

BOOK REVIEWS

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TO A ROCKY MOON: A Geologist's History of Lunar Exploration. Don E. Wilhelms. 1993. *The University of Arizona Press, Tucson.* 477 p. Hardcover, \$29.95.

This lengthy and detailed account of lunar exploration and science strikes an admirable balance between personal memoir and history. As a history it provides a detailed and contextual account of lunar geology during the 1960's and 1970's, and a less-detailed but informative account for the rest of the century. As a memoir it provides an engaging story of the scientific exploration of the moon as seen by one of the activity's more important behind-the-scenes scientists.

Through the NASA History Series and a variety of independently published histories, memoirs, and popular accounts there is now a considerable body of literature treating spacecraft exploration of the Moon from institutional, administrative, engineering, political, and personal perspectives. Wilhelms' book is a welcome addition to the very small portion of that literature dealing with science. It complements historian W. David Compton's *Where No Man Has Gone Before. A History of Apollo Lunar Exploration Missions* (Washington, D.C.: NASA History Series, 1989) which provides a good archives based account concentrating on programmatic, institutional, and administrative aspects and general scientific developments. It also complements Bert [Elbert A.] King's excellent but much shorter memoir, *Moon Trip: A Personal Account of the Apollo Program and Its Science* (Houston, TX: University of Houston, 1989). King, also a geologist and first curator of the returned lunar samples, worked at the NASA Manned Spacecraft Center in Houston as part of the in-house scientific group who planned for scientific lunar exploration, astronaut training, and care and analysis of the returned samples.

Wilhelms discusses the six piloted landings and three voyages around the Moon between 1968 and 1972, as well as a multitude of instrumented spacecraft from the US and the Soviet Union that flew before, during, and after Apollo. Wilhelms was active in the several teams and groups who designed missions, recommended landing sites, planned the surface activities, trained the astronauts, and analyzed their findings.

As a freshly minted Ph.D., Wilhelms joined the new Astrogeology Branch of the U.S. Geological Survey late in 1962, not long after its formation. While Apollo's

mission had more to do with politics, scientific considerations were important in two respects. First, engineers and planners needed lunar science in order to design the spacecraft and conduct the missions. Second, investigating the nature and origin of the Moon was the main scientific justification for the project. To assist in these activities, NASA had encouraged (and funded) the creation of this new branch under the leadership of the enthusiastic and ambitious Eugene Shoemaker.

The USGS Astrogeology branch was probably the largest single scientific group devoted to lunar science. Their orientation was decidedly geological and, more specifically, stratigraphic, reflecting the intellectual commitments of Shoemaker, who had founded lunar stratigraphy in the late 1950's through analyses of impact craters on earth and moon. They did not, however, enjoy hegemony in lunar science or lunar planning. A multitude of standing and ad hoc committees, science divisions at NASA headquarters and at its Manned Spacecraft Center in Houston, the Lunar Science Institute (created in Houston by the National Academy of Sciences at NASA's request), and various other groups and individuals all worked at scientific interpretation, planning, and execution. Lunar science included many disciplines other than geology. While Wilhelm's account is unabashedly and frankly written from his personal and institutional perspective, he does not neglect these many other actors. His descriptions of events, institutions, and personalities is refreshingly vivid and forthright. He praises those he thinks worthy of it, and gives his criticisms honestly yet without being mean-spirited. Historians of the earth sciences will be interested to know, for example, that debates concerning the validity of field techniques or conflicts between geological and geophysical approaches are by no means confined to this planet alone.

Wilhelms and his colleagues pursued their scientific goals through telescopic observation, terrestrial field work on presumed analogues to the lunar features, and a suite of spacecraft that relayed images of the lunar surface as they sped toward impact, landed, or later orbited the moon. Combining these with data from other sciences and activities, the geologic map and the report or scientific paper became the medium by which theoretical assertions were put forth. However, more than just scientific understanding was at stake. Interpretations of the lunar conditions and history were translated into significant investments in hardware, choices of experiments, location and timing of landings, specific detailed activities for the astronauts' field

traverses on the moon, etc. Wilhelms recounts equally and without apology the cases in which this background research faithfully guided later activities, and those in which planners were misled by theoretical commitments later discarded. On balance, he finds that the system, for all its messiness and inefficiency, worked well. Geological aspects of lunar exploration were, by his account, rather well planned and executed within the confines of existing theory, technique, and resources. There were few overt blunders, and the missteps were understandable for an exploratory enterprise.

