Memorandum from SLTT Chair (Matti) to SLTT committee members (12/01/2000)

Science Language Technical Team
Action Plan
1 December, 2000

SLTT colleagues:

About 15 of us got together the morning of 13 November [at Geological Society of America Annul Meeting, Reno, Nevada, 2000] to discuss general issues and to develop an action plan for our science-language activities. This document summarizes the discussions, and provides the guidance for our activities over the next few months.

Participants

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Peter Schweitzer (USGS)
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Andy Rorick (U.S. Forest Service)
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(1) What we need to do

- develop lists of **control-words** for the description and naming of geologic materials and geologic structures. Control-words are rigidly defined words whose definitions cannot be violated (sandstone has exactly one definition; monzogranite has exactly one definition; thick-bedded has only one definition);
- provide formal definition of each control-word (sources: AGI dictionary of geoscience, IUGS plutonic-rock classification, widely-cited geoscience textbooks, etc.)
- develop hierarchical classification of control-words (parent-child relationships using software to be announced) (e.g., Visio2000pro)
- provide all documentation by 30 April, 2001, including:

  (1) definitions of control-terms
  (2) diagrams of parent-child relations

(3) Minimal boiler-plate that describes our results and places them in the context of the proposed North American geologic-map data model

- Consider developing a thesaurus approach to control-terms and their non-controlled equivalents (synonyms, related terms, proxies for control-terms)

(2) Specific components of 1.0 strawman

- For the following categories, develop control-terms for the deepest level possible in each hierarchy:

  (1) **rock name** (e.g., limestone, monzogranite, blueschist, colluvium)

  (2) **lithologic attribute** (e.g., coarse-grained, fissil-weathering, thin-bedded, unconsolidated, texturally massive, porphyritic, porphyroclastic, mullion)

  (3) **rock genesis** (e.g., marine, nonmarine, alluvial, plutonic, volcanic, fluvial, colluvial, dynamothermal, high-strain)

  (4) **genetic structures** (e.g., flow foliation, eutaxitic fabric, cumulate layering, graded bedding, sole structures, slaty cleavage, earth flow,)

- If possible, develop as part of each hierarchy generic field terms that allow for general-purpose classification of materials and structures (e.g., “granitic”, “basaltic”, “conglomeratic”, “marble”, “mudrock”, “cross-bedded”, “gneissic” “mylonitic”, “silty”) so that reconnaissance observations can be recorded meaningfully in the data model

- Identify internationally-recognized geologic-time classifications that can be used by the data model. The SLTT does not have to recommend or advocate any one scheme: we merely have to collect them together as schemes that can be used by the data producer. The data model design team will develop a metadata technique for associating an age term with its time-scale scheme. Time scales that come to mind include:

  (A) Harland and others (1989)

  (B) IUGS timescale (Remane, 2000)

  (C) time scales compiled in Berggren and others (1995)

(3) Target Audience: Science language should be technical—that is, it should be developed by and speak to the trained geologist. Although we all are concerned about how the professional and non-professional non-geoscience audience will access and understand our database content, this concern should be addressed by a technical team tasked with designing the data-model user interface.

(4) Basis and scale of terminology: Map-unit categories (i.e., formation, member, tongue, lentil, bed) are conceived and extended through a process that integrates hierarchical observations beginning at the ***hand-sample and outcrop level*** but extending to the ***hillside and regional level*** and augmented

by the ***thin-section and chemical-analysis*** level. Thus, hierarchical terminology schemes leading to map-unit description should reflect:

- regional-scale observation
- hillside-scale observation
- outcrop-scale observation
- hand-sample-scale observation
- thin-section-scale observation
- chemical analysis-scale observation

(5) Existing strawman-classifications for consideration include (but are not limited to):

- Rock classification schemes of British Geological Survey (BGS)
- Version 6.0 classification scheme of SLTT member Bruce Johnson (Matti will distribute again; Johnson will provide parent-child diagrams)
- Volcanic and plutonic classification schemes of SLTT member Steve Ludington (Matti will distribute again)
- SCAMP version 2.0 rock-classification schemes (Matti will distribute again)
- Any other hierarchical classification schemes that subgroup members can identify

(6) In addition to nomenclature for sedimentary, igneous, metamorphic, and surficial materials, we need to develop language for the following materials:

- tectonic rock units (e.g., broken formations, mélanges, tectonic breccia, bolide-impact rocks)
- rock-types of hydrothermal or alteration origin
- rock-types of mixed origin
- rock-types of unknown origin

(7) The following rules MUST be adhered to:

- hierarchies must follow independent non-intersecting pathways (or so I understand [correctly?] from the data model design people)
- A control-term cannot be arrived at by more than one pathway. For example, the mineral “calcite” cannot be arrived at via a sedimentary pathway leading to calcite or a metamorphic pathway leading to calcite or an igneous pathway leading to calcite. Instead, the mineral calcite must be approached via a single pathway in a mineralogy hierarchy that incorporates children of calcite (e.g., calcite, *sedimentary*; calcite, *metamorphic*; calcite, *vein*)

(8) To assist data-model design team, we need to distinguish between the following terms:

- "rock"
- "rock unit"
- "map unit"

(9) To assist data-model design team in developing a map-unit characterization field

- develop language that allows each map unit to be characterized concisely and distinguished clearly from other map units
- develop control terms applicable to lower, upper, and lateral **boundaries of map units** (e.g., conformable, unconformable, sharp, discrete, transitional, gradational, mixed, migmatitic, intrusive, extrusive, interfingering) and for distinguishing properties (geologic, geomorphic, pedogenic, paleontologic. This may not be possible within the scope of our initial lithologic assignment, but we need to have it on our radar screen as we do our job, and make some progress in this direction.

References Cited

Berggren, W.A., Kent, D.V., Aubry, M-P., and Hardenbol, J., eds., 1995, Geochronology, time scales and global stratigraphic correlation: Tulsa, Oklahoma, Society of Economic Paleontologists and Mineralogists, Special Publication 54, 386 p.

Harland, B.W., Armstrong, R.L., Cox, A.V., Craig, L.E., Smith. A.G., and Smith, D.G., 1989, A geologic time scale, 1989: New York, Cambridge University Press, 246 p.

Remane, Jurgen, compiler, 2000, International Stratigraphic Chart: Division of Earth Sciences, UNESCO, 16 p., 1 plate. Published in cooperation with the International Union of Geological Sciences and the International Commission on Stratigraphy.