

# DIGITAL MAPPING TECHNIQUES 2024

The following was presented at DMT'24  
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from the DMT Meetings (1997-2024)

<http://ngmdb.usgs.gov/info/dmt/>

# John Wesley Powell: Explorer, Ethnologist, Soldier, Abolitionist, **Geologist**

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*Distinguished Professor of Geology  
Illinois State University*





## **Serendipity!**

Dr. Marjorie Chan  
Professor of Geology  
University of Utah

Colloquium  
Presentation here on  
March 24, 2018  
Powell's Birthday!



# John Wesley Powell

## Objects & Stories from the Colorado River Expeditions

### Cultural artifacts are returning home to Utah

NHMU has acquired a collection of Native American baskets and a child's wearing blanket that were collected by Frank Marion Bishop (Powell's cartographer) when he was on the 1872 Colorado and Green Rivers expedition with Powell. We also recently received a transfer of objects from Illinois State University (where Powell taught) that were collected by Powell himself and include Native American baskets, moccasins, a beaded quiver and a wooden bow.

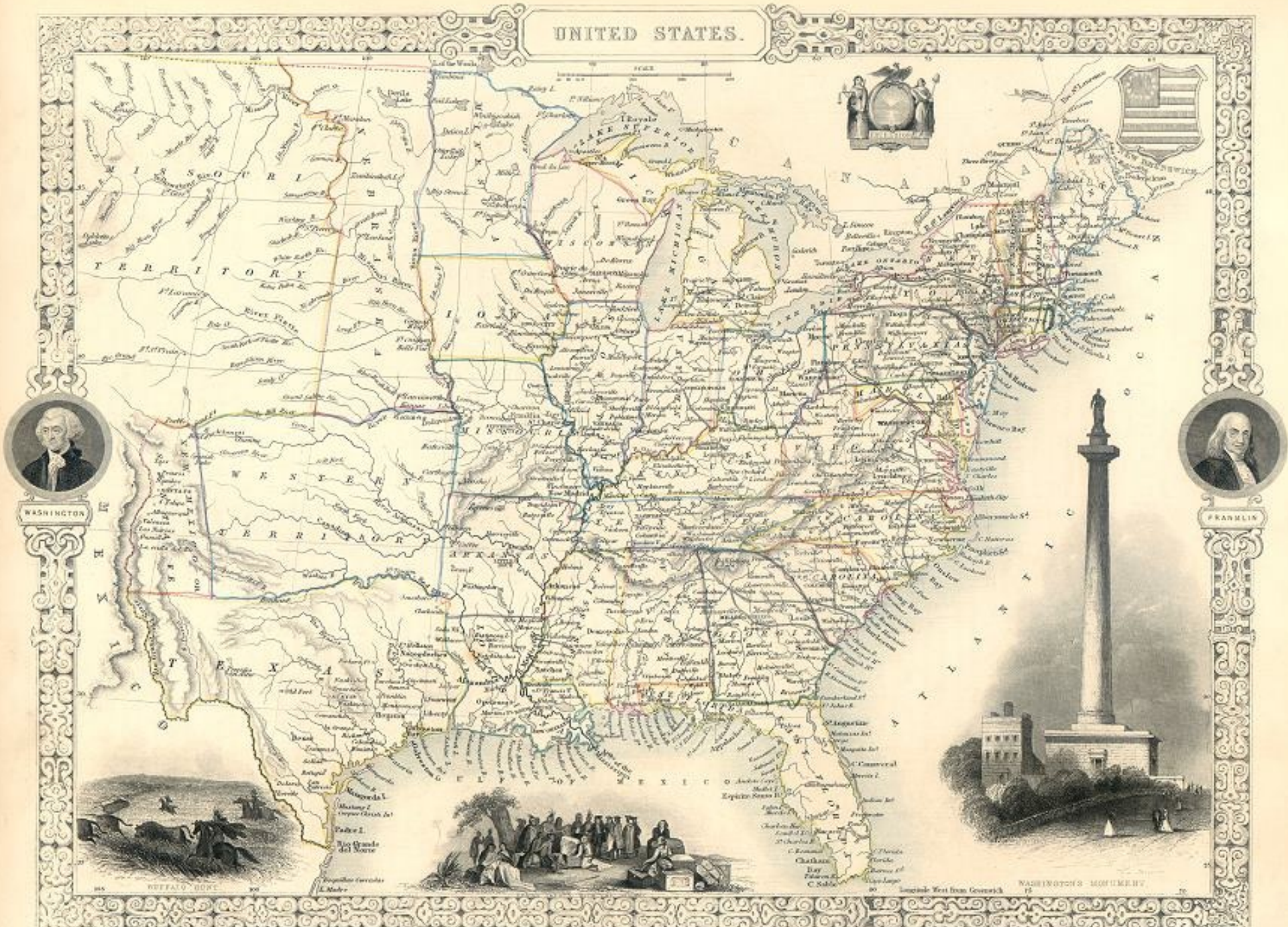
Powell's expedition made substantial contributions to the geology, anthropology, hydrology, and geography of the American West. NHMU's collections represent the physical evidence of these early expeditions and are, therefore, worthy of museum care.

Generously supported by  
**Illinois State University**  
Lawrence T. & Janet T. Dee Foundation

 **NATURAL HISTORY MUSEUM OF UTAH**  
Rio Tinto Center | University of Utah



UNITED STATES.



