BOOK REVIEWS

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HISTOIRE DES SCIENCES DE LA TERRE ENTRE 1790 ET 1815, VUE À TRAVERS LES DOCUMENTS INÉDITS DE LA SOCIÉTÉ DE PHYSIQUE ET D'HISTOIRE NATURELLE DE GÈNEVE. TROIS GRANDS PROTAGONISTES: MARC-AUGUSTE PICTET, GUILLAUME-ANTOINE DELUC, ET JEAN TOLLOT. *Albert V. Carozzi, ed. 1990. Mémoires de la Société de physique et d'histoire naturelle de Genève, v. 45, fasc. 2. 411 p. Softcover, $48.00 (including surface postage and handling; order from Secretary of S.P.H.N. Natural History Museum of Geneva, P.O. Box 434, CH 1211 Geneva 6, Switzerland).*

The Société de physique et d'histoire naturelle (Physics and Natural History Society) of Geneva was founded in 1790. It met for the first time on August 5, 1791, under the name of the Geneva Naturalists Society. On the occasion of its bicentennial, the Society presents this very beautiful volume.

The first part of this work contains a text by René Sigrist on the *Origins of the Society* (1790–1922); to expand on this work, A. V. Carozzi, professor emeritus at the University of Illinois (Urbana–Champaign) had the intriguing idea of gathering all the unpublished geological papers presented during the first quarter century of the Society's existence (1815 is the date of the Vienna Congress, which divided Europe after the fall of Napoleon in France). He reproduces the records of the sessions, successively held by Vaucher (until 1810), and afterward by Colladon. He includes numerous documents, especially several reports of the sessions' chairmen.

All of this constitutes a very detailed documentation for the geology historian, particularly those interested in the sociology of science. In addition to important texts, the Society is seen as a living entity, reminding us of surprising discussions about, for example, the divining rod. (Although alas! in our times of renewal of occultism, this interest may seem less derisory than it is.)

But the memoir is not simply an extremely detailed work devoted entirely to the work of scientists. Carozzi also comments throughout the publication on the manuscripts presented. Using his extensive knowledge of Genevan geology, he clarifies certain points about the geological observations of the authors. Most important of all, he produces several historical reviews, each one of which could be the subject of an article in a specialized review. This is to say that the volume contains a dual documentation: the unpublished texts that re-create the Society's activities with its debates, readings, visitors, etc.; and Carozzi's comments, both as an historian who places the texts in their context, and as a geologist on the state of knowledge at the time. The original texts are in heavy type, the comments in standard type.

Of the three great protagonists cited in the title, the most well known is without doubt M. A. Pictet (1752–1825), a Genevan physicist and geologist who, starting in 1796 in the *Bibliothèque britannique,* introduced the works of English authors to the continent. G. A. Deluc (1729–1812) is the younger brother of Jean-André, the author of the *Letters to the Queen of Great Britain* and the *Letters to Blumenbach.* Less well known, of course, than his elder brother, he shares with him his main ideas, particularly his adherence to the balance between the history of the earth and the story of Genesis. Finally, J. Tollot (1733–1815) is included through the use of his memoirs and travel accounts, deposited in the files of the Geneva Historical and Archeological Society.

Among the contributions of Tollot we have a review about the geology of the valley of Abondance (Chablais) that he lectures on as chairman of the session (October 1791); a memoir on the formation of the gypseous mountains (January 1794); and also one on the Quaternary geology of the Genevan country (February 1796). In January 1799, he travels in the Jura and Alsace and wonders about the decrease of the water on the globe. This he explains by the oxidation of iron, with the release of residual hydrogen. The idea is original, comparable to the ideas of *Telliamed* or Werner, writes Carozzi. It is of course true to the chemistry in the water formation process; the composition of water had just been discovered.

In May 1802, Tollot presents two reviews. In the first, concerning the mountains of Voirons and of the Salève, he explains his tectonic theories. During the withdrawal of the sea, the limestones, which are lying on the granite, cleave themselves vertically and horizontally while collapsing. At the margins, especially exposed to movements, zigzaging ledges (which puzzled Saussure) are created. In the second review, devoted to a journey in Oberland, he explains his theory about the earth, with granite (at the basement), clay and limestone.

Concerning Pictet, it is interesting to recall the circumstances of his conversion to Plutonism. On March 22, 1798, H. B. Saussure "communicates his observations on a review by Th. Beddoes which establishes the connection between basalt and granite." The British author is a convinced plutonist, and his review, which contains numerous personal observations, was

published as early as 1791 in the *Philosophical Transactions,* only shortly after the first publication on the subject by James Hutton (1788). In his analysis of the review, Carozzi reminds us how the *Theory of the Earth* was presented to the Genevan naturalists in the *Bibliothèque brittanique.* This journal published in 1796 an abstract of the *Theory* which is in fact a sharp critique of J. A. Deluc. A debate with Playfair follows, next a series of new publications about "the observations on granite" by Hutton, and then the experiences of Sir James Hall concerning the effects of heat and pressure on rocks.

It is in 1806, in a letter to Patrin, that Pictet claims to be shattered by the results of Sir James "in favour of the vulcanists," although the use of the word "vulcanist" shows that he doesn't yet clearly distinguish the plutonists' thesis from the simple adherence to the volcanic origin of basalt. We have to wait for a review published on September 9, 1814, in the Société de physique et d'histoire naturelle, about the "origin and the way of formation of basalt" for him to clearly declare that he makes use of this igneous–aqueous liquidity that the theory, named Plutonic, sustains: the theory according to which the state of the globe is the result of a universal conflagration, which must have caused "elevation of temperature and high pressure."

G. A. Deluc, for his part, has an interesting position on volcanism. On July 19, 1804, he reads a review intended for the *Bibliothèque brittanique* called "new observations on the volcanoes and their lavas." Carozzi analyzes this review, in order to show that Deluc is "neptunist-volcanist": granite is sedimentary, whereas basalt is volcanic. But the originality is not in this common position, which places him well within plutonism, but rather in his argument on the origin of lavas. He criticizes Humboldt, still a neptunist, "who neglects the products of fire." He rejects Humboldt's belief that the focal point of the volcanoes is situated in the porphyrys, and seems to prefer believing that volcanoes originate in deeper regions, which would not have any equivalent on the surface (apart from the porphyrys). He reasons thus because of the presence of minerals such leucite and olivine, which cannot be found in any other rocks. And when he alludes to the ledges "in a state of flabbiness, pulverant or muddy," perhaps he is thinking of the observations of Dolomieu (*Journal des Mines,* year VI, volume VII), who is the first to break with the old theory on the formation of volcanoes (by inflammation of coals and pyrites), by postulating a liquid nucleus under the granite. (An analysis by Carozzi in this direction would have been interesting, in order to understand what appeared to me as Deluc's most innovative ideas.)

Deluc similarly criticizes Patrin, for whom the volcanic fires are caused by the fermentation of schists. In July 1806, he carries on the argument with Patrin about the structure of basalt. This argument is published in the *Bibliothèque britannique,* but Deluc presents his review to the Society on the 31st of the month. Patrin is no longer a plutonist, nor even a determined volcanist; he admits a mixed origin, with under-sea volcanism and sedimentation. But Deluc accuses Patrin of using imaginary ideas, whereas one should not lose his way in "vain pursuits." Like his brother, he is careful, above all else, to conciliate science and religion and to subordinate the first to the second.

