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Cartoon by William Conybeare (1787–1857) of William Buckland (1784–1856) entering Kirkdale Cave (Courtesy of the Department of Geology, National Museum of Wales)

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GREGORY A. GOOD

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This issue of EARTH SCIENCES HISTORY begins, sadly, with another Éloge—of our valued colleague, Hatten S. Yoder, Jr., who was equally adept in his science and in history. My association with Hat goes back twenty years, to my first research forays into the Carnegie Institution of Washington. Hat was always a friend to history and to historians. He cheerfully opened doors for us to the library and archival holdings of the Institution, and he was a strong advocate for the preservation of those records of his colleagues and predecessors. Future historians are indebted to him and now, through the careful attention Bob Hazen, these historians will have a means to know a little more about this extraordinary human being.

This issue provides a forum, as well, for the founding editor of the journal, Gerry Friedman, to relate his memories of aspects of his early associations with John L. Rich, Walter H. Bucher, and other mid-twentieth century geologists. Friedman examines controversies surrounding Rich's concepts of undaform, clinoform, and fondoform; the 'blister' hypothesis; and 'bedding thrusts'. He also weighs in on Walter Bucher's contributions to tectonics and Robert Dietz's statement that Bucher put geology fifty years behind.

The first article in this issue, by Alan Cohen, narrates the discovery and early exploitation of diamonds in South Africa ca. 1870, especially the activities of Mary Elizabeth Barber (1818–1899), William Guybon Atherstone (1814–1898), and the German petrographer Emil Cohen (1842–1905). The prominent role of social networks in this activity is worthy of notice. The second article, by Marianne Sommer, offers a wide-ranging and incisive analysis of the cave in early nineteenth-century Britain as a contested, "many-layered political space." She examines the meanings of caves in Romantic poetry, relates the visits of poets to Fingal's Cave, Wookey Hole, and other well-known caves, discusses the folklore of caves, and then uses these backdrops for a careful analysis of the activities of gentlemen geologists in caves. William Buckland's (1784–1856) investigations of Kirkdale Cave figure prominently, as do his relations and those of other gentleman geologists with amateurs such as Mary and Jane Talbot. This richly textured tale suggests similar analyses in other venues in which scientists, poets, and tourists have interacted.

The issue is rounded out by a Linda VanAller Hernick, with a research note on a nineteenth-century amateur collector of Devonian sponges, Edwin Bradford Hall (1825–1908). Edwin Hall was one of the behind-the-scenes workers who made possible the massive investigations of James Hall (1811–1898) of Albany, New York. The importance of amateurs in nineteenth-century geology is well known, but the individual stories are still instructive.

Announcements for this issue include several upcoming conferences and events.

14–19 March 2004: The Centennial Meeting of the Association of American Geographers, Philadelphia, PA, will include seven sessions with historical themes. Presentations will include historical discussions of weathering geomorphology, desert morphology, Symmes's hollow Earth theory, fluvial system response, roles and experiences of women in geomorphology, the biome concept, climatic determinism according to Huntington and Lovelock, comparative studies of research in the U.S. and Russia, climatology, weather radar, the exploration of Greenland, and aspects of the career of John R. Mather. Included among the speakers will be members of HESS: Antony Orme, Dorothy Sack, Frederick E. Nelson, H. Jesse Walker, and others. Readers interested in the full program should contact the AAG.

25–27 March 2004: During the joint meeting of the NE/SE Sections of the Geological Society of America at Tysons Corner, Virginia, there will be a session on the theme **'Salvage Geology at Opportunistic and Permanent Sites'.** Manmade and natural events often temporarily expose outcrops, fossils, etc., which must be investigated quickly if they are to investigated at all. More information may be obtained from Cyril Galvin at galvincoastal@juno.com or from James C. Dawson at james.dawson@plattsburgh.edu.

31 March–4 April 2004: American Society for Environmental History (ASEH) will sponsor its annual conference in Victoria, British Columbia, Canada on the theme **'Cultural Places and Natural Spaces: Memory, History, and Landscape'.** More information may be obtained at http://www.h-net.org/~environ/ASEH/welcome_IE4.html.