WASHINGTON



FRANKLIN



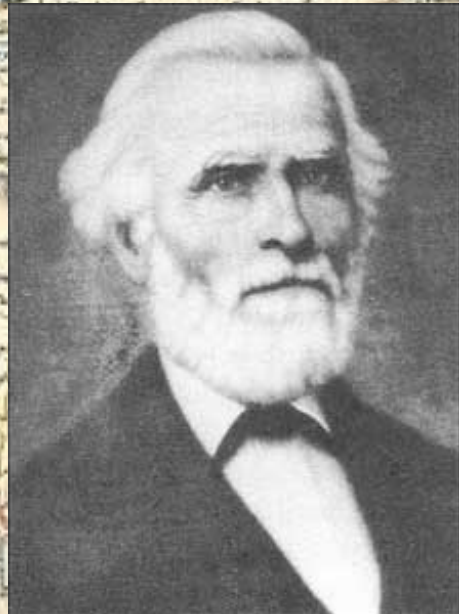
BUFFALO HORN

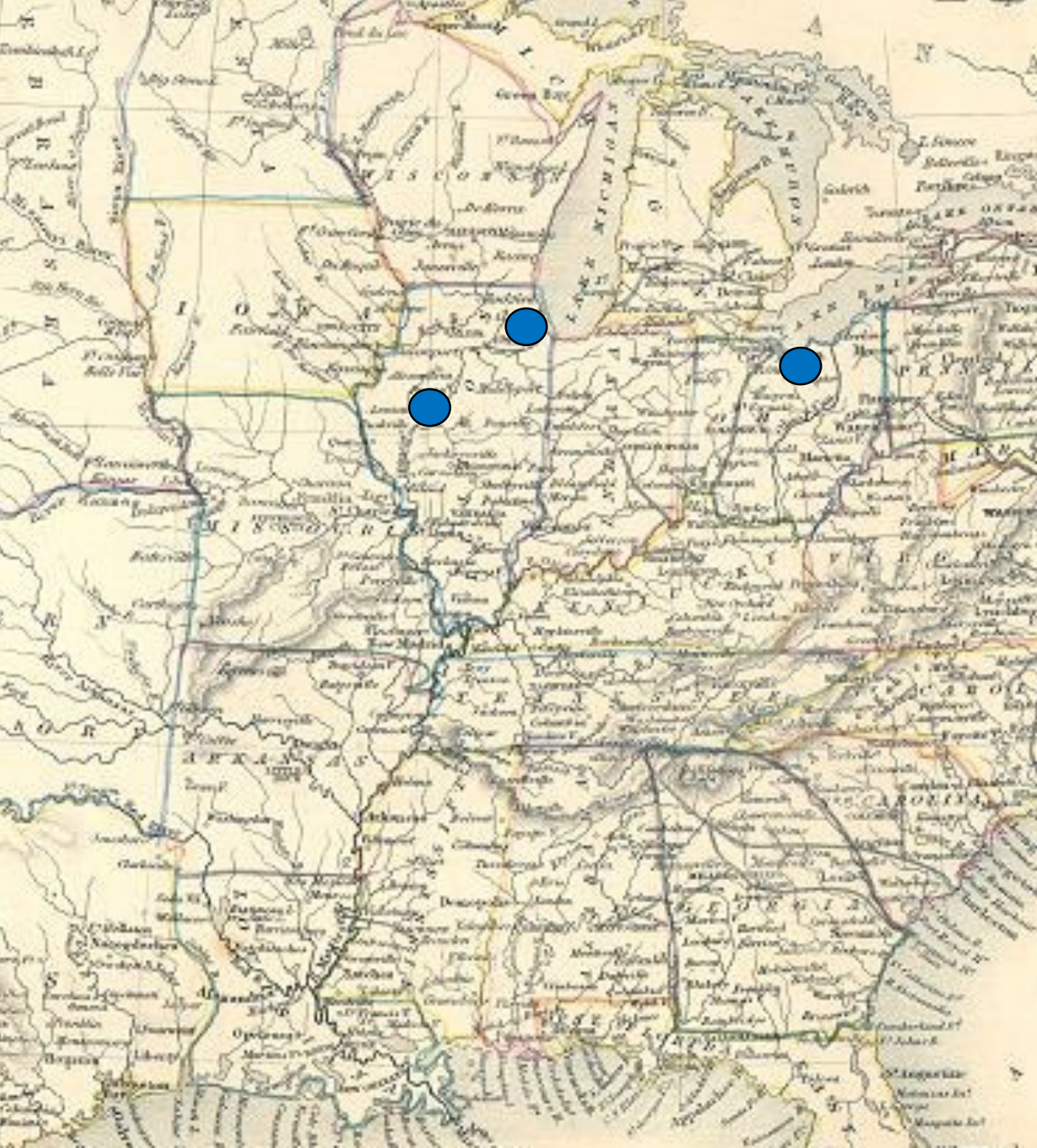


WASHINGTON'S MONUMENT

# Early life and education

- Born in Mount Morris, New York, in March 24, 1834, the eldest son (of eight) of Joseph and Mary Powell.
- Jackson, in southern Ohio, then Walworth County in southeast Wisconsin, Boone County in northern Illinois and finally near Wheaton, Illinois.
- “Big George” Crookham, an early mentor Powell in Ohio.
- Had a private school...Powell accompanied Crookham out into nature where he learned to identify plants, rocks and bird songs. Sparked Powell’s intense curiosity of nature.
- Eventually moved to Boone County, IL and then again to near Wheaton, IL.