Additionally, we note about the Deluc brothers that Guillaume-Antoine's election into the society was established with difficulty because of the opposition of Saussure, who bitterly remembered his arguments with the elder brother. It was passed, according to the handwritten notes of L. A. Gosse on January 5, 1795 (the sessions' records stay mute during the agitated periods of the French Revolution). We can add that Jean-André himself was proposed as honorary member only on February 2, 1799, after the death of Saussure.

In September 1799, Deluc presents a review on the geology of the Salève, which will later be published in the *Journal de Physique.* He refuses with his brother to join the Saussurian stampede to explain the valleys not as the product of water erosion, but cracks of tectonic origin. One year later, in October 1800, in a review on the same mountain (about the vale of Monnetier) he contests the theory of crystallization of the mountains that Saussure defends in the volume 1 of *Voyages. . . .* This theory had also been supported by Delamétrie, Director of the *Journal de Physique,* with whom Jean-André maintained a correspondence. This later enabled him, in 1790–1793, to publish most of his ideas. Carozzi takes advantage of this review (published in the *Journal de Physique*) to analyze the "remarks on the granite by the Prussian Leopold von Buch," published in the same issue. The famous naturalist hasn't yet seen the Auvergne, he is a neptunist, as is his master Werner.

Buch's review on Auvergne's volcanoes will be presented in August 1804. Von Buch himself will be received in 1802 by the Society. He will lecture there on a note about the temperature of springs (published in the *Bibliothèque britannique*), which Carozzi analyzes.

The study of the works and reviews analyzed or that of the people invited can also be a measure of the Society's life. Among these last ones, besides von Buch, we can cite Dolomieu (a few days before his death), Volta (who presents a theory on bolides), Escher von der Linth, Biot, Humboldt, Gay-Lussac, and Necker de Saussure.

Concerning the works discussed, besides the Huttonian theory already pointed out (including its debates on the duplicating of Hall's experiments on the crystallization of chalk, which Colladon cannot succeed in reproducing), we note that the gypsum's quadrupedals of Cuvier are mentioned, and next year, the works of Haüy. In 1801 a great debate on meteorites begins, which enables Carozzi to settle a long historical account on the question. Werner's book about sills is presented for its French translation in 1805. Jurine presents a review of Lamarck (Museum's Annals) which discloses his ideas about *Hydrogéologie* on the shifts of position of the center of the earth.

And then, the Society speaks of the dowsing rod for the detection of springs. In November 1804, Vaucher

and Decandolle propose an experiment on the question. Tingry speaks of his shame to see such preoccupations. However, they come back to the question in 1808 and after harsh discussion, a committee is appointed. The account of its proceedings, given during the session of January 19, 1809, is tasty. It reminds us too much of the cavils of our modern parapsychologists to resist the delight of quoting a few lines: A subject who "thinks he recognized in himself a great sensibility to springs and metals" is chosen. "He felt no sensation on approaching an armchair, on one of the arms of which two louis [French gold coins] had been set." The experiments "strongly foretell him the presence of the metal once he has seen it placed, yet they frequently delude him when he ignores its whereabouts." But as always, when the result is really negative, the subject deduces that he is not a good water-diviner!

More pages would be needed to give even a feeble notion of the memoir's contents, which are extremely detailed. I only emphasize what caught my attention during a first quick reading. In fact, it's a work that should be kept in one's library and rethought in every detail.

It is difficult to imagine the years this book cost the author. He used, besides the records of the sessions, the personal notes of L. A. Gosse, which especially helped during the periods when the record is incomplete. But the deciphering must have been very difficult. Albert Carozzi, and with him his wife Marguerite ("collaborator of every day on one continent or the other"), deserve our acknowledgment and admiration for this gigantic work.

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THE OTHER SIDE OF THE MEDAL (A Paleobiologist Reflects on the Art and Serendipity of Science). *Everett C. Olson. 1990. McDonald and Woodward Publishing Company, Blacksburg, Virginia. 182 p. Hardcover, $22.95.*

The study of nature, and the opportunity to pursue that study as a profession, are rewards enough for most scientists. An accounting of findings and insights about how the world works is demanded by the scientific community, although to most this comes naturally from a desire to share their excitement with others. Research publications are the sole literary legacy of most scientific careers: "A New Brachiopod from West Texas" (with apologies to brachiopod specialists) or "Yet Another New Theory of Evolution." These insights, shared almost exclusively with other scientists, are not generally the aspects of our work and life that interest neighbors, relatives, and children. Exploding laboratory equipment, swimming with pirahna, adventures in the field, or intrigue at the lab are experiences we all can embellish in order to entertain others (if we survive them!). For some, age and experience also bring the desire to pass on thoughts about 'Life' in its broad philosophical sense. Most scientists never set down such stories or views, either because we feel that we are just not interesting enough to enough people, or simply never manage to find the time.

Well, Professor Olson is interesting enough and has found the time to treat us to a story of a part of his life and times. *The Other Side of the Medal,* a title that may have meanings within meanings, does not concern the development of far-reaching ideas, nor does it chronicle the events surrounding important discoveries. If the reader is not familiar with the details of Olson's scientific contributions, this book will not shed much light on them; it is not an autobiography or history. It is part yarn and part philosophical dissertation, a rendering of some of the events (those the author considers important or interesting) that shaped his professional life.

The book is divided into two parts. The first (six chapters, 78 pages) focuses on Texas, its Permian fossils, and the people and places that frame the field life of a paleontologist. The second (eight chapters, 100 pages) is a complex account of Olson's travels in the Soviet Union and his interactions with several Soviet scientists, notably I. A. Efremov. From these two rather disconnected halves we can get a sense of time and place, and the role of the recorded events in Olson's life, though little about his perceptions of his own influences on the course of those events. Overall, I would describe this book as consistently readable and entertaining, occasionally thought-provoking, and nostalgic without being sentimental.

For many geologists, time spent in the field is time spent fully awake, in contrast with the sleep-walking routines of office and lab, intrusions of the phone, and the tides of departmental politics. Even though most careers are largely built indoors, it is field-work that makes this tolerable. The descriptions of north-central Texas—the people encountered, the photos of colleagues, cars and collecting sites—will ring true to anyone who experienced field-work in any part of the United States. In a more-or-less chronological series of anecdotal stories, Olson provides an insightful rendering of how the place and its denizens can humble the (self-designated) mighty, arguing that ". . . there is so much to learn from these towns and their people that they must not just fade away. Who will teach humility to our young city people?"

We hear surprisingly little in this first six chapters about the other side of academic life: looking at the fossils, developing ideas and promoting them at meetings, or spreading 'truth' among (and receiving it from) students. There is only brief discussion of how fossil finds in Late Permian strata were crucial to the development of the chronofauna concept, its elaboration into a model of ecosystem organization, and its implications for ecosystem responses to biotic and abiotic changes—a crucial part of the research that ultimately led to his Russian connections. Missing also are accounts of his professional contemporaries and how they

divided the spoils of Texas, or how they received each other's ideas.

The second half of the book requires considerably more attention than the first; it can hardly be described as "light reading." It encapsulates the development of Olson's study of Russian fossils, and his attempt to understand the "dialectical" logic of his closest Russian colleague and friend, Professor I. A. Efremov. So great was the influence of Efremov's thinking on Olson's own ideas about scientific, especially evolutionary, thought (". . . his influences on my outlooks and researches in subsequent decades has been profound" p. 98), that this part of the book is in many ways a biography of Efremov. However, in the details of Efremov's life and thoughts, his scientific and literary pursuits, and the philosophy guiding his writings, we see Olson himself struggling against the strictures of reductionism manifested in the New Evolutionary Synthesis of the late 1950's and early 1960's. Efremov's espousal of a holistic alternative to the confines of evolutionary thinking in the West gave Olson an outlet for thoughts, derived from his work in Texas, that did not mesh clearly with what he perceived as an incomplete New Synthesis.