5–9 July 2004: The International Commission on History of Meteorology (ICHM) will host a conference titled **'From Beaufort to Bjerknes and Beyond: Critical Perspectives on Observing, Analyzing, and Predicting Weather and Climate'** at Polling Monastery, Weilheim, Germany. Details may be viewed at http://www.meteohistory.org. The deadline for proposals is 29 February 2004.

5–7 August 2004: Fifth British-North American Joint Meeting of the British Society for the History of Science (BSHS), the Canadian Society for the History and Philosophy of Science (CSHPS), and the History of Science Society (HSS) in Halifax, Nova Scotia, Canada. The theme **'Circulation of Knowledge'** allows for a variety of approaches, including: the circulation of scientific knowledge around the world; the formation of knowledge through exploration, migration, trade, and fieldwork; and circulation among disciplines and research fields. More possibilities are outlined at http://www.hssonline.org.

20–28 August 2004: The International Commission on the History of Geological Sciences (INHIGEO) will hold a Topical Symposium, with the official number T-20.02, on **'Institutions, Museums, and Scientific Societies in the History of the Geosciences'** in Florence, Italy, within the Thirty-second International Geological Congress. The aim of this session is to provide a comparative evaluation of the role of scientific institutions—such as natural history museums, surveys, academies, and scientific societies—within the history of the geosciences, in different national, geographical, and cultural contexts. Particular emphasis will be placed on significant figures and geological research activities linked to such institutions. To date this subject has not been treated in detail by historians of geology and the proposed session will be the first international contribution to the development of this field of historical studies. For details please visit http://www.iugs.org/iugs/science/sci-chog.htm.

29 August to 3 September 2004: History of Geology Field Excursion, organized by the International Commission on the History of Geological Sciences (INHI-

GEO), 'Italian Institutions and Geological Sites in the History of Geosciences'. Following the Thirty-second International Geological Congress in Florence (20–28 August, 2004), INHIGEO is organizing a field excursion (29 August–3 September), visiting field sites, academies, and museums important in the history of geology. It is open to all persons, whether or not they are members of INHIGEO or are attending the International Geological Congress. While the trip is particularly designed for historians of geology and geologists interested in earth sciences history it will also be of general interest, contributing to knowledge of aspects of scientific and artistic cultural history.

Program: Florence–Siena (Academy of Fisiocritici), with stops at Radicofani and Mt Amiata (geological sites). Geological and mining sites in Colline Metallifere, Montieri. Etrurian sites in Populonia. Visit to Etrurian mining museum in Campiglia Marittima. Geological sites in Larderello, Saline di Volterra and Le Balze. Volterra to Vinci across Val d'Era and Val d'Arno. Museo Vinciano at Vinci. Bologna (Academy of Sciences; natural history and geological museums). Imola (geological sites and Scarabelli Museum). Verona (Museum of Natural History, with Monte Bolca fossil fish collections; Academy of Agriculture, Sciences, and Letters). Verona–Vicenza: traverse of historical geological sites in Chiampo and Agno valleys. Geological sites in Belluno–Feltre area. Venice (Venetian Institute of Sciences, Letters and Arts; Museum of Natural History). Estimated cost: €900 inclusive. Further information: Professor Nicoletta Morello, Dipartimento di Storia Moderna e Contemporanea, Università di Genova, Via Balbi 6, 16126 Genova, Italy. Tel. +039 010 2099838 Fax +39 010 2099826 (nicoletta.morello@lettere.unige.it).

7–10 November 2004: The History of Geology Division of the Geological Society of America will host a symposium during the annual GSA meeting in Denver, Colorado, on the theme **'The Layer-Cake Concept—Then and Now'.** The concept of time-parallel stratigraphy was widely accepted in the nineteenth century. It was eclipsed by the facies concept for many decades but has made a resurgence in the guise of sequence and event stratigraphy. Papers are invited on historical aspects (of any century) of the layer-cake concept. Send potential titles, suggestions, and queries to Charles W. Byers, cwbyers@geology.wisc.edu.