He does at times marvel at the resilience of some of his colleagues' pet theories in the face of what most others considered fatally disconfirming evidence. He evenhandedly marvels at some of this own theoretical commitments that now look implausible in retrospect. His true laments are reserved not for blunders but for missed opportunities. Some of these were the result of the unfortunate lack of clairvoyance that frustrates all of us. Some were the regrettable results of accidents, such as the crippling of the Apollo 13 spacecraft enroute to the moon. This cascaded through the future flight schedule and landing opportunities. It also, though Wilhelms does not say this, only increased the conservatism of the flight planners and controllers at Houston and added to the already strong desire in some quarters to get Apollo over with before something worse happened.

Wilhelms is most disappointed over the opportunities missed because of the cancellation of very nearly bought and paid-for scheduled missions. Wilhelms advances the usual suite of factors that historians have debated for years—the stress of the Vietnam war and the Great Society on the already faltering economy, the boredom of engineers and NASA managers with things that have already been achieved, the faltering interest of the nation as a whole as reflected in the television networks showing their usual fare instead of live television from the moon, the desire of President Nixon to rid himself of the Kennedy-Johnson legacy and procure a space achievement of his own, etc. He fares no better than we in comprehending how decision makers could junk such a hard-won infrastructure for what seemed to be miniscule near-term savings. Yet even here Wilhelms' evenhandedness shows itself. He believes that the original schedule, which would have ended with Apollo 20 instead of Apollo 17, would have "skimmed the scientific cream in a cost-effective way." (p. 337) Far from considering scientific exploration a birthright in a reasonably wealthy industrial society, Wilhelms concedes and accepts that science was only one, probably minor, motivation. "So the glass is half-empty. But it is also half-full." (p. 338).

Wilhelms bases his historical and scientific assertions on a solid foundation of published literature, including, thankfully, many citations to relatively obscure "grey literature" that is often difficult to identify or locate in standard searches. This is supplemented by references to various minutes and reports presum-

ably distributed and hopefully surviving in various institutions' archival collections. Moreover, he provides from his personal recollections a wealth of unique contextual information concerning how some of these reports and papers were "really" generated. His account truly shines when he provides his own insights into the events in which he was involved directly and in his pithy descriptions of colleagues. The reader is provided a vivid picture of science and technology in action, as practiced by real human beings.

Wilhelms does a good job of documenting his various assertions, and the notes contain much amplifying information and further citations. However, no repository information is given for some of the more obscure sources. Aside from a few citations to interviews, telephone conversations, and letters from colleagues, there are no other archival or manuscript sources mentioned. I raise this issue not to criticize unfairly the present work, nor to demand unreasonably that scientists writing memoirs slavishly follow the professional standards of historians. I was persuaded by the author's text and style that his assertions were well-founded and his reconstructions of events and issues authoritative. But the big question remaining was, where are the unpublished papers and documents that underlay this fascinating story? This concern is addressed more to the readers of this journal, especially those writing or contemplating writing similar works.

For the sake of interested readers, I should answer at least partially my own question. The history offices or divisions at NASA Headquarters, the Johnson Space Center, and the Jet Propulsion Laboratory maintain extensive collections and finding aids to relevant materials. The National Archives in Washington, D.C. holds the records of the U.S. Geological Survey, including some materials of the Geologic Division relevant to the founding of Astrogeology. The exceptionally rich and valuable collections of Astrogeology's first branch chiefs, Eugene Shoemaker and Hal Masursky, have recently been accessioned and made available to researchers at the National Archives branch in Laguna Niguel, California. The disposition of Wilhelms' own papers are, as of this writing, not yet settled; they reside with him in San Francisco. There is a transcribed oral history interview by Ronald Doel in the collections of the Center for History of Physics, American Institute of Physics, in College Park, Maryland.

The illustrations are carefully chosen and help one follow the text, especially the maps showing traverses made by Apollo astronauts on the moon. Unfortunately, they are reproduced at such a scale as to require a magnifying glass to read. Further, it would have been helpful if they had been numbered and mentioned at appropriate places in the text. The appendices, notes, bibliography, and index are all well done and very useful.

All things considered, this book was a pleasure to read, informative, and authoritative. As a memoir, it is exemplary. As a historical study, it is reliable and stimulating. I recommend it highly.