The second half of the book struck me as more interesting from a historical perspective than the first, which is nonetheless more historical in tone. The descriptions of field-work in the mid-twentieth century convince me, as someone who began collecting fossil plants in the mid-1970's and in Texas as recently as 1989, that field-work is field-work; then and now, digging a hole with a pick and shovel in searing heat is hard work, and the local culture still can seem as alien as those of many foreign countries. Differences are not to be denied (particularly in travel, logistics, and funding), but Olson offers us only a little comparative perspective on how the times and scientific themes of the 1930's and 1940's affected approaches to collecting data and designing a program of field research.

It is in the second part of the book, which focuses on the period from 1959 to 1972, that we can see how Olson struggled to reconcile his own observations with the conventional wisdoms of New Synthesis evolutionary theory, albeit as in a play in period costume rather than in historical narrative. Efremov's apparent confidence in his own perception of the flaws in the philosophical underpinnings of those theories must have appealed strongly to someone who saw his close colleague, Robert Miller, abandon evolutionary biology as a sterile pursuit (p. 122); someone who found the likes of Theodosius Dobzhansky (p. 124), and G. G. Simpson (p. 145) unsympathetic to his growing unhappiness with the lack of fit between a rigid, gradualist, reductionist model of evolution and the fossil record of Late Paleozoic vertebrates. There are useful lessons here for those of us who began our careers after it became acceptable to question the 'rightness' (or at least the all embracing 'completeness') of the New Synthesis and regard vigorous debate about this pivotal topic as essential for the health of the discipline.

The inclusion of some of the illustrations, of letters exchanged with Soviet bureaucrats, and the grim, almost hopeless tone of much of the social commentary revealed in Efremov's letters will puzzle many readers. In addition, much of the description is again anecdotal, giving us only a faint glimmer of the plights and strengths of Soviet vertebrate paleontology in the 1960's. But overall, persistent readers will find it a fascinating (if sometimes inscrutable) look at I. A. Efremov and E. C. Olson.

And what of the title? Is "the other side of the medal" the other side of the Romer-Simpson Medal, awarded to E. C. Olson in 1987 by the Society of Vertebrate Paleontology? Or does it pertain to the Russian saying, reflecting the duality of things and the dialectical view of the world (noted in passing in only one place in the book)? The answer may be both, and possibly more, woven together in a fashion that we can hope is not too devious for linear-thinking reductionists to appreciate fully.

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A CENTURY OF GEOLOGY, 1885-1985, AT THE JOHNS HOPKINS UNIVERSITY. *Francis J. Pettijohn. 1988. Gateway Press, Baltimore (distribution by Dept. of Earth and Planetary Sciences, Johns Hopkins University). 316 p. Hardcover, $20.00.*

CORNELL GEOLOGY THROUGH THE YEARS. *William R. Brice. 1989. College of Engineering, Cornell University. 230 p. Softcover, $10.00.*

Institutional history can be approached in many ways, from the highly personal viewpoint of an active participant to a more detached and descriptive mode, made necessary in part by the passage of time. Some time ago, in his 1984 *Memoirs of an Unrepentant Field Geologist: A Candid Profile of Some Geologists and Their Science, 1921–1981* (University of Chicago Press), Francis Pettijohn provided a splendid example of the former in chapters dealing with his tenure at the University of Chicago and later the Johns Hopkins University. In *A Century of Geology, 1885–1985, at the Johns Hopkins University* he continues this approach, not only detailing the early history of the department but bringing a marvelous personal perspective to his account of the events of which he was a participant. Those years, from 1952 to 1973, include his service as department chairman from 1963 to 1968. William Brice on the other hand, while a 1971 Cornell Ph.D. and an acknowledged beneficiary of extensive assistance from long-time faculty members, is of necessity more reportorial in his account of the history of that department, from 1868 to 1984, in *Cornell Geology Through the Years.* His book, a veritable "gold

mine" of anecdotal material, provides an overview that is particularly useful as a record of the various contributions of Cornell geologists in the context of that era. Both works are important resources and are highly recommended.

Science exists only in a social context and in the later 19th, and most of the 20th century, American academic research institutions (along with governmental organizations and professional societies) provided the structure within which geology developed. This is especially so when geology is considered as a craft, learned by apprentices who are guided and influenced by masters within a guild-like system. While Cornell (founded 1868) is older, Johns Hopkins was established in 1876 and consciously patterned after the German research model. It is often cited as "the first real university in America." George Huntington Williams, who became a one-man department of geology in 1885, had obtained his doctorate in Heidelberg and "brought with him not only the techniques of microscopical petrography but also the tradition of German scholarship." Microscopical petrology became "the new geology" and, under Williams, doctorates were earned by among others, A. C. Lawson who is perhaps the most celebrated of Hopkins' graduates and Florence Bascom who, despite (it is said) attending lectures seated behind a screen, was the first female to earn a doctorate in geology in America. Later the department awarded the first American Ph.D. in meteorology, to O. L. Fassig. Hopkins' faculty in that period included the first American geophysicist (H. F. Reid) and first sedimentary petrographer (M. I. Goldman).

After a time, renewed German influence and an emphasis on structural geology came to Hopkins in the person of Ernst Cloos, younger brother of the renowned Hans Cloos. Cloos served from 1930 to 1968, and as chairman from 1952 to 1963. Pettijohn brought his own unique approach to sedimentary geology to Hopkins upon his arrival in 1952. He served until retiring in 1973 but remaining active as an emeritus thereafter. At the conclusion of Pettijohn's chairmanship, which was between 1963 and 1968, the formerly separate departments of geology and oceanography, as well as a group in meteorology and fluid dynamics, merged into a new department of earth sciences. Pettijohn's account brings the story of the combined department up to 1985, the centennial year of Williams' original department. As a participant during a third of the department's history, Pettijohn set high standards for himself, his students, and the institution with which he was affiliated. This shows in his history which, like his earlier "Memoirs," examines the defects as well as the accomplishments of the department and the individuals about which he writes.

Two concluding chapters are entitled "Hopkins and Academia" and "Hopkins and the Geological Sciences." In the former Pettijohn analyzes the role of geological and geographic environment, administrative support, faculty and curriculum, and finally students in the success of a department; in the latter he reviews the contributions of Hopkins geologists. These include G. H. Williams and microscopical petrology, M. Goldman and himself and sedimentary petrology, H. P. Eugster and experimental petrology, J. D. H. Donnay and crystallography, Ernst Cloos and microtectonics, H. F. Reid and seismology, and John Graham and paleomagnetism. These two concluding chapters provide not only a review of events at Johns Hopkins in those 100 years but an overview of the nature of geology and its transformation in the same period. Pettijohn has performed a service which transcends both institutional and personal history, all of which is supported by numerous photographs, 47 pages of appendices, and six pages of references.

In a different way, William Brice's account of geology at Cornell, while containing an abundance of essential information, is not explicitly concerned with detailing the operation of the department itself (it is less of an "institutional history"), but is taken with the character, personal histories, and accomplishments of individual faculty members themselves. As Brice states in his preface, "I have tried to focus on people who, for one reason or another, seem to stand out from the rest. These are the faculty members who have had the most influence on their students, on the development of the earth sciences, and on the subsequent history of the department . . . . I have chosen to concentrate on faculty and staff . . . I have attempted . . . a work that celebrates real people."