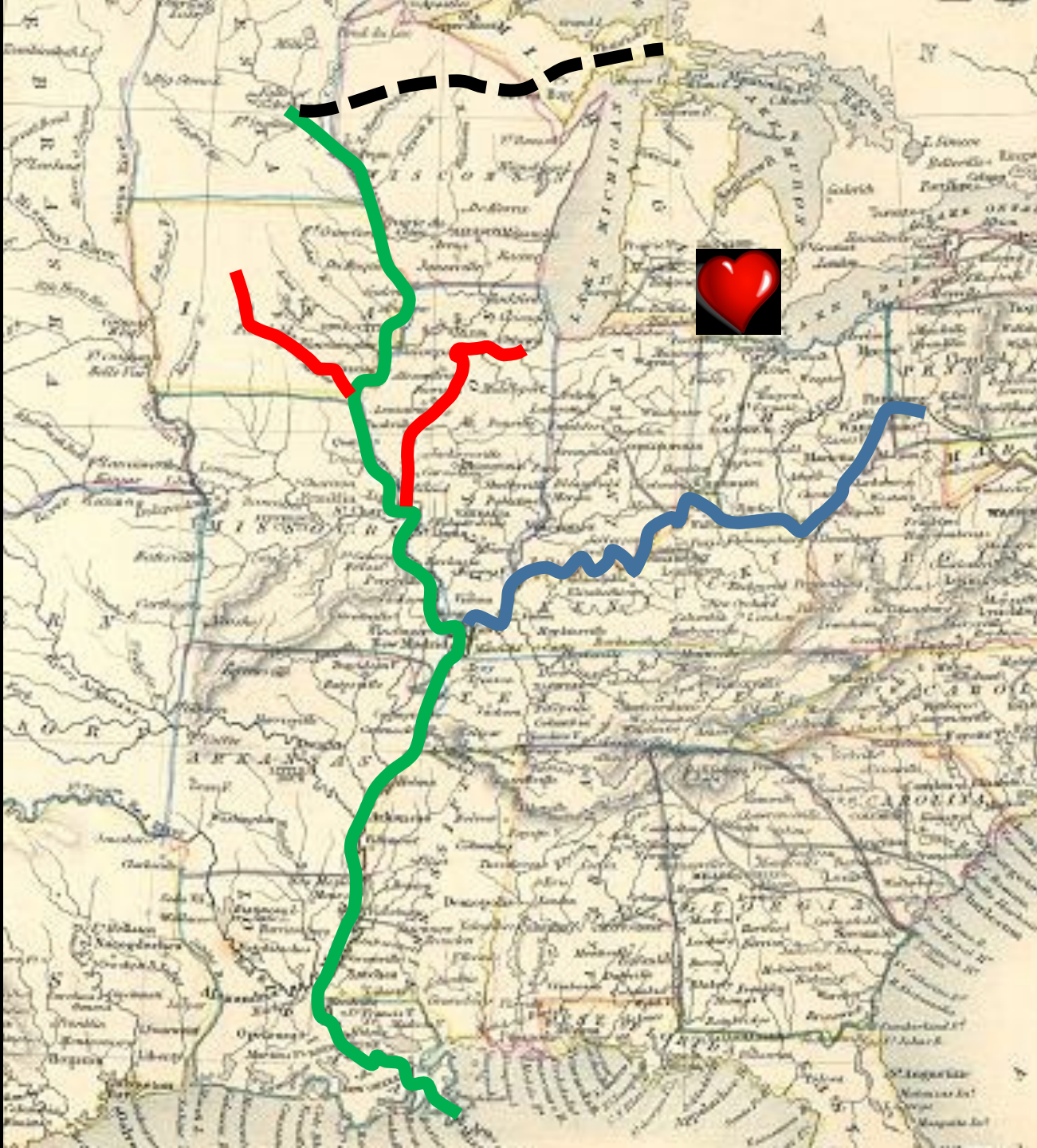


# Early life and education

- At age 12 was head of family farm in Wisconsin while his father was away preaching.
- Provided him the moral character, physical stamina and work ethic that would serve him well later in life.
- First encounter with Native Americans.
- Eventually moved to Boone County, IL and then again to near Wheaton, IL.
- Left home at the age of 16. Powell spent time teaching in central Illinois and taking classes at Illinois Institute (later renamed Wheaton College), Illinois College in Jacksonville, and Oberlin College in Ohio
- Received an honorary degree from Illinois Wesleyan University during the siege of Vicksburg. **NO FORMAL CREDENTIALS**

# First Explorations

- 1854 – first of his “expeditions” was a four month walk across Wisconsin
- 1855 – Rowed the length of the Mississippi from St. Paul to the Sea
- 1856 – Rowed from the forks of the Ohio to St. Louis
- 1857 – Rowed the Illinois and Des Moines River valleys
- The particulars of these river trips are lost, yet the cumulative result of these summers cannot be overstated. Powell, was studying the topographical features of river valleys while gaining experience piloting river craft.
- From 1858 to 1860, he studied Native American mounds in Illinois, Missouri, Indiana, and Ohio.





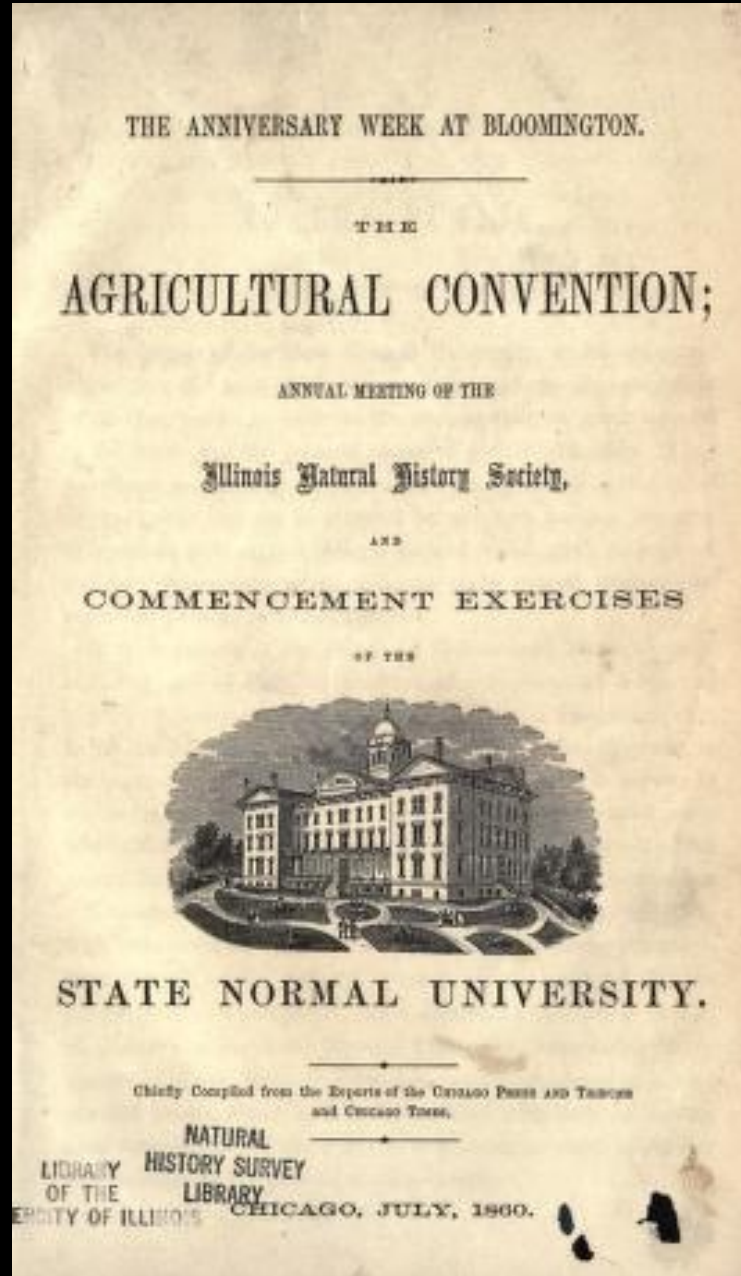
# Illinois State Normal University established 1857



- Oldest public university in Illinois.
- Illinois State University is the largest preparer of teachers in Illinois and among the largest in the nation.
- Initially envisioned to be much more....also the Agricultural and Industrial University of Illinois.
- Prominent founders include Abraham Lincoln, David Davis, Jessie Fell. Mostly local support.
- Old Main built in 1860.
- Headquarters of the Illinois Natural History Society.
- We are one of the eight charter departments here.
- Abolitionists and progressives. Wanted a school for everyone.



# Illinois Natural History Society, established 1857



- Illinois State Normal University was the base for scientific research in Illinois from the late 1850s – early 1870s before the establishment of the “Industrial University” down the road 50 miles.
- Powell was elected in 1859
- Powell appointed secretary in 1860

# Civil War



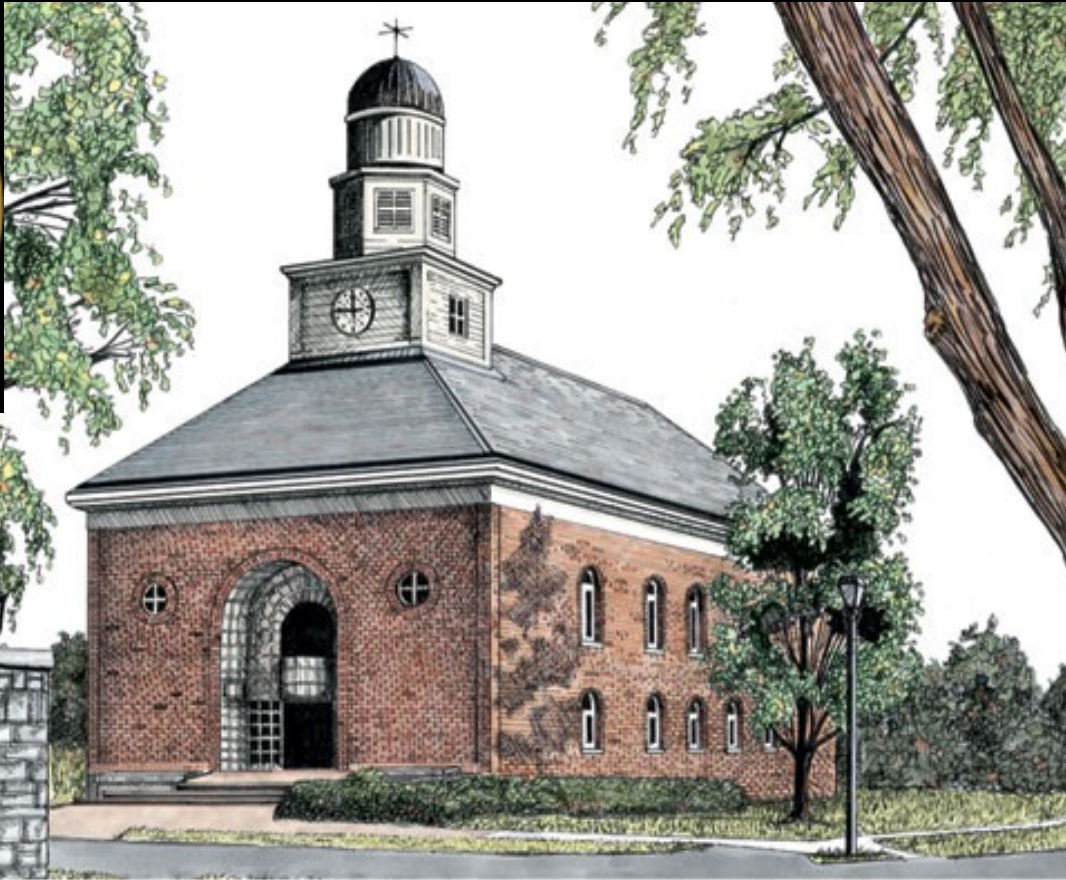
WALKER & MABBETT,  
125 MICHIGAN AVE. DETROIT



WALKER & MABBETT,  
125 MICHIGAN AVE. DETROIT

- Battery F, Illinois Second volunteer artillery.
- Took leave to marry Emma Dean
- Arm lost in Battle of Shilo.
- Commanded the battery in several engagements