LETTERS TO THE EDITOR

Letter to the editor:

For readers it may be useful to have some more objective information concerning the book *Vom Wunderzeichen zum Naturobjekt,* reviewed by Andre Wakefield in **Earth Science History** (2002, 21:225–226). It may be remembered that up to and including the fifteenth to seventeenth centuries auroras were looked upon as miraculous signs. With the invention of the printing press, leaflets and pamphlets reproduced such signs in the sky, including auroras. These phenomena were looked upon as magic omens relating to human life and activities, presaging war, plague, disease, and distress. Comets bore similiar portents. During and after the Thirty-Year War (1618–1648) the aurora borealis was forgotten in Middle Europe. During the so-called Maunder Minimum (1645–1715), both sunspots and auroras were rare. The knowledge of the auroras had been forgotten in the beginning of eighteenth century in general and normal people did not know what an aurora is.

In that time, on March 17, 1716, a great aurora was widely observed. It showed over Halle all forms and colours: Auroral arcs with rays, red rays which reached the zenith, patches in different colours, and the great auroral corona. People were surprised by these sudden phenomena which appeared in the sky over Halle. They did not understand this sign and asked Wolff to give an explanation. Wolff followed this request and gave in the central Hall of the university a public talk, not only for students, but also open for all interested citizen of Halle. A great number of students and citizens came to the Hall, and all of them listened to Wolff's lecture. He gave a new interpretation of this sign in the sky; this aurora was not a sign of God, but a manifestation of the Earth's atmosphere, a natural object which could be explained and understood with the available scientific knowledge. This was the *new* interpretation which he presented, and which was a key statement in that time. After Wolff's lecture it was in general accepted that auroras are not miraculous signs of the heavens. Furthermore, they were understood as a natural object. This book presents Wolff's lecture and the two other examples of description of the great aurora of March 17, 1716. They are of fundamental interest for current research in solar-terrestrial physics.

Yours truly,

Wilfried Schröder
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Reviewer's Reply

Dr. Schröder has done some excellent technical work on noctilucent clouds and the aurora borealis. But physics is not history, and his more general claims about eighteenth-century science, culture, and society rest on little or no evidence. That was my main point.

Yours truly,

Andre Wakefield

To the editor:

I thank **EARTH SCIENCES HISTORY** for publishing Warren Hamilton's long and thoughtful review of *Plate Tectonics: An Insider's History of the Modern Theory of the Earth* (2003, 22:93–98). Hamilton recognizes the central purpose of the book to illustrate how "science . . . really operates." But given this—that our intent was to tell what happened, rather than what should have happened—I found his criticisms misplaced. Moreover, his review is salted with personal accusations, which compels me to defend my work.

Discussing my comments on Lawrence Morley's essay, Hamilton accuses me of being unaware "of the obstructive role played far too often, now and then, by peer-reviewers . . . who block dissemination of views with which they disagree." On the contrary, this is exactly why Morley's essay is in the book. Homer Le Grand and I sought out Lawrence Morley to contribute to this volume because we knew what had happened to his *Nature* submission, and we thought it an essential part of the story. It is a central problem of history and sociology of science to understand how scientific ideas are received: why good ideas get neglected and rejected, why bad ideas can take deep root, and how the definitions of 'good' and 'bad' change. If I did not express outrage over Morley's treatment at the hands of *Nature* reviewers, it was in part because as a historian I accept these events as part of the scientific process.[1] It was also because Morley himself is not outraged. Lawrence Morley is a hero not just because he had a great idea, but because he took its rejection in stride, continued to be productive, and is to this day a generous, gracious, and charming person.

Hamilton also criticizes the book for the fact that Harry Hess is "repeatedly credited . . . because of his direct influence on participants," even though his ideas were "inferior" to Bob Dietz's and essentially the same as those of Arthur Holmes. Hamilton is asking for a history that did not occur. It was Hess—not Dietz or Holmes—who lectured at Cambridge and inspired Fred Vine, and it was his paper that was widely circulated in American geological circles and had a profound impact. In the book's preface, I specifically noted that Dietz's work was "by the standards of current knowledge closer to being correct," and in my earlier work I have showed in detail that Hess's concept was essentially the same as Holmes's.[2] Ironically, Hamilton criticizes me for citing this earlier work.