These people proceed from Charles Frederick Hartt, founder of the department 1868 (who worked and died at an early age in Brazil); O. A. Derby, an apparent suicide in Brazil; and Hartt's other protege J. C. Branner (who became president of Stanford University and Herbert Hoover's mentor); Richard Rathburn; H. L. Fairchild (long-time secretary of the Geological Society of America); and W. F. E. Gurley. Subsequent faculty members include Theodore B. Comstock (future president of the University of Arizona), S. G. Williams, H. S. Williams, J. F. Kemp, and R. S. Tarr. Brice details Tarr's experiences as part of a Robert Perry expedition to Greenland and during later Tarr-organized Cornell expeditions to Alaska. After a "period of confusion" that followed Tarr's death in 1912, Brice discusses A. C. Gill, G. D. Harris, Heinrich Ries, and O. D. von Engeln who, until 1965, was associated with the department for over sixty years. The mid-20th century era at Cornell is covered in chapters on J. D. Burfoot and C. M. Nevin, on "Change and Continuity," on "The Postwar Period with [W. S.] Cole and [J. W.] Wells," and on "The Centenary Years." During "The Transition Years," in 1971 the department was transformed administratively into an intercollege department of the College of Engineering and the College of Arts and Sciences. It was also moved physically from its old quarters to a building on the engineering campus. The modern era of reliance on external funding, of global tectonics, of continental seismic profiling and, finally, the acquisition of a new building in 1984 is outlined in chapters entitled "New Faces in the De-

partment," "Islands and Mountains," "COCORP," and "Snee Hall."

Brice's perceptive account of 116 years of geology at Cornell, published in an 8½ by 11 inch format, is abundantly illustrated. Its utility would be enhanced, however, by the inclusion of additional data in tabular form, other than the appendix of a single page entitled "Department Heads and Chairmen."

Institutional histories are diverse and come in many forms. Both Pettijohn and Brice are to be commended for their very fine but different contributions to this genre. Both works are highly recommended.

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ENERGY AND EMPIRE. A Biographical Study of Lord Kelvin. *Crosbie Smith and M. Norton Wise. 1989. Cambridge University Press, New York. 866 p. Hardcover, $89.50.*

Geologists recall the 19th century controversy around Kelvin's calculations of the age of the earth as a satisfying episode when the descriptive, intuitive knowledge of stratigraphers and paleontologists triumphed over the quantified precision of physicists. How Kelvin earned the authority to represent the physics of his day, and the remarkable breadth and unity of his long life's work are less well known among geologists. This book by Smith and Wise will interest any historically minded geologist or geophysicist with its detailed description of Kelvin's work in the context of his times.

Biographers follow the commendable practice of beginning at the beginning. Here are the very first sentences of three biographies of Kelvin: "Lord Kelvin came of a stock which helped to give to the north of Ireland its commercial and industrial supremacy over the rest of that distressful country" (Gray, 1908). "William Thomson, Baron Kelvin of Largs, was born in Belfast on the 26th of June 1824. The family was of Scottish origin" (Thompson, 1910). "Lord Kelvin, revered and respected statesman of science in the golden age of late nineteenth-century British Imperialism, began life not in Great Britain, but in Ireland" (Smith and Wise, 1989).

The Irish question reverberates in these sentences of Gray and Thompson, and Smith and Wise go on to suggest that it was Kelvin's political activity on the correct side of that question, rather than his eminence in science and technology, that was the immediate occasion of his peerage. They credit the Ulster heritage that came to Kelvin through his father as the source of his practical, model-building, measurement-oriented approach to science.

The subtitle, "a biographical study," suggests something other than a traditional biography. The book opens with a 9-page Contents that must be read rather than scanned, and closes with a 23-page bibliography and a 29-page index. In between, the text is divided in four parts: (1) the young Kelvin's Glasgow and Cambridge environment (144 pages); (2) the state of mathematical physics and Kelvin's contributions to it, mainly from the first half of his career (364 pages); (3) the age of the sun and the earth (149 pages); and (4) the environment in which Kelvin's successful technical innovation flourished, mainly from the last half of his career (166 pages). The Preface says that Wise had primary responsibility for Part (2) and Smith the remainder, but there are no easily marked stylistic differences attributable to this division.

Part (1) emphasizes the influence of his father, James Thomson, professor of mathematics at Glasgow College, and describes Kelvin's precocious mathematical beginnings, his days at Cambridge as student and fellow, and his appointment at age 22 as professor of natural philosophy in Glasgow College. He retired from this position 53 years later.

Comparison of the strictly biographical details in Smith and Wise, Part (1), with those in the benchmark biography by Silvanus P. Thompson (1910) suggests that little new was found in the intervening 8 decades. Of thousands of letters available, Smith and Wise say few reveal Kelvin's emotions, but they did find new letters that tell how Kelvin was repeatedly refused by the woman of his choice (she later recorded her regrets). In 1852, he married another who was ill during much of their marriage until her death in 1870.

In some details, the older biography still seems preferable. Kelvin played cornet and french horn and helped found the Cambridge University Music Society. This interest in music appears throughout Thompson, but is hardly noted by Smith and Wise. The faintly comic maneuverings for the Glasgow professorship, orchestrated by Kelvin's father as they waited for the incumbent (Meikleham) to die, are more fully told by Thompson. The day he learned of the long-awaited death was remembered two months later by Kelvin as the date of a C.U.M.S. concert.

Part (2) is an exposition of Kelvin's fundamental science and its relations to the work of his time. It begins with an informative chapter on the origins and aims of the British school of mathematics in which Kelvin was a pivotal figure from his student days through the early years of his professorship. There follow 7 chapters on Kelvin's application of this mathematics to electricity, thermodynamics, and hydrodynamics, and the codification of this approach in the Treatise on Natural Philosophy (with P. G. Tait). Like many scientists, Kelvin's work was built on a few fundamental techniques mastered early in his career and repeatedly relied upon. For Kelvin, these were the mathematics of Fourier and Green, some of which he had independently derived, the thermodynamics of Carnot, and the experiments in energy conversion of Joule.

There is also the blind side of his brilliance: Kelvin's initial disdain for Faraday's interpretation of electrical fields, and Kelvin's life-long failure to appreciate Max-

well's work on electromagnetism. Faraday was not among the notables submitting testimonials supporting Kelvin's candidacy for the Glasgow professorship, although they were by then acquainted and the senior Thomson had urged his son to get his experimental abilities properly on record. Thompson says Kelvin did not ask Faraday because Faraday was known not to give testimonials.

For the geological reader, Part (3) will be the meat of this book. The outlines of Kelvin's work on the age of the earth are reasonably well known among geologists, especially since Burchfield (1975). Kelvin's interest in the subject extended from his prize-winning essay as a teenager at Glasgow College, continued with his discovery of Fourier, was implicit in his inaugural lecture as professor, reached its peak influence from around 1870 to 1890, and lasted through his life right up to the month of his death in 1907. Kelvin was acquainted with most of the leading geologists of his day and was president of the Glasgow Geological Society (1872–1893) where many of his papers on the subject were initially presented. His attack on Darwin's estimate of time needed for the denudation of the Weald did not prevent him from establishing cordial relations with Darwin's son, George Howard Darwin, whose academic training paralleled his own and who contributed significantly to the geophysical investigation of the change in the length of day which Kelvin had initiated.

