies the New Berlin Formation (new name) or is the surficial unit in Walworth County. Age is Pleistocene (Wisconsinan).

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