Most egregiously, Hamilton accuses me of getting the facts of gravity anom-

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[1] For analytical perspectives on peer review, see P. F. Ross, *The Sciences' Self-Management: Manuscript Refereeing, Peer Review, and Goals in Science* (Lincoln, MA: Ross, 1990); R. Roy, Funding science: The *real* defects of peer review and an alternative to it, *Science, Technology, and Human Values,* 1985, 10(3):73–81; D. E. Chubin and E. J. Hackett, *Peerless Science: Peer Review and U.S. Science Policy* (Albany: State University of New York Press, 1990); D. V. Cichetti, The reliability of peer review for manuscript and grant submissions: A cross-disciplinary investigation, *Behavioral and Brain Sciences,* 1991, 14:119–135; S. Cole, *Making Science: Between Nature and Society* (Cambridge, MA: Harvard University Press, 1992); H-D. Daniel, *Guardians of Science: Fairness and Reliability of Peer Review,* trans. W. E. Russey (New York: VCH, 1993); Paul N. Edwards and Stephen H. Schneider, Self-governance and peer review in science-for-policy, The case of the Second IPCC Assessment Report, in *Changing the Atmosphere: Expert Knowledge and Environmental Governance,* eds. Clark A. Miller and Paul N. Edwards (Cambridge: MIT Press, 1991), 219–246; H. F. Judson, Structural transformation of the sciences and the end of peer review, *Journal of the American Medical Association,* 1994, 272:92–94; and Ann C. Weller, *Editorial Peer Review: Its Strengths and Weaknesses* (Medford, NJ: Information Today, ASIS &T Monograph Series, 2001).

[2] Oreskes, Naomi, with Homer Le Grand, *Plate Tectonics: An Insider's History of the Modern Theory of the Earth* (Boulder: Westview Press, 2001), xx; and Naomi Oreskes, *The Rejection of Continental Drift: Theory and Method in American Earth Science* (New York and Oxford: Oxford University Press, 1999), 268–271.

alies wrong, and presents his own version instead. Here he has conflated history with hindsight. There is no question that the interpretations of Vening Meinesz, Hess, and others in the 1930s–1950s were conditioned by their working assumptions, as is the case with all modeling. But at the time, their work was widely accepted as demonstrating that gravity anomalies occurred, and that they indicated either variations in crustal thickness or dynamic imbalances. Because most Americans who thought about the issue were committed to uniform crustal thickness, they accepted the argument in favor of some kind of tectonic disturbance, although what kind most were not prepared to say. Hamilton anachronistically accuses me of getting the location wrong because I refer to trenches rather than "forearcs," but the term forearc was not in general use in the period under discussion. Vening Meinesz, Hess, and others, referred to an association of gravity anomalies, trenches, and volcanic arcs. Often this was shortened to an association of anomalies with trenches. As a historian, I have used the appropriate historical terms and described the situation as the historical actors did.

Finally, Hamilton accuses me of accepting plate tectonics as "ultimate truth." This is preposterous. Over the past decade, historians and sociologists of science, myself included, have been repeatedly attacked as anti-science for an allegedly reckless relativism, and charged with undermining trust in science.[3] Now I stand accused of blocking progress through naïve absolutism. Evidently, you just can't win.

Yours sincerely,

Naomi Oreskes
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Director, Science Studies Program
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[3] For a blissfully clear account of why relativism is not reckless, and may or may not undermine science depending on circumstances and interpretation, see David Bloor, Skepticism and the social construction of science and technology: The case of the boundary layer, in *The Skeptics: Contemporary Essays,* ed. Steven Luper (Aldershot, UK: Ashgate Press, 2003), 249–265; and Relativism at 30,000 Feet, Paper presented at the Science Studies Program Colloquium, April 2003, San Diego, CA.

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ÉLOGE

HATTEN SCHUYLER YODER, JR.
MARCH 20, 1921–AUGUST 2, 2003

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Hatten S. Yoder, Jr., internationally known experimental petrologist, historian of earth science, and Emeritus Director of the Carnegie Institution's Geophysical Laboratory in Washington, D.C., died on August 2, 2003, in Bethesda, Maryland, following complications from surgery. Hat Yoder was born and raised in Cleveland, Ohio, where he developed a love of science at an early age. After graduating from Lakewood High School, he obtained his bachelor's degree at the University of Chicago in 1940 and engaged in postgraduate work at the University of Minnesota in 1941.

During World War Two Hat served in the United States Navy on aircraft carriers in both the European and Asian fronts, rising to the rank of Lieutenant Commander. Late in the War he was a meteorological officer on the MOKO expedition to Siberia as part of a joint Russian-American effort to monitor weather prior to the planned Allied invasion of Japan—a remarkable experience in science and politics that he chronicled in his 1997 book, *Planned Invasion of Japan (1945): The Siberian Weather Advantage.*

After the War Hat returned to his interrupted education, earning a Ph.D. from MIT in 1948. That same year he began his first—and only—job, as a scientist at the Geophysical Laboratory [Experimental Petrologist (1948–1971), Director (1971–1986), and Emeritus Director (1986–2003)]. In that creative environment, Hat designed and constructed an arsenal of high-pressure experimental apparatus that was unmatched in the world, and he applied those tools to key experiments that unlocked secrets of rock formation. It was during his early years at the Lab, on August 1, 1959, that he married Elizabeth Marie Bruffey. Betty and Hat had two children, Hatten S. Yoder III and Karen M. Wallace.

Historians of science will remember Hat Yoder both as a scientist and an historian. First and foremost, he was one of the most distinguished petrologists of the twentieth century, perhaps second only to Norman Bowen in originality and insight. Yoder's contributions to understanding the origins of metamorphic and igneous rocks have been among the most cited references in the earth sciences and, more than any other scientist, he has elucidated the physicochemical origins of basalt. For these contributions Yoder received numerous honors. He was the youngest geologist to be elected to the National Academy of Sciences (in 1958). He was subsequently awarded many of earth science's highest tributes, including the Arthur Day Medal (1962), the Werner Medal (1973), the Wollaston Medal (1979), and the Roebling Medal (1992). The mineral yoderite was named for him after he synthesized the compound.

Hat used his scientific success to help other people and to influence public policy. He was president of several earth science societies, including the History of the Earth Sciences Society (1995–1996). He served on the editorial boards of many journals, including *Earth Sciences History.* He was a member of the National Research Council's Executive Committee, as well as the U. S. National Committees for Geochemistry, for Geology, and for History of Geology. He also

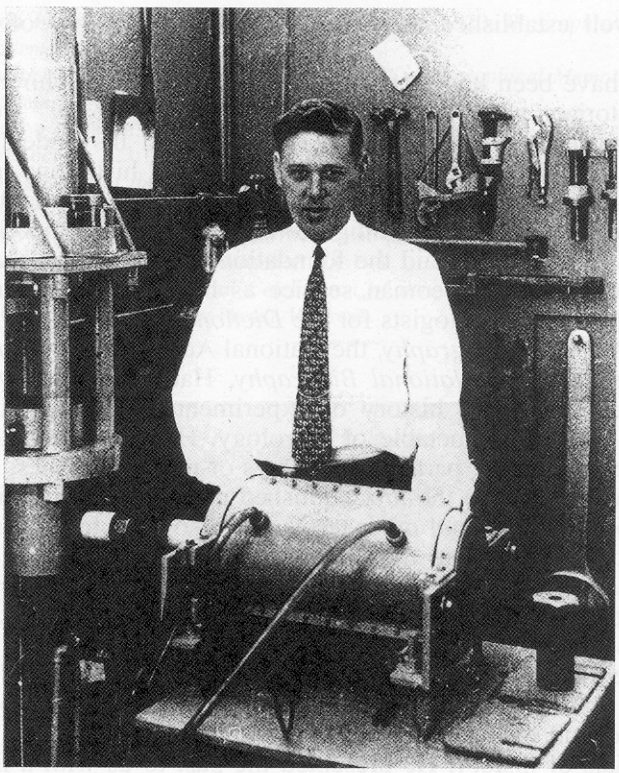

Figure 1. Hatten S. Yoder, Jr., posed (circa 1955) in front of his internally-heated, high-pressure gas apparatus that achieved pressures in excess of 10,000 atmospheres, at temperatures above 1,200 degrees Celsius. This "bomb" was employed by Hat in decades of experiments to determine the origins of basalt and other rocks. (Photo courtesy of the Yoder family.)

served on a dozen departmental visiting committees across the country, he advised Congress on issues ranging from dwindling natural resources to the overstated hazards of asbestos, and he was on the Library Board of the American Philosophical Society for many years.

Hat Yoder displayed an unswerving honesty, integrity, kindness, and dedication to fairness. "Right is right," he insisted, and backed up his conviction with action. In the early 1960s he was one of a group four men who conspired to desegregate the Whites-only restaurant of Washington, D.C.'s historic Willard Hotel. Along with scientist Alvin Van Valkenburg and a lawyer, Hat accompanied Charles Weir, an African-American scientist from the National Bureau of Standards, to the hotel's restaurant. When they were refused service, the quartet threatened legal action and they were seated. Later, as Geophysical Laboratory Director from 1971 to 1986, he championed opportunities for women in science.

Hat had a keen love of history, perhaps fueled by his passion for philately (he was especially proud of his collection of early American stamps). He was also an avid genealogist with special expertise on the diverse Yoder family in America. He saw his own research as an extension of earlier studies, and he always presented his petrologic research in a rich historical context. Of special note in this regard was the volume that he co-authored and edited marking the fiftieth anniversary of Norman Bowen's classic, *Evolution of the Igneous Rocks,* first published in 1928. Yet for most of his career Hat focused on experimental research and his reputation as one of the giants of twentieth-century petrology

was already well established when he embraced the history of science in the 1990s.

Conflicts have been known to arise between scientists who claim to be historians and historians who claim to know how science "really" works. Throughout his distinguished historical output Hat displayed his understanding of the important and complementary roles of scientists and historians in documenting the history of science. Hat brought to the history of geology what the geoscientist does best—unearthing and explaining the experiments and theories of previous earth scientists, whose work laid the foundation for later research.

Hat Yoder performed yeoman service as biographer of more than twenty famous geologists and petrologists for the *Dictionary of Scientific Biography,* the *Dictionary of American Biography,* the National Academy's *Biographical Memoir* series, and the *American National Biography.* Hat's historical writings include fascinating accounts of the history of experimental petrology, including a remarkable and insightful timetable of petrology. He was fascinated by the etymology of scientific terms, particularly names of new disciplines, and he went to great lengths to track down the first published usage of "geophysics," "geobiology," "biogeochemistry" and other terms. He also used his access to important archival records to contribute more than a dozen papers on the history of the Geophysical Laboratory and its staff. For this body of work he received the 1998 History of Geology Award of the Geological Society of America.

In all his historical writings, Hat Yoder remained close to the petrologic science that he knew so intimately—in which he, himself, played such a significant historical role. He sifted through countless volumes of laboratory records, correspondence, and scientific writings to lay out, for scientist and historian alike, the raw materials of history. He presented the past to us with a firm foundation of impeccable scholarship, lucid prose, and an awesome comprehension of the intricacies of rocks' varied origins.

Hat's last historical contribution, its draft completed only days before his hospitalization, is a book-length history of the Geophysical Laboratory. True to his convictions as a scientist writing history, Hat focused on the technical content of the Lab's science—the operation of apparatus and the execution of experiments, rather than the motivations of personalities and the broader intellectual context of their contributions.

During his last months Hat drove himself. He always gave his broad smile and characteristic nod, but he often fretted that there just wasn't enough time. In addition to his exhausting work on the monumental Lab history, he was haunted by stacks of unpublished data on the melilite family of minerals, excited by new research on prebiotic chemistry, and obligated to fulfill numerous commitments related to his many scientific committees. The end came too swiftly.

HATTEN SCHUYLER YODER, JR.: SELECTED PUBLICATIONS ON THE HISTORY OF THE EARTH SCIENCES

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