Kelvin's objection to uniformitarianism was deep seated; as interpreted by Lyell, the idea turned the earth into a perpetual motion machine, contravening the fundamental laws of thermodynamics he had helped establish. But he gave too little consideration to the possibility that geological field observations could have validity. Field data suggesting a nonrigid earth, the great time required for deposition of strata, and the necessity of time for evolution of species were probably not seriously examined by him. The geologists had damned themselves in his eyes for their ignorance of energy dissipation, and probably this tainted their other findings. When the discovery of radioactivity freed the geologists from his restraint, Kelvin stayed with the classical arguments.

While geologists find this a satisfying episode, vindicating their observational science, there is a disquieting subplot. Throughout the last half of the 19th century, geological estimates of the earth's age converged toward Kelvin's, attracted no doubt by his great authority. As the data forced Kelvin, somewhat reluctantly, to reduce his estimate, leading geologists found reason to reduce theirs. Human nature has not changed, and it may be worth considering whether the same process of convergence could not happen today.

Part (4) deals with Kelvin as an enterpreneur, a progenitor, perhaps, of the academically founded science industries that now surround many universities. Kelvin's main commercial applications were to telegraphy, electricity, and navigation, and many of these innovations had what would now be called geophysical applications. A large percentage of Part (4) deals with the context rather than the work itself. For example, in chapter 21 on Kelvin's contribution to navigation, much of the material deals with navigation customs of the day, a brief history of 19th century shipbuilding, and the political implications of Kelvin's yacht. But one does come away with the feeling that Kelvin's connection with maritime work, the trans-Atlantic telegraph, sounding machines, and ship compasses, was inevitable, given the man and the sea-going activity near Glasgow.

This book is the best full length treatment of Kelvin available. For geological readers, it will provide a better understanding of a famous episode in the history of their science.

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CURATORS AND CULTURE: The Museum Movement in America, 1740-1870. *Joel J. Orosz. 1990. The University of Alabama Press, Tuscaloosa. 304 p. Hardcover, $34.95.*

In six long chapters, more or less chronological, the author argues his thesis that American democratic culture molded the early museums and similar cultural organizations in America. After some swings, a compromise was struck between the need for public education and the need for professionalism. This then remains the model followed by our present-day museums. To arrive at his conclusion Dr. Orosz examines ten institutions, three in Philadelphia, three in New York, one each in Hartford, Cincinnati, Baltimore, and Washington in some detail; five others are touched upon in less detail.

A great deal of scattered material is brought together in this work. The best summary that I can give is to list the six chapter headings in full: The Curio Cabinet Transplanted to the New World, 1740–1780; The Moderate Enlightenment, 1780–1800: The Museum for the Respectability; The Diadactic Enlightenment, 1800–1820: The Decline of the Respectability; The Age of Egalitarianism, 1820–1840: The Ideal of Popular Education; The Age of Professionalism, 1840–1850: The Scientists Lead the Way; The American Compromise, 1850–1870: The Synthesis of Popular Education and Professionalism.

This work gives details of some institutions that were only names to me and some that I had never even heard of. Anyone interested in Museology should certainly own this book and dip into it for reference.

Though I encourage readers to obtain and explore this book, this does not mean that the basic thesis is acceptable. For the author, the point of departure is an historical essay by G. Brown Goode (1850–1896) who rendered the opinion that the early history of museums in America was inconsequential. There was

indeed much going on that Dr. Orosz documents, and one of his aims is to refute Goode's rather cavalier judgment. In analyzing my career, I have been struck with the difference between being ahead of one's time and being a trend setter. Timing is important and most of the institutions and organizations described withered because the timing was wrong. In my view, Goode was more right than he was wrong.

Of all those organizations considered, the Philadelphia museum of Charles Willson Peale was by far the most important. Had Jefferson seen fit to urge Federal support from Congress, the entire course of these kinds of institutions would have been different. No matter how significant museums may be as a measure of culture, in the big picture of economics, they are the last to be well supported and the first to be pinched. As good a thesis, if not better, could have been constructed by considering the sources of money and the economic climate. A small group of citizens cannot support a real museum or even a cabinet of curiosities.

To give body to his history, the author treats the history of art galleries, historical societies, and natural history museums. Perhaps the real story is that these skeins were partially intertwined at first, but very shortly became separate entities. Peale, whose 250th birthday is in 1991, ran a highly successful natural history establishment in part by forgoing his art for decades. It is prejudice on my part, but I saw this work as undervaluing Peale and overvaluing Barnum. They are at opposite poles of the museum world.

Peale did invent almost every museum technique known today, not only in display but also in membership, lectures, and even in sale of museum souvenirs. He made a fundamental contribution to knowledge—and brought in the crowds—by mounting a mastodon, the first fossil vertebrate assembled in the New World, and he did support basic research by Wilson on birds. Apart from the founding of the Academy of Natural Science and the Smithsonian Institution, the course was downward after Peale retired. Until after the Civil War, museums were not important centers of research and to argue about tensions between education and research is to erect a Gouldian strawman. Every research worker in a museum, no matter how dedicated or withdrawn, is aware that if the public stops coming in to see the displays, his job will vanish. It was always like that.

I have complained too much, for an author has the right to pursue whatever course he desires and to draw whatever conclusions he sees fit. This is an important book.

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GREAT GEOLOGICAL CONTROVERSIES. 2nd ed. *Anthony Hallam. 1989. Oxford University Press, Oxford. 244 p. Hardcover, $50.00; Softcover, $19.95.*

How scientific controversies are opened, sustained, and closed has long fired the interest of historians, philosophers, and sociologists of science. Special notice has been taken in the past two decades of debates about the earth. A series of volumes on the stratigraphic wars in Victorian Britain and the many publications examining the triumph in the late 1960's and early 1970's of "mobilism" over "fixism" have yielded provocative and sometimes conflicting accounts of the importance of social and cognitive elements in such controversies.

This collection of case studies, the first edition of which appeared in 1983, is a most welcome addition to this important field. As Hallam puts it (p. vii), "focusing upon controversy is helpful because issues tend to get dramatized and the underlying assumptions and attitudes of the protagonists often brought out into the open." Each episode demonstrates this point. Each includes apposite quotations from the major participants, yet Hallam avoids hagiography and Whiggism. He claims no great originality in interpretation but surely his own experiences as a paleontologist inform his choices from the relevant literature. This informs equally his emphasis upon social interaction, personalities and scientific styles, as well as the "evidence of the rocks," as determinants of geological theories and the closure of debates. Hallam constantly reminds us of two salient points. First, ideas do not engage in debates; scientists do. Second, "facts" are an important resource in debates but are neither the unique possession of one group nor unequivocal: facts are, in part at least, shaped by the outcome of controversy. The focus on geology, of course, does leave open the question of the extent to which insights gained through studies of controversies over theories of the earth are applicable to other sciences.

The chapters carried over from the first edition are little changed, but the references have been updated to reflect the most recent scholarship on many of the topics covered. Hallam adds two new chapters for this edition. One, which sketches some of the stratigraphic debates in Victorian Britain, is the least successful of the book. He draws heavily upon Martin Rudwick's *The Great Devonian Controversy* and James Secord's *Controversy in Victorian Geology.* It is a formidable task to abstract these two works so as to convey both a clear understanding of the many issues at stake and the carefully nuanced, detailed arguments on which their resolution turned. Hallam makes a valiant effort, but the result is likely to be quite unsatisfactory to readers previously unacquainted with the relevant geology and history.

Most geologists and general readers are likely to open the book to the new chapter "Mass Extinctions." This concerns the widely publicized furore which erupted in 1980 over whether or not there was a sudden, mass extinction at the K–T boundary and whether this was produced by terrestrial or extraterrestrial causes. This set of related debates remains open and growing: the implications, should the "impacters" achieve closure on their terms, are far-reaching; it engages a wide range

of disciplines and specialties; and the social and scientific interests involved are complex, shifting, and conflicting. It is therefore of unusual interest to those studying scientists in action, all the more so because it appears to bear out the point that facts do not "speak" unequivocally until closure occurs. A comprehensive account of this episode has, of course, yet to be written. Hallam, more so than in the other chapters, must act as historian. He succeeds admirably, both in giving an overview of the episode and in introducing the interested reader to key items in the literature. He deftly summarizes the unfolding of the debate and the major arguments of the contending groups, while maintaining a scrupulous neutrality. This last point is worth emphasizing, for many readers will be aware that Hallam is an active participant in this set of debates, and that at the time of publication he had clearly stated his opposition to extraterrestrial explanations. One might think that this chapter gives the lie to his contention that the "disinterested," "objective" scientist is a mythical being but I suspect that Hallam would disagree. Rather, he would draw a distinction between the demands of one's own research, in which strongly held convictions are a necessary spur, and the demands of writing a piece of "history in the making" which will appeal to and engage the broadest possible readership.

Hallam aims his book at at least four targets: professional geologists, students, other scientists, and the scientifically literate public, including historians of science. He hits all four. It has certainly had a good response from science, humanities and social science students in my own first-year (freshman) course on scientific controversies. It is likely to appeal particularly to geologists but it is, for the most part, generally accessible and intrinsically interesting as a survey of the major changes in geological thought from the 18th century to the present.

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GENERAL VIEW OF THE AGRICULTURE AND MINERALS OF DERBYSHIRE. *Vol. 1. 1811. by John Farey, Sen., with an Introduction by Trevor D. Ford and Hugh S. Torrens (1989), Peak District Historical Society Limited. Variously paginated. Peak District Mining Museum, Matlock, Bath, Derbyshire DE4 3NR, U.K. (£30). A dollar check ($57) should be sent to John Paulson, 4461 Blackbeard Road, Virginia Beach, VA 23455.*

This monumental volume, at 531 pages plus 47 pages of preface and introductory material, is a testimony to an outstanding early nineteenth-century naturalist who surely should be counted among the fathers of geology. However, as a result of the veneration of James Hutton (1726–1797) and William Smith (1769–1839), many of the other remarkable pioneers of geology have been pushed into the background, including even the doughty Abraham Gottlob Werner (1749–1817). To my shame I must admit that until I opened this book I had never heard of John Farey (1766–1826). Yet he is listed in Susan J. Thompson's *A Chronology of Geological Thinking from Antiquity to 1899* as the author of geological observations on faults and erosion. This monumental book, the first volume of a three-volume sequence, is not included in Thompson's chronology.

The modern geology of Derbyshire and adjoining areas consists of a Precambrian outlier known as Charnwood Forest, Carboniferous Limestone and Coal Measures, and Permo-Triassic and Lower Jurassic strata. My first geological publication was on the Precambrian rocks of Charnwood Forest. My field work was done entirely on foot, and I saw many of the exposures which Farey described. My last summer's field examination included the area west of Nottingham shown on Farey's map, where I saw the Permo-Triassic and Jurassic likewise included in Farey's study. Hence, nostalgia made me eager to study this book.

With this incentive, the introduction to the book by Trevor D. Ford and Hugh S. Torrens fascinated me. John Farey occupied a role in England similar to that of Amos Eaton (1776–1842) in the United States. Both were supported by landed gentry, and both completed important studies contributing to agriculture. However, Eaton left a lasting legacy, whereas Farey was consigned to oblivion. Who was this John Farey?

His output was astonishing: 258 published books, articles and notes spanning the entire spectrum of science and mathematics, and even touching on the topic of music are noted in this book's introduction. Farey worked for the Duke of Bedford, and for Sir Joseph Banks, patron of British science and agriculture. Through Banks, Farey met William Smith and became Smith's booster, as becomes apparent through reading Farey's techniques of stratigraphic mapping. Farey and Smith examined the local strata together.

For part of his life, Farey was a land surveyor and in his mapping he emphasized the importance of faults. The Geological Society of London rejected for publication some of his manuscripts; reviews were scornful and sneering. For his Derbyshire study he was paid £450, making Derbyshire one of the most expensive surveys undertaken by the Board of Agriculture (Harrison, 1955). Three volumes resulted from his study. Only the first volume has been reprinted; the total *Report* of 1901 pages was by far the largest ever published by the Board. Forty years later the Geological Society still followed Farey's fault pattern.

Farey's consulting fee impressed me. In 1814 he was paid 2 guineas per day, plus expenses. In the England of 124 years later, working likewise in agriculture, I earned less than one guinea for an 80- to 90-hour week. Taking inflation into account, Farey was paid *quite* well. I found this bit of information most impressive.

Following 47 (unpaginated) pages of introductory material, the facsimile of the book is reproduced in its entire 532 pages. Unfortunately, the five colored maps

and sections which were included in the original have been lost. The book discusses hills, valleys, rivers, rocks, caves, strata, soils, minerals, mines, collieries, mining processes, faults, and the processes of faulting and erosion. Detailed lists of parishes, villages, hills, rock exposures, mines, and collieries are included.

This book was an eye opener for me. In my next course in the history of geology, Farey will be included. Since students enjoy slides of founders of geology, I plan to copy the profile of John Farey found on the title page.

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ERRATA

The following corrections should be noted in Desmond Collins' review of *Wonderful Life* by Stephen Jay Gould, which appeared in Earth Sciences History, v. 9, n. 2, 1990.

p. 163—column 1, paragraph 1, line 11: a comma should be place between "another" and "historical"

p. 163—column 2, paragraph 1, line 8: "1901" should be "1909"

p. 163—column 2, paragraph 2, line 17: should read: "Walcott began his career while *working* on a local farm . . ."

p. 164—column 2, paragraph 2, lines 11–13: the part in quotations should read "hypothetical evolutionary tree reflecting a view of life's history *suggested by the* reinterpretation of the Burgess fauna"

In the heading of the review of *Scientist of Empire,* (ESH, v. 9, n. 2, p. 168), the date of publication, which was inadvertently omitted, is 1989.

BOOK REVIEW PROCEDURES

Because we are now dealing with a commercial printer, an update on procedures for submitting book reviews is in order.

Because production schedules of commercial printers differ considerably from in-house publications, earlier submissions will be required. For the spring issue, the book review editor will need the review by *February 1*; for the fall issue by *August 1.*

Allen Press asks that *all manuscripts be double-spaced and unjustified.* All reviewers are asked to head their reviews in the following format: TITLE (primary title in all capitals; any subtitle may use lower-case letters), author, date, publisher, number of pages, hard or softcover, price. Any further information on ordering a book may be included in parentheses.

Example: **WONDERFUL LIFE. THE BURGESS SHALE AND THE NATURE OF HISTORY.** *Stephen Jay Gould, 1989. W. W. Norton, New York. 347 p. Softcover, $19.95.*

INTERESTING PUBLICATIONS

Since the start of this journal, Editor Gerald M. Friedman has prepared this column. Contributors wishing to list recent books and papers of interest to our membership are requested to send them to the Editor.

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ANNOUNCEMENTS

The directory of women in the history of science, medicine, and technology is currently being updated. Anyone wishing to be included should write for an entry form to: Prof. Alice Stroup, Women's Directory, Department of History, Bard College, Annandale-on-Hudson, New York, 12504, telephone (914) 758-6822.

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Announcing the availability in paperback ($14.95) of *The Behavior of the Earth* by Claude Allègre, published by Harvard University Press. This book was reviewed in *Earth Sciences History,* vol. 9, no. 1, 1990.

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The Board of Directors of Northeastern Science Foundation jointly with the *History of Earth Sciences Society,* has decided to hold a meeting on the History of Geology in its Rensselaer Center of Applied Geology in Troy, New York, in 1992. This meeting is scheduled to combine field trips with sessions of theme-oriented papers and posters. The meeting is scheduled July 29 through August 1, 1992 following the meeting of the British Society for the History of Science, which, jointly with its Canadian and U.S. counterparts, will meet in Toronto, Ontario, Canada, July 25–28, 1992. Toronto and Troy are within less than a day's driving range or about one hour's flight time. Hopefully members will attend the meeting in Toronto and then come to Troy. The field trips return to the hallowed ground of geologic pioneers: Amos Eaton (1776–1842), James Hall (1811–1898), William W. Mather (1804–1859), Lardner Vanuxem (1792–1848), Sir Charles Lyell (1797–1875), Louis Agassiz (1807–1873), and Sir William Logan (1798–1875). Their field locations, and even some of their work stations and graves, will be visited.

* * *

The 1991 Annual Meeting of the History of Science Society will be held in Madison, Wisconsin, 31 October through 3 November. The meeting will run concurrently with the Society for History of Technology's annual meeting and the joint HSS-SHOT Conference on Critical Problems and Research Frontiers in History of Science and Technology. The number of regular HSS sessions will be reduced somewhat because ses-

sions of interest to HSS members will be incorporated into the other meetings. Proposals for sessions and individual papers are due on 1 April 1991. For guidelines on submitting proposals, please contact the HSS program chairs, Albert Moyer and Richard Hirsh, Department of History, Virginia Tech, Blacksburg, VA 24061-0117: E-mail AEMOYER @ VTVM1.BITNET or RICHARDS @ VTVM1.BITNET. For information on SHOT sessions, contact Deborah Fitzgerald, 1225 Orchard Drive, Ames, IA 50010. For details on the Critical Problems Conference, contact Frederic Holmes at Yale or Bruce Sinclair at Georgia Tech.

KUDOS

On October 5, 1990, Dr. Albert V. Carozzi became the first recipient of the Marc-Auguste Pictet medal for outstanding achievement in the history of science. This newly-created award was given by the Société de Physique et d'Histoire Naturelle de Genève on the occasion of its bicentennial ceremonies (1790–1990).

CALENDAR

1991

Summer—IAGA General Assembly, Vienna, Austria. Symposium 6.1 "Pioneers in geophysical research". This interdisciplinary session will deal with the influence of outstanding scientists, the importance of leading ideas and results, and the role of scientific institutions. Symposium 6.2. "Historical data for variability of solar and geomagnetic activity". Topics include variability of the sun over recent millennia; geomagnetic and geophysical aspects; and validity and importance of historical data, sources and observations. For additional details and to contribute an oral or poster presentation, contact: Dr. W. Schröder, Hechelstrasse 8, D-2820 Bremen-Roenebeck, Germany.

June 25–30—Gondwana Meeting, Hobart, Tasmania. Contact: R. H. Findlay, Dept. of Resources and Energy, Box 56, Rosny Park, Tasmania 7018. Phone: 002/30-8333; Fax: 002/44-2117.

July 11–14—International Society for the History, Philosophy and Social Studies of Biology. Northwestern University, Evanston, Illinois, USA. A session on "science and religion" is being organized by C. G. Winder, Dept. Geology, University of Western Ontario, London, Ontario, Canada N6A 5B7.

Aug. 11–24—IUGG, general assembly, Vienna, Austria. Contact: Peter Steinhauser, IUGG Organizing Committee, ZAMG, Hohe Warte 38, A-1190, Vienna.

Aug.—International Congress on the Permian System of the Globe to celebrate the 150th anniversary of the establishment of the Permian System, Perm, Russia. For additional details, contact: Dr. W. Kanes, Earth Sciences and Resources Institute, University of South Carolina, Columbia, South Carolina, 29208, USA.

Aug. 28–30—Events in Earth history, joint meeting of IGCP projects 216, 293 and 303, Calgary, Alberta. Contact: H. H. J. Geldsetzer, Institute of Sedimentary and Petroleum Geology, Geological Survey of Canada, 3303-33rd St. N.W., Calgary, T2L 2A7. Phone: (403) 292-7155; Fax: (403) 292-5377.

Sept.—INHIGEO Symposium. Dresden, Germany. "Museums and collections in the history of mineralogy, geology, and paleontology". Associated field trips. For additional information, write: Sekretariat der GGW, INHIGEO 1991, Invalidenstrasse 43, 1040 Berlin.

Sept. 6–11—2nd International Congress on Paleoecology. Nanjing. Ma Yuying, Nanjing Institute of Geology and Paleontology, Chi-Ming-Ssu, Nanjing, 210008, People's Republic of China.

Sept. 8–12—European Association of Science Editors, meeting, Oxford, England. Contact: EASE, Lawrence, Kansas 66044. Phone: (913) 843-1235; Fax: (913) 843-1274.

Sept. 18–21—Preservation of Earth, meeting, Cologne. Contact: KölnMesse, Messe- und Ausstellungs-Ges.m.b.H. Köln, Messeplatz 1, Postfach 21 07 60, D-5000 Köln.

Sept. 22–27—12th International Congress of Carboniferous and Permian stratigraphy and geology. Buenos Aires. S. Archangelasky, Ms. Argentine de Ciencas Naturales, Av. A. Gallardo 470, Buenos Aires 1405, Argentina.

Oct. 6–18—Preventative conservation for geological collections, course, Kingston, Ontario, by Queen's University, and Canadian Museum of Science. Contact: Director, Art Conservation Department, Queen's University, Kingston, K7L 3N5, Canada.

Oct. 20–24—Geological Society of America Annual Meeting, San Diego, California, U.S.A. Contact: Jean Kinney, GSA Headquarters, P.O. Box 9140, Boulder, CO 80301. Phone: (303) 447-2020.

1992

June 14–17—American Association of Petroleum Geologists and SEPM Annual Meeting, Washington, DC, USA. Contact: Convention Department, AAPG, Box 979, Tulsa, OK 74101 USA.

June 28–July 1—5th North American Paleontological convention, Field Museum of Natural History, Chicago, Illinois 60605. Peter S. Crane, Department of Geology, Field Museum.

July 25–28—British Society for the History of Science jointly with its U.S. and Canadian counterparts, Annual Meeting, Toronto, Ontario, Canada.

July 29–Aug 1—Meeting on the History of Geology, Troy, NY. Field trips, theme-oriented posters and papers. Contact: Gerald M. Friedman, Northeastern Science Foundation, P.O. Box 746, Troy, NY 12181-0746. Phone: (518) 273-3247; Fax (518) 273-3249.

Aug. 1–14—Global Change, International Meeting, sponsored by the American Congress on Surveying and Mapping and the American Society for Photogrammetry and Remote Sensing. Contact: ACSM/ASPRS, 210 Little Falls Street, Falls Church, VA 22046.