GEOLOGISTS SUBJECTED TO REPRESSION (Biographical Materials). L. P. Belyakov, E. M. Z. Zablotzky, L. V. Nikolskaya, F. F. Perchonok, compilers. 1992. Ed. S. A. Rudenko, St. Petersburg, Russia. 152 p. (In Russian; no price available)

The amount of Russian literature on the history of geology is extremely scarce, especially biographical papers and reference books. Published information about the repression experienced by Russian geologists was entirely unknown outside of the former USSR until recently. "Geologists Subjected to Repression" is the first biographical reference book, elucidating the blood-stained pages of the history of geology within the territory of the former USSR, throughout the period of communist rule.

This book tells about 400 geologists and other people peripherally participating in geology who were subjected to various forms of repression. For example, the book discusses the arrest of members of the Provisional Government in the Winter Palace in October 25, 1917 (A. V. Liverovsky, P. I. Palchinsky) and victims of the "Red Terror" in 1919–1920 (A. V. Adrianov, P. Ya. Armashevsky). Also documented is the persecution of dissidents at the beginning of the 1980's (M. N. Kolyada, M. N. Landa). Names of geologists are found in the lists of repressed persons in almost all of the significant actions taken by various State punitive bodies. The book also describes specific repressive actions, including repression in relation to the break-up of the Geological Committee in 1928; to oil exploration in 1929–1930 and 1937; to sabotage and espionage activities of counter-revolutionary groups in geological exploration during 1930–1931; to the geophysical branch of "The Pulkovo Case;" to the case of the Leningrad Mining Institute in 1937; and to sabotage in geology in 1949–1950. Repression ranged from searches and short-term arrests to long terms of imprisonment. Death in prison or execution by firing squad was frequently the eventual fate of these people.

It is conceivable that the 17th International Geological Congress, which took place in Moscow in 1937, also initiated repression. Its active organizers, D. I. Mushketov and N. I. Svitsky were arrested even before the Congress convened. Both of these men were shot soon after their arrest. Other active participants and persons involved in the Congress's preparation were repressed soon after the conclusion of the Congress. Repression against the polar geologists M. M. Ermolaev, R. L. Samoilovich, and N. N. Urvantsev also occurred at that time. The peak of repression occurred during 1937–1938. From this book it is clear that during this period (1937–1938), no less than one

fifth of all geologists who were included on these grievous lists were subjected to repression. Most of the so-called "shoot" sentences also occurred during that time. Over a period of eight years the largest geological institution in Russia, the Central Scientific Research Geological Prospecting Institute had seven directors. This rapid turnover of directors was due to the fact that five of these directors were executed in eight years. It seems that the coal-geologist K. A. Voinovsky-Kruger was quite right when he bitterly jested he was lucky that he had been arrested in 1930—otherwise he would have certainly been shot in 1937.

In addition to the striking absurdity of the accusations of counter-revolutionary propaganda, Trotskyism, espionage, and fomenting acts of terrorism, geologists were sometimes prosecuted for "geological crimes," such as wrongly interpreting a geological section, withholding information on the location of deposits, prospecting non-promising deposits, and not exploring promising ones. The so-called "Krasnoyarsk case" in 1949 was the largest among all punitive actions of a geological nature. At that time several tens of geologists were arrested, including such well-known geologists as Ya. S. Edelshtein, I. F. Grigoriev, V. K. Kotulsky, V. M. Kreiter, F. N. Shakov, and A. A. Vologdin.

Reading this book, one cannot help being shocked at the size and scope of repression. Nobody could feel safe. Anyone could be arrested, including the young or elderly, ordinary topographers to directors of institutes, and students to academicians.

Many well-known geologists, the pride of Russian science, were subjected to repression in different years. In addition to those already mentioned, they are A. K. Boldyrev, G. I. Goretsky, A. N. Krishtofovich, F. Yu. Levinson-Lessing, B. K. Likharev, G. F. Mirchink, M. G. Valyashko, and the Bulgarian J. S. Jovchev, among others. Even V. I. Vernadsky, one of the most outstanding scientists in natural sciences of the twentieth century, was briefly arrested; K. E. Bailes' book *Science and Russian Culture in an Age of Revolution. V. I. Vernadsky and His Scientific School, 1869–1945*, was recently published in the USA [A review of this book has been published in *Earth Sciences History*, v. 12, no. 2, 1993—Ed.].

Arrests came absolutely without warning. For example, M. M. Tetyaev was twice decorated with the Order of Lenin in 1948, the highest government award of the former USSR. But in 1949 he was arrested. Ya. S. Edelshtein was decorated with the Order of Lenin in 1949 and was arrested the same year. It is said that some people were afraid of being "in favor," comparing their situation to that described in Friedrich Schillers' famous ballad "Der Ring des Polykrates."