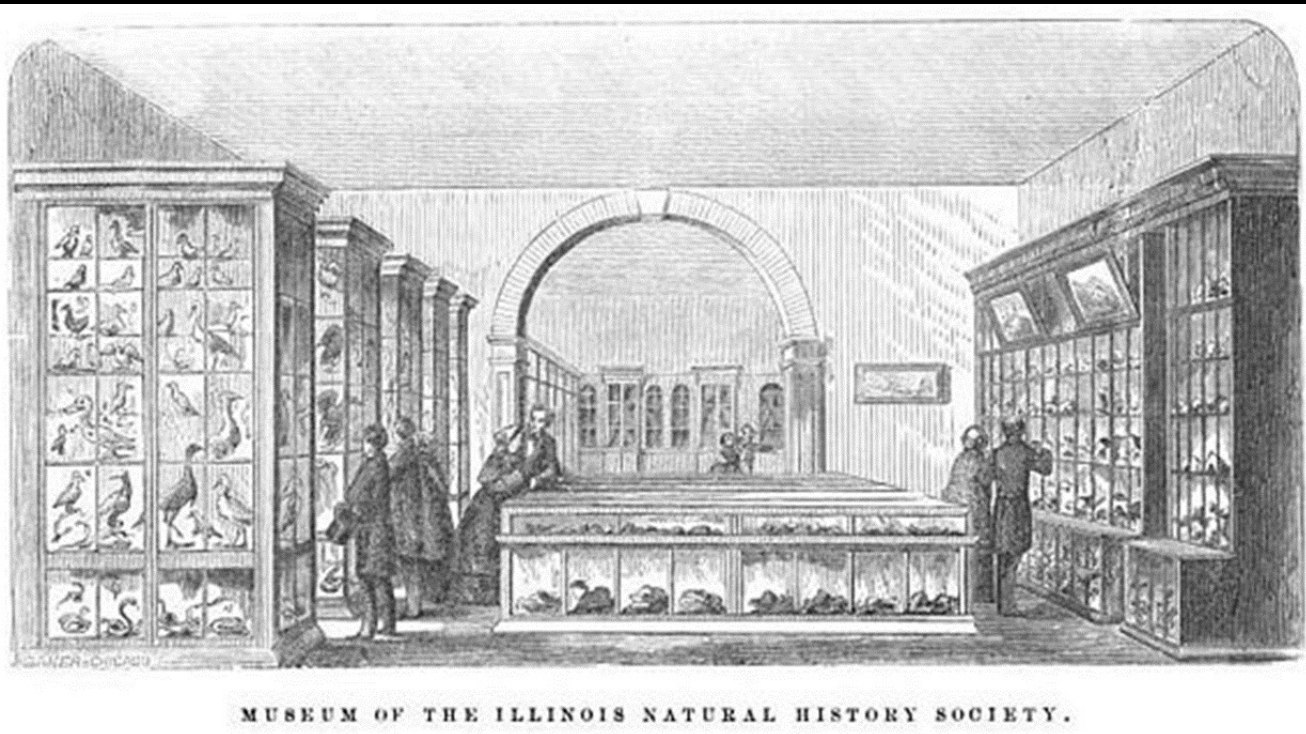
# Illinois Wesleyan University



*Illinois Wesleyan University, Bloomington, Il*

- Established in 1850
- Methodist affiliation
- Powell was joined the faculty as a geology professor in 1865 and he was on the staff there through 1868
- **A pioneer of using field work in teaching science. Powell led his students on frequent field trips, a then-innovative approach to science education“**
- **“We all recall how textbooks went to the winds with Major Powell,”** recalled student J. B. Taylor.

# Museum of the Illinois Natural History Society

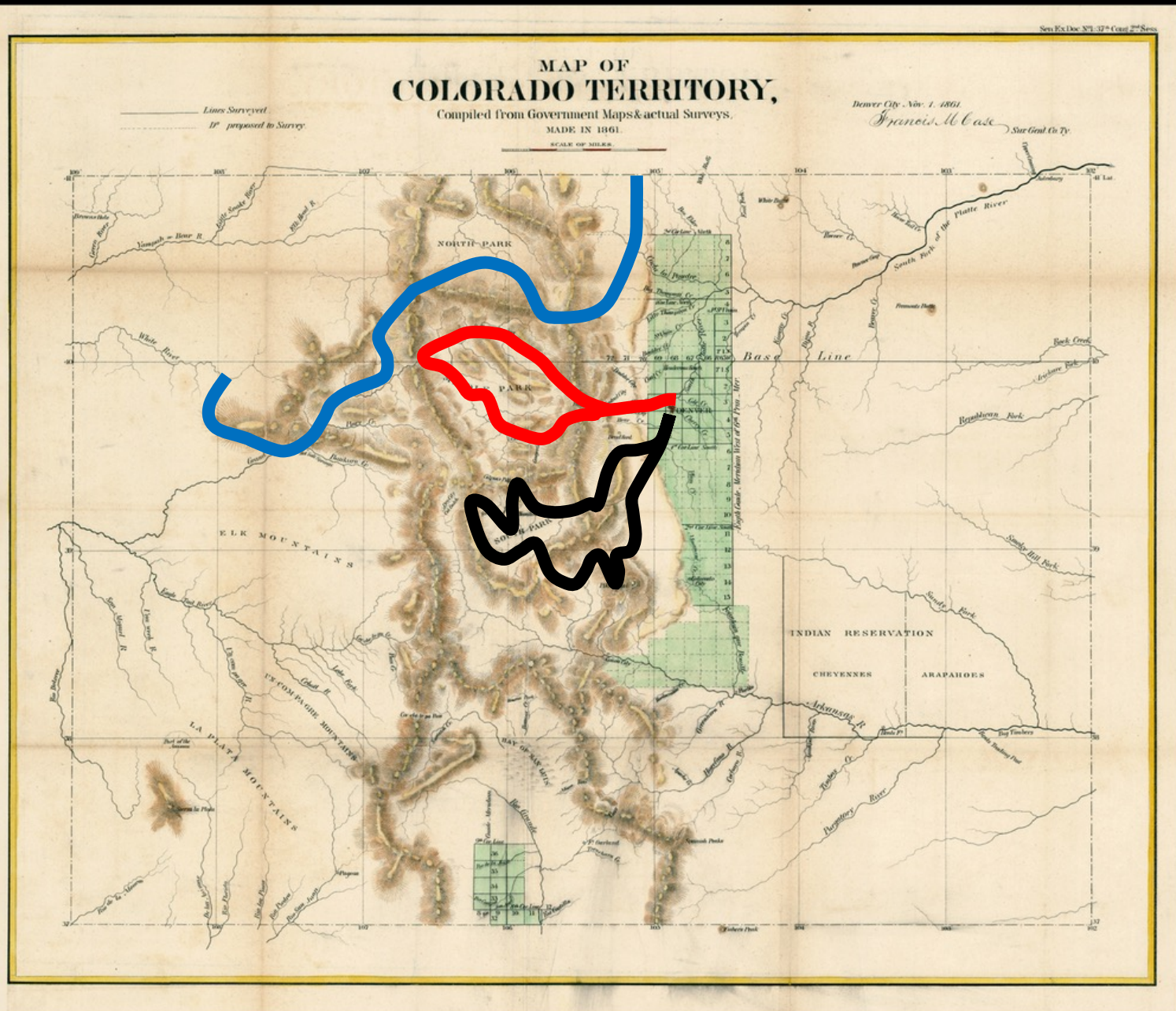


- The Society's 3,300 square feet museum was housed in Old Main on the Illinois State Normal Campus
- The departure of curator Charles Wilbur, led to a period of mismanagement and neglect
- Powell emerged as the Museum's chief advocate and sought to advance his professional standing.
- Drafted a memo to the legislature to support a full-time curator salary as well as operating funds to enhance the collections
- The legislation was passed and signed by the governor in 1867 on the same day that the establishment of the "industrial university". Powell was named curator



# The 1867 Expedition to Colorado

- Allocated \$500 to “expand the museum collections” by organizing an expedition to the central Colorado Rocky Mountains
- Realized that Illinois State Normal University was a better place to stage his scientific expeditions
- Additional sponsorship provided by the War Department, the Industrial University, and Chicago Academy of Sciences amounted to \$600. The rest was out of pocket
- Eleven people joined Powell, including students, observers and friends, including his wife.
- Martin Titterington, an Illinois Wesleyan junior, recalled "*the wrecked wagons, new-made graves and deserted sod houses*" they encountered on the journey



- Powell remained after the rest of the group returned for the fall term at IWU.
- Crates containing rocks to butterflies returned to the cluttered museum.
- Powell returned late fall to give a series of lectures about his expedition, organize the collection, and plan for the next trip.
- Board of Education approved another \$900 for his next expedition.
- Important to note that in addition to provisions, the Colorado trips received no federal support.



# The 1868 expedition to Colorado



- Powell resigned from Wesleyan because he knew his future was in the west.
- 1868 Group was the first European Americans to Summit Long's Peak. Also brought students from Illinois State and Wesleyan.
- Spent summer and winter planning for the 1869 trip.



# 1869 and 1871 Grand Canyon Expeditions (aftermath)



- Returned from the west a celebrity. Lectured about his adventures across the country.
- 1869 Parcels of specimens weighing “half a ton” were deposited at the Museum at Illinois State.
- Powell performed his curator duties in early 1870.
- It was clear that he was not serious about studying Illinois flora.
- In December 1870 the collection was valued at \$95,000 with tens of thousands of specimens. Ownership of much was uncertain.
- Illinois Natural History Society disbanded, and the collection ownership was transferred to the state.
- Powell officially resigned as curator and from Illinois State Normal University in 1872.
- Collections (most) were eventually transferred elsewhere as the locus of Illinois science moved to the industrial university.

# 1870s – The four Geological Surveys



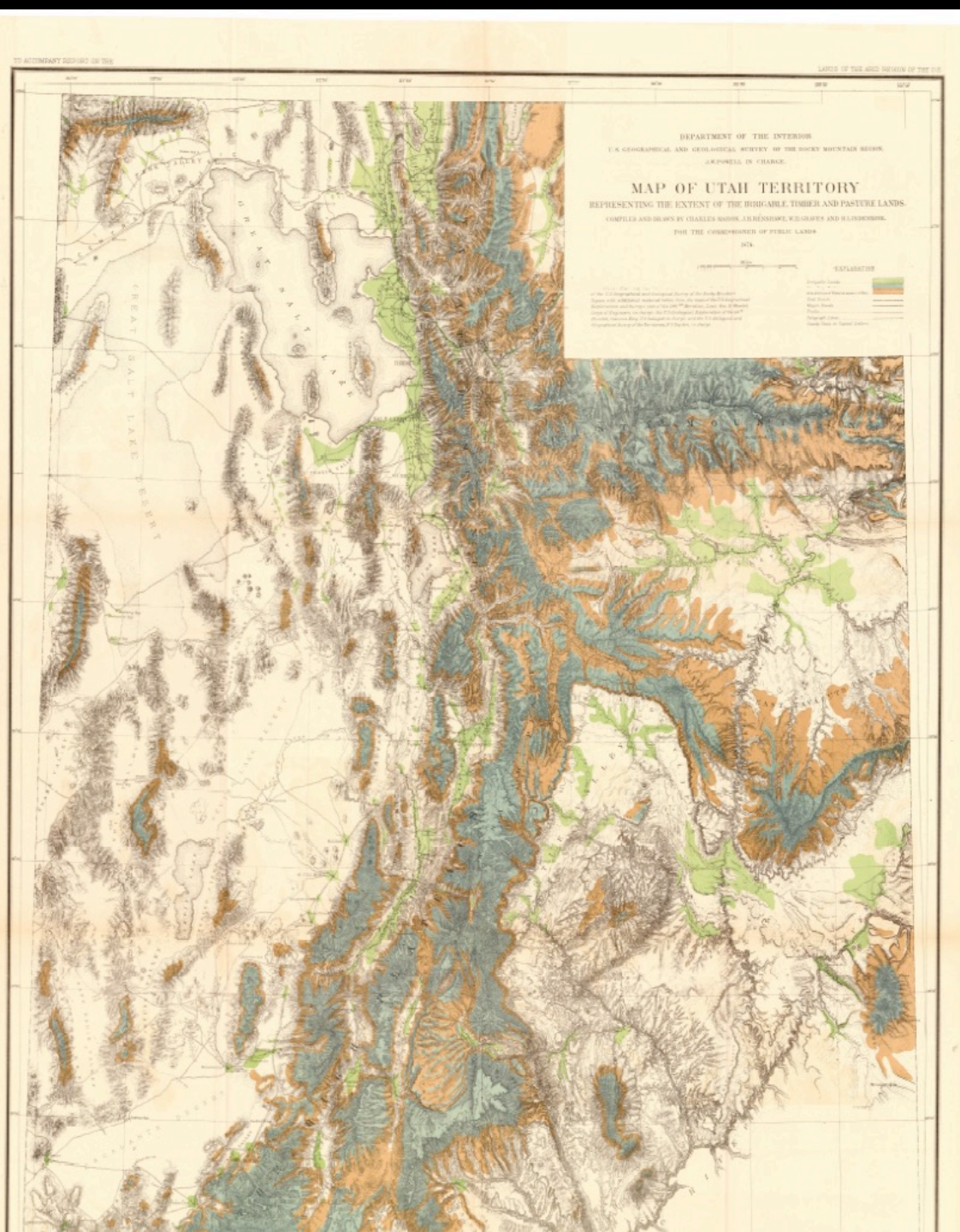
Figure 6. The Hayden survey in the Yellowstone area, 1871.

- Authorized by Congress in 1867 for geologic research of western lands.
- King Survey: 40<sup>th</sup> Parallel. Route of the transcontinental railroad.
- Hayden Survey: upper Missouri River valley
- Wheeler Survey: Nevada and the Great Basin
- Powell Survey: Utah and Colorado Plateau
- Received \$10,000 from the U.S. Government for the second Grand Canyon trip and more for later. Required **publication** of his results.
- Theory of geologic mapping advanced.
- As the survey's were geographic, conflicts arose.
- Political pressure of civilian versus government mapping.

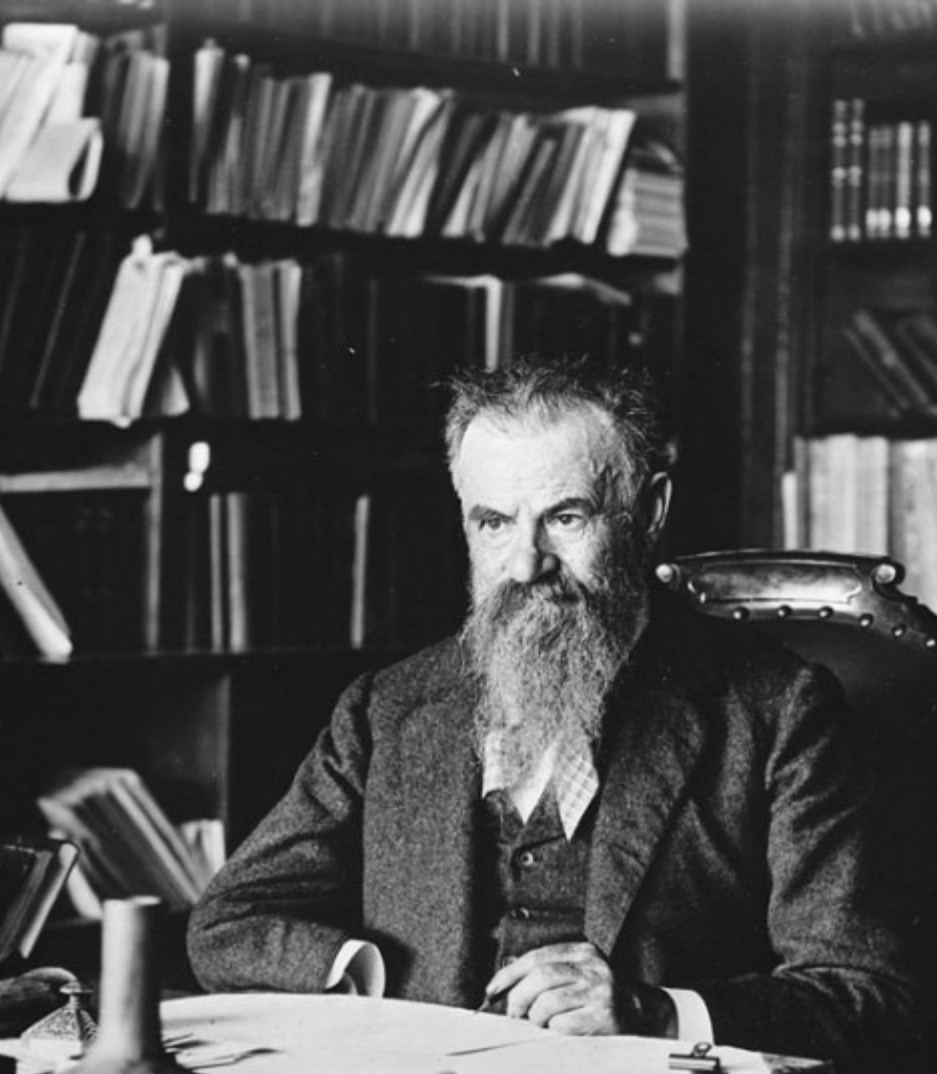
# Scientific Legacy in Geology

- Powell, J.W., 1873. **Some remarks on the Geological Structure of a district of country lying to the north of the Grand Canon of the Colorado.** *American Journal of Science and Arts (1820-1879)*, 5(30), p.456.
- Powell, J.W., 1875. **Exploration of the Colorado River of the West and its Tributaries.** Government Printing Office, Washington, D.C.
- Powell, J.W., 1876. **Report on the geology of the eastern portion of the Uinta Mountains and a region of country adjacent thereto.** Government Printing Office.
- Whitfeild, R.P. and Powell, J.W., 1877. **Preliminary report on the paleontology of the Black Hills, containing descriptions of new species of fossils from the Potsdam, Jurassic, and Cretaceous formations of the Black Hills of Dakota.** Government Printing Office.
- Powell, J.W., Gilbert, G.K., Dutton, C.E., Drummond, W. and Thompson, A.H., 1879. **Report on the Lands of the Arid Region of the United States: With a More Detailed Account of the Lands of Utah. With Maps.** Government print. Office.
- Dutton, C.E. and Powell, J.W., 1880. **Report on the Geology of the High Plateaus of Utah.** Government Printing Office.
- Powell, J.W., 1885. ART. XVI.--**The Organization and Plan of the United States Geological Survey.** *American Journal of Science (1880-1910)*, 29(170), p.93.

# Fluvial Geomorphology (Powell, 1875)



- Reflecting on the dynamic relations between moving waters and the geologic structures they crossed or matched, proposed a three-fold classification of drainage systems, two of which were new.
- Concept of a **base level** of erosion below which streams could not cut
- **Antecedent** streams predated geologic uplifts of plateaus and mountains and maintained their courses during uplift
- **Superimposed** streams exceeded uplift rates to expose older structural settings
- **Why does the Green River flow through rather than around the Uinta Mountains?**
- **Thus, geomorphology was born.**



# Birth of the U.S. Geological Survey

- In 1879, after four years of persistent lobbying, Powell succeeded in consolidating the rival surveys into the U.S. Geological Survey
- Clarence King was appointed the first director
- Powell was appointed director of the Bureau of Ethnicity, which was part of the Smithsonian. Powell held this position until his death
- King resigned in 1881, and Powell was appointed the Geological Survey's second director.
- The survey's role and annual budget increased exponentially during Powell's tenure, and by 1890-1891, the annual appropriation for the Geological Survey neared \$750,000.
- The U.S. Geological Survey was at the time the largest scientific organization in the world.





# Organizing the Survey: Basic vs. Applied Science

- King emphasized mining (economic) geology, to devote but a small effort to general geology
- Powell allowed the staff to choose not only their methods of work but the subjects they would investigate as well.
- Abolished the regional concept. Refined the definition of public domain.
- Included all U.S. territory rather than just the west
- The National Geographic Society
- The Geological Society of America
- In 1888, he was elected president of the American Association for the Advancement of Science, then considered the highest honor for an American scientist.

# Topographic Mapping



- Powell championed one geodetic system and one topographic system of what is still a core function of Federal mapping — the development of consistent national mapping standards.
- Without a good topographic map, geology cannot even be thoroughly studied
- In 1884, Powell announced, “A Government cannot do any scientific work of more value to the people at large than by causing the construction of proper topographic maps of the country.”
- Powell’s understanding that more detailed mapping would be required by future generations eventually led to the nationwide 1:24,000-scale topographic map series (completed in 1991) and eventually the current US digital topographic map series. 54,000 maps



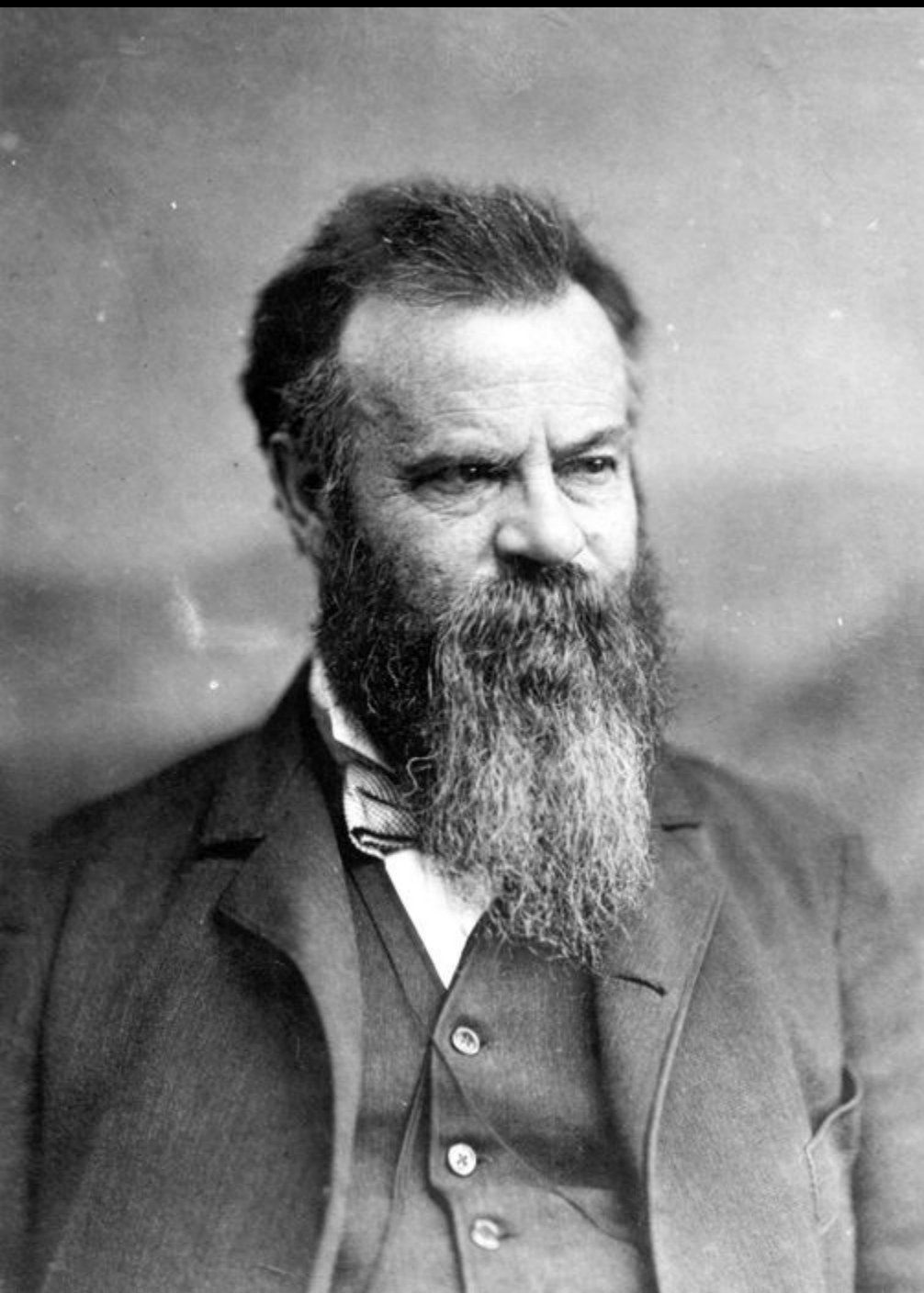


# After the U.S. Geological Survey

- Powell's views on settlement in the West eventually antagonized influential Western politicians and the railroad companies,
- The railroad companies owned 183,000,000 acres for building the railways, did not agree with Powell's views on land conservation.
- They aggressively lobbied Congress to encourage farming instead, as they wanted to cash in on their lands.
- The U.S. Congress went along
- Tired of the politics, he resigned from the Survey in 1894. Powell continued to direct the Smithsonian's Bureau of Ethnology until his death in 1902.

# Bibliography

- [https://en.wikipedia.org/wiki/Illinois\\_Museum\\_of\\_Natural\\_History](https://en.wikipedia.org/wiki/Illinois_Museum_of_Natural_History)
- <https://onmilwaukee.com/visitors/articles/johnwesleypowell.html>
- <https://calisphere.org/item/ark:/13030/tf467nb6zq/>
- [https://www.nps.gov/parkhistory/online\\_books/geology/publications/inf/powell/sec5.html](https://www.nps.gov/parkhistory/online_books/geology/publications/inf/powell/sec5.html)
- <http://www.waterencyclopedia.com/Po-Re/Powell-John-Wesley.html#ixzz5RUYi0gG4>
- <https://www.usgs.gov/staff-profiles/john-wesley-powell>
- NPR. (2002) The True Legacy of John Wesley Powell. National Public Radio. Sept. 22, 2002
- Freed, J., 2007, Education Illinois: A History of Illinois' Normal School.
- Rabbitt, M. C. (1989) "The First Quarter-Century" in The United States Geological Survey 1879-1989. USGS circular; 1050
- Wallace Stegner, Beyond the Hundredth Meridian: John Wesley Powell and the Second Opening of the West (Houghton Mifflin, 1954; reprint, New York: Penguin Books, 1992).
- Donald Worster. A River Running West: The Life of John Wesley Powell (Oxford University Press, 2001).
- John Wesley Powell G. K. Gilbert, 1902, John Wesley Powell (eulogy): Science, New Series, Vol. 16, No. 406, p. 561-567.



# Water Issues

- Powell championed an approach where political and economic institutions would adapt to the environmental realities of the West
- “hostile to a too-rigid traditional pattern of settlement” that had been established by the Public Land Survey System and Homestead Act.
- “I tell you gentlemen you are piling up a heritage of conflict and litigation over water rights, for there is not enough water to supply the land.”
- Promoted systematic studies and data collection in hydrography, and advocated conservation and careful planning in the use of Western lands
- lands west of the 100th meridian were not generally suitable for agriculture.
- 1878 report proposed that future state boundaries should be based on watershed areas.