Aug. 16–21—Annual Meeting of the Society for the History of Technology. Uppsala University, Sweden. For additional information, contact: Uppsala Turist and Kongress, "SHOT", St. Persgatan 4, s-753 20 UPPSALA, Sweden. Telefax: 46-18132895.

Aug. 24–Sept. 3—29th International Geological Congress, Kyoto, Japan. Contact: Dr. Tadasahi Sato, Chairman, Japanese National Committee on Geology, Inst. of Geoscience, The University of Tsukuba, Ibaraki 305, Japan.

Sept. 21–25—4th Annual Conference on Paleoceanography-Global Change, Kiel, Germany. Contact: ICP Organizing Committee, % GEOMAR, Wischhofstrasse 1-3/Bldg., 4, D-2300, Kiel 14, Germany.

Oct. 26–29—Geological Society of America, Annual Meeting, Cincinnati, Ohio. Contact: Jean Kinney, GSA Headquarters, P.O. Box 9140, Boulder, CO 80301. Phone: (303) 447-2020.

OFFICER REPORTS

REPORT OF THE SECRETARY FOR 1990 HISTORY OF THE EARTH SCIENCES SOCIETY

The Society concluded its first year of the '90's with approximately 500 members and 175 institutional subscribers, representing more than 25 countries. Those numbers far exceed our figures in the mid-1980's, and are at our plateau of the last two years. Volume 9 of *Earth Sciences History* featured the "History of Vertebrate Paleontology in the Rocky Mountain Region" in the June issue, and the "Trans-Atlantic Exchange of Geological Ideas in the 19th Century" in December. Both numbers were well received and attracted new members.

Our Spring '90 election produced another strong "voter turnout." Reaction to the inclusion of mini-biographies of the candidates was positive. William M. Jordan (Millersville Univ.) is our President-elect for 1991. Thomas E. Bolton (Geological Survey of Canada) will be a Councilor for 1991 and 1992. Kennard B. Bork (Denison Univ.) was re-elected to the Secretary's post. James E. Brooks (S.M.U.-Institute for the Study of Earth and Man) concluded his second stint as Program Officer at the end of 1990. The position will be filled by C. E. Nehru (Brooklyn College). A bad-news/good-news situation, concerning the Treasurer's office, occurred in 1990. After serving the Society so well for half a decade, Kenneth L. Taylor (Univ. of Oklahoma) resigned, as of March 1991. Fortunately, our Associate Treasurer, Thomas E. Pickett (Delaware Geological Survey), was already versed in Society procedures and was appointed by President Ursula B. Marvin (Harvard-Smithsonian Center for Astrophysics) to take over the reins as Treasurer. We owe Ken Taylor a huge vote of thanks for all of his work, largely unseen by the membership at large, in keeping up with the myriad chores as Treasurer of a far-flung organization such as H.E.S.S.

As you learned in Gerald M. Friedman's editorial in Volume 9, Number 2, the Society is moving its production phase to Allen Press. Gerry and his staff in Troy have done a fine job of shepherding our journal from its inception in 1982 to the eve of its tenth birthday. The evolution from camera-ready copy and minimalist illustrations to desk-top publishing and excellent reproduction of photographs will now take another step up the final-production ladder.

This is perhaps the moment to make a brief pitch for helping the Society grow to meet its expanding services. In 1989 we produced a world-wide membership Directory, this year we are moving to a professional printer, and during this time all phases of running the Society have increased in cost. Our membership and subscription rates are exceptionally low, particularly when compared to journals costing ten to fifty times our annual rate. If you can help us gain new institutional members by contacting librarians and institutional officers, it would be greatly appreciated. Just drop me a note if you would like to have some H.E.S.S. membership brochures to distribute to colleagues. Both the Society and the history of geoscience would profit from having *Earth Sciences History* available to students and professionals around the world.

REPORT OF THE TREASURER FOR 1990

Total Society revenues accounted for by the Treasurer and Associate Treasurer for 1990 totaled slightly under $17,000 (from membership dues, subscriptions, sale of back issues, interest, and contributions). Mainly because of increased journal production costs—which not incidentally have made it possible to improve the appearance of *Earth Sciences History*—the Society's uncommitted balance as of the end of 1990 declined somewhat from the previous year.

So that readers will not be misinformed about two finance-related points on which inadvertent errors appeared in the last number, I wish to make two corrective statements: (a) The institutional subscription rate for *Earth Sciences History* remains $30 per year (not $25), where it has been set since 1990; (b) The Society has no plans to contract for fulfillment services to be done for a fee, by Allen Press or any other agent, for the simple reason that we cannot afford it; the work to maintain member and subscriber lists and addresses will continue to be done *gratis* by the Secretary and Treasurer, along with other volunteered work such as renewal services, payment recordkeeping, fulfillment of back-number orders, and preparation of mailing labels.

On behalf of the Society, the Treasurer acknowledges with gratitude the generous contributions received in 1990 from the following individuals:

Michele Aldrich, Albert T. Armstrong, Charles W. Barnes, Kent A. Bowker, A. Brouwer, Albert V. Carozzi, Marguerite Carozzi, Gilbert Corwin, Janet W. Crampton, Robert H. Dott Jr., Ellen T. Drake, Bruce Francis Elchison, John S. Ferguson Jr., Gerald M. Friedman, David H. Geiser, William Glen, M.F.X. Glynn, Gunnar Henningsmoen, David H. Hight, Alan Horowitz, Donald M. Hoskins, B.F. Howell Jr., William M. Jordan, Maurice Kamen-Kaye, Arthur F. Krueger, Walter O. Kupsch, Peter Lessing, David Leveson, Alan Leviton, Joel J. Lloyd, Kathleen Mark, Ursula B. Marvin, Alan P. Mason, David M. McMahon, Robert C. Milici, Anne Millbrooke, Wade E. Miller, Barbara L. Narendra, Sally E. Newcomb, Herbert P. Obodda, William A. Oliver Jr., Thomas R. Osberg, Leroy E. Page, Louis C. Pakiser, Thomas E. Pickett, John James Prucha, George Rapp Jr., Charles K. Scharnberger, Robert R. Shrock, Marie Siegrist, Bri-

an J. Skinner, Hisao Sunouchi, Tsutomu Tanimoto, Keith Tinkler, Carmen Virgili-Rodon, Malcolm Weiss, Peter M. Whelan, Ellis L. Yochelson, George Zammitt-Maempel, Lester G. Zeihen.

Grateful acknowledgement is also made of contributions toward page costs from the United States Geological Survey and the National Park Service.

Dr. Ursula B. Marvin, our Society President, has accepted my resignation as Treasurer effective March 1, 1991, and has appointed Dr. Thomas E. Pickett of the Delaware Geological Survey to succeed me in that office. I have served as Treasurer since 1985, and that is long enough (even with a midterm leave of absence, during which Ellis Yochelson did the work—thanks, Ellis).

The Society is very fortunate that Tom Pickett is willing to take on the Treasurer's tasks. As Associate Treasurer during the past year, he has already been carrying out a significant part of the Treasurer's responsibilities, including maintenance of records for institutional subscribers, fulfillment of orders for back numbers, and preparation of mailing labels for issues sent to institutional subscribers. Tom will be an excellent Treasurer.

On stepping aside as Treasurer, I wish to thank all those who have aided the Society during the last half-dozen years as Assistant Treasurers in Canada, the United Kingdom, Australia, Spain, and West Germany.

Respectfully submitted,
Kenneth L. Taylor