One can only visualize the terrible consequences of this geological repression in Russia. Not only were the human losses from this terror of a severe nature but the negative consequences for the scientific development and advancement of geology in the former USSR are difficult to overestimate.

The book introduces into scientific circulation an enormous amount of materials never published in Russia and can serve as a source of biographical information about Russian geologists subjected to repression. This book is filled with what may appear to be an overly abundant amount of descriptive information about repression. However, such an approach by the authors seems necessary, because, as mentioned above, published information about repression in the former USSR has been extremely scarce. Unfortunately, the book frequently lacks detailed material concerned with the actual scientific activities of the people mentioned in the book or their contributions to geological science. Also an adequate bibliography and other types of reference material are lacking.

The foreword states: "The aim of this publication is to preserve the names of repressed geologists in the history of geology irrespective of their fame" (p. 5). The authors performed vast studies on the collections of factual material and we cannot help but admire their efforts. They fulfilled their aim brilliantly. Unfortunately the book, which is very interesting both for geologists and historians, is published in small quantities and only in Russian (without any summary in English). It is therefore unavailable for those who do not know Russian.

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BRIEF HISTORY OF GEOLOGY. Wang Zhixian and Wang Hengli. 1983. *Henan Science and Technology Press, Beijing*. 266 p. (In Chinese; no price available)

This is quite a remarkable book. In only 266 pages of text, Wang Zhixian and Wang Hengli, two professors at the China University of Geosciences (Beijing), describe the development of ideas about the Earth and modern geologic thought in both China and the world starting about 2000 B.C. They evaluate important milestones of geology and scientists involved in these events as well as their contributions to the development of geology.

China has long been known as one of the ancient cultural centers of the world. The authors present a summary overview of existing knowledge about minerals, rocks, geologic processes, and fossil remains in ancient China before the fifteenth century A.D. Much ancient geological knowledge in China is so similar to that of the modern world that some names of minerals such as "shiyi" (quartz) and "cishi" (magnetite) are still used by Chinese geologists.

However, modern geological theory in China comes from the West. It was not until the end of the nineteenth century that modern geology developed in Chi-

na. The authors speak highly of activities of foreign geologists in China and believe that the research work carried out by them constituted an important part in the earlier development of modern geology in China. Amadeus W. Grabau, an eminent American geologist, is one representative among them. He devoted the latter half of this life to geological science of China.

The authors do not discuss, however, the reason why ancient geological knowledge of China did not become the modern theory. Also, this book is written in Chinese and may be too difficult for many Western Scientists to use. So I do not believe this book will be widely adopted as a textbook for university in the West, and the distribution of the book will therefore be limited. The book should, however, most definitely be used as a reference for research on earth science history or by people interested in the Chinese history of science and technology. I recommend it highly.

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Editor's note: The existence of this book has only now come to light, with the re-establishment of relations with China.

LANGUAGE AND EARTH. Elective Affinities between the Emerging Sciences of Linguistics and Geology. Bernd Naumann, Frans Plank, and Gottfried Hofbauer (eds). *Studies in the History of the Language Sciences*, 66, Benjamins, Amsterdam/Philadelphia, 1992. 445 p. Hardbound. \$110.00.

This book is a selection of papers, eleven in German and six in English, written by thirteen linguists and four geologists, who met in Germany in October 1989 to discuss the mutual influence of their respective disciplines. Since the foreword mentions that the widening gap between the sciences and the humanities had actually led to the meeting, I was expecting to find typical cases discussed by linguists that would be understood by geologists and vice-versa, to fulfill the purpose of bringing together the sciences and the humanities.

Unfortunately, most papers by linguists deal merely with nineteenth-century affinities, metaphors, analogies with earth scientists in their respective search for the origin of languages or the origin of the Earth, as for example Georg Christian Fuchsel's comparison of "youth, adulthood and old age in both language and the earth." Furthermore, with reference to Fuchsel's numbering of rock layers in correspondence with their decreasing relative age and his awareness that there is "yet to be found under the deepest layer some kind of 'basic rock' [he probably meant basement] (the so-

called *Grundgebirge*), appropriately labelled X since nothing was to be known about the beginning and duration of its formation" (p. 48), Bernd Naumann merely linked this unknown origin in geology to the "metaphysical hole" mentioned by Jacob Grimm for the origin of languages without wondering why Füchsel had come to such a conclusion. Similarly, Wolfert von Rahden mentioned that Füchsel's "inquiring glance at stones and fossils reveals the abyss of time which provokes a shift in the new paradigmatic thinking to come [in linguistics]" (p. 289) without giving any explanation about Füