

Anniversaries

Herschel observes geology 200 years ago



JOHN HERSCHEL AND HIS GEOLOGIST'S HAMMER: 1824 EUROPEAN TOUR

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Figure 1. Portrait of John Herschel.
Source: From a copy held by the author of the original housed in St. John's College, Cambridge.

Two hundred years ago, in the 1820s, geology was taking off. In France, Italy, Britain, and elsewhere, researchers mapped mineral types, described fossils, and considered Earth's history as revealed by the rocks. In London, the Geological Society had grown to hundreds of members, who gathered for lively discussions. Mary Anning's *Plesiosaurus* was presented to the Society in February 1824 by William Conybeare. William Buckland famously revealed his *Megalosaurus*, and he entertained audiences with his discussions of the fossils of elephants, rhinoceroses, and hyenas found over several years at Kirkdale Cave.

One attendee at these evening meetings was John Herschel, then best known as First Wrangler in his 1813 class at Cambridge, one of England's foremost mathematicians. Since university he had plunged into the chemistry of minerals and paid special attention to the interaction of polarized light with crystals. His friends included Adam Sedgwick, William Buckland, and Charles Lyell. After a meeting of the Geological Society in February 1824, Herschel wrote to his mother: "Last night I

was admitted a Fellow of the Geological Society. It was a most remarkably entertaining meeting. Buckland presided ... and gave us a most amusing and instructive lecture." Herschel valued being accepted by the geological community.

Herschel's interest in geology looked mostly to chemical reactions, mineral formation, and how rock strata and types can reveal the history of the Earth. His first forays into the field in 1816 and 1817 were to "mineralogize" (his word!) in Devon and Cornwall. He brought minerals and crystals back to his lab for chemical and optical analysis and he sought to enlarge his supply networks. When he set his sights on the Alps, the collection, description, and analysis of minerals and crystals was high on his list of desiderata.

The first two of Herschel's European tours – in 1821 and 1824 – included geological or mineralogical investigations. A stop in Paris was a must, where Herschel met Simon Laplace, Alexander von Humboldt, and François Arago. Herschel sought their cooperation on astronomical

projects and their advice on people and places for his tour. In 1821, Herschel and Charles Babbage travelled to Chamonix and Mt. Blanc, Milan, and Zermatt, where they hired guides and climbed the Breithorn (4164 m) in the Pennine Alps. Herschel's first interests were in standardizing the use of barometers and other instruments in mountain research and in the collection of minerals for analysis.

Herschel's 1824 tour provided a 6-month sabbatical from the tribulations of scientific society in London. Herschel stopped in Paris again, where, as he wrote his mother "Humboldt ... gave me some very useful information respecting the Alps, Vesuvius, &c." Indeed, Humboldt gave Herschel a copy of Leopold von Buch's 1822 "Géologie du Tyrol" and also introduced Herschel to Eilhard Mitscherlich (the discoverer of isomorphism), a rising German mineralogist/crystallographer who Herschel later championed for a Royal Society medal. After Paris, Herschel passed quickly to the Savoy Alps and the Mt. Cenis Pass into the Susa Valley and toward Turin. He paused for barometrical readings, to gather minerals, and to invent a new instrument for measuring the intensity of solar rays. The tour included several geological excursions: several weeks near Naples exploring volcanic features; three weeks crisscrossing Sicily from Palermo to Catania, and two weeks among the peaks of the Tyrol. He climbed Vesuvius and Etna, measured and sketched, and gathered gases.

Herschel linked into the support network for geological fieldwork in each area he visited: in Naples, the experts on Vesuvius were Teodoro Monticelli and Nicola Covelli and in Sicily Mario Gemmellaro. In Tyrol he found local guides and mineral dealers who could assist in his collecting. Herschel also connected with traveling and expat Britons, including the Proconsul William Hamilton and the Oxford geologist Charles Daubeny. Hamilton's observations of Vesuvius were well-known and he generously oriented Herschel to the region. In Catania, Sicily, Herschel encountered Daubeny, along with a Count Beffa Negrini of Mantua. They each had "a large hammer and a bag," and Herschel gladly formed a traveling trio of geologists with them, and they crossed Sicily together.

Everywhere Herschel went in 1824 he collected minerals and crystals. The mineralogical highpoint of the trip was in the Tyrol. By late August Herschel reached Neumarkt, Tyrol, and wrote in a letter to his mother that he was setting out on a "mountaineering expedition" in the Fassa valley "to commence my search for game (I don't mean partridges, but Apophyllites & Stilbites, and that sort of underground game.)" Herschel hired local guides and horses to travel mountain trails while his servant, James Child, escorted the carriage and luggage by the main roads. During eight days, he wrote his mother, "my object was to take in as much of the country to collect as many minerals, to make as many drawings, ... as could be done...". He carried linens, a cloak, hobnailed boots, a drawing board, blowpipe, and a "huge hammer to beat the rocks over the head...". And in his copy of Buch's "Géologie du Tyrol," Herschel noted repeatedly "Examined on the spot. Found correct."

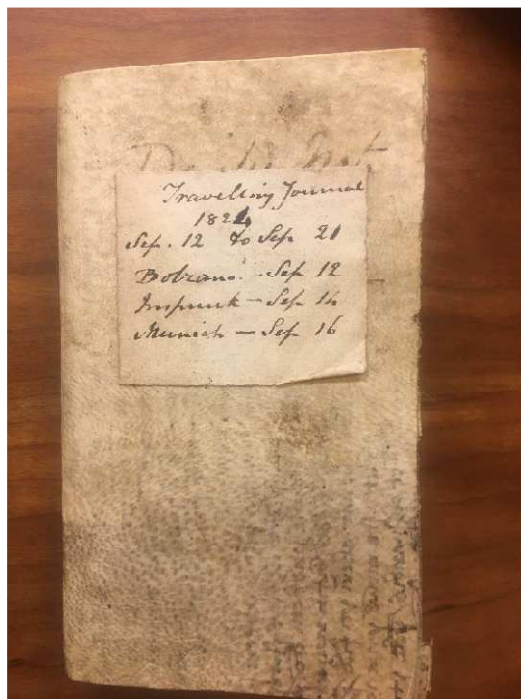


Figure 2. The cover of Herschel's pocket Travel Journal through Tyrol. Through this narrative, his letters home, and his accounts book, Herschel tells us every geological site he visited, with the names of guides and mineral sellers, mineral types and qualities, etc. Photo by the author, University of Texas, Herschel Family Papers, container 22.8.

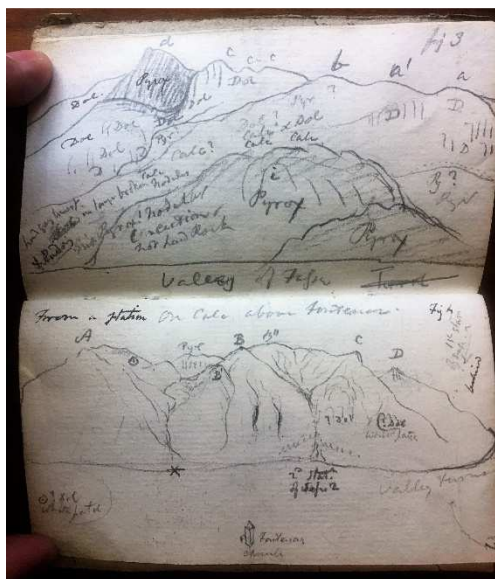


Figure 3. A quick sketch by John Herschel, keyed to a discussion of peak names and rock types. It reads in part: "Valley of Fassa. From a station on calc above Fontenazzo [Fontenazzo]." Photo by the author, University of Texas, Herschel Family Papers, container 22.8.

Herschel reflected back on his tour in a letter to William Whewell, 28 November 1824: "I have been rambling through Italy Sicily the Tyrol & Germany since I last saw you. Tell Sedgwick that I took Von Buch's letter to Humboldt with me among the Dolomites & the Tyrol and chastened the old Baron's noodle. It is a famous country however for the Vulcanists.... On one point however all are agreed, viz: that the Tyrol is a roasted province, not a pickled one."

Following the long sojourn in Europe in 1824, Herschel became a conduit of information for British geologists traveling to areas he had visited. He advised both William Whewell and Charles Lyell before their European trips. He told them of great volcanic landscapes, the interfoliation of dolomite and pyroxene, and which mineral dealers and guides could be trusted and which could not.

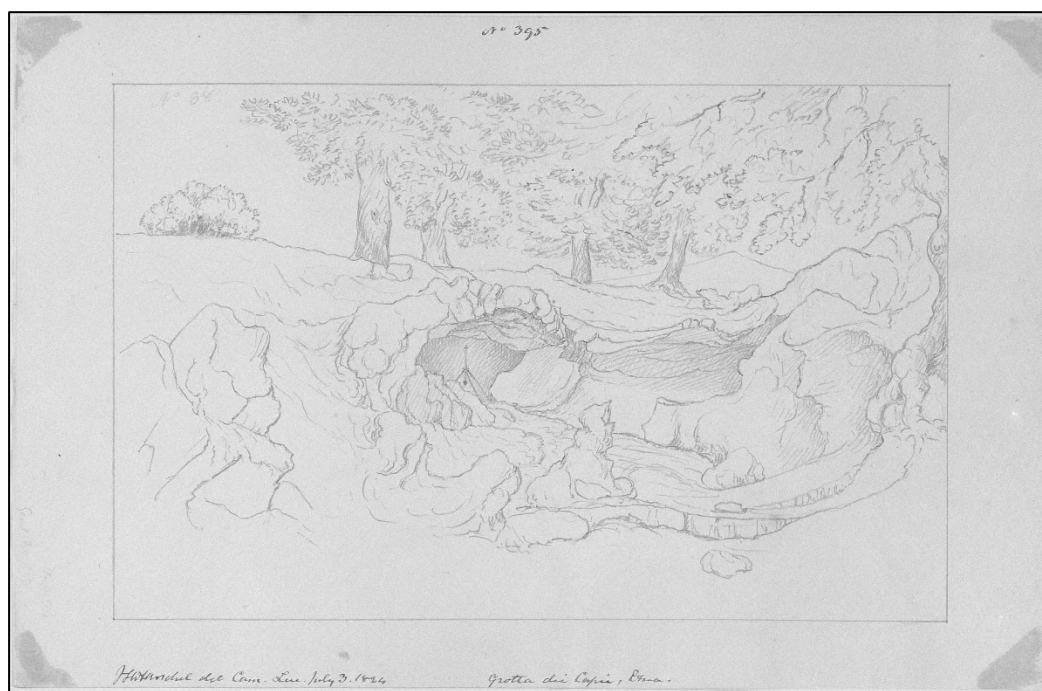


Figure 4. Herschel's drawing of a barometer station on Mt. Etna at the Grotta dei Capri during the 1824 tour. Herschel's sketch no. 395. From: The J. Paul Getty Museum, Los Angeles, John F.W. Herschel, Grotta dei Capri, Etna, 3 July 1824, graphite drawing made with the aid of a camera lucida, 19.8 cm x 31 cm, gift of the Graham and Susan Nash Collection.

Historians have focused much attention on the big controversies of geology – Neptunists v. Vulcanists, Uniformitarians v. Catastrophists – or on the major accomplishment of reaching consensus on the order of the strata and the processes of uplift or volcanic activity. We would do well to look as much to the secondary figures, like Herschel, who can help us to understand better how geological practice spread across scientific communities. Two hundred years ago, geology was a broader, deeper stream of activity than we have yet uncovered.

Further Reading

- Stephen Case, *Making Stars Physical: The Astronomy of Sir John Herschel*, Pittsburgh: University of Pittsburgh Press, 2018.
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- Gregory A. Good, The Astronomers Who Fell to Earth: Or, How the Copernican Revolution was Completed in the Alps, *Physica: Rivista Internazionale di Storia della Scienza*, New Series, 2021, 56:7-19.
- Gregory A. Good, Herschel's Planet: Earth in Cosmic Perspective, in *Cambridge Companion to John Herschel*, ed. by Lukas Verbrugg and Steven Case, Cambridge: Cambridge University Press, forthcoming 2024, pp. 186-208.
- David Oldroyd, *Thinking about the Earth: A History of Ideas in Geology*, London: Athlone Press, 1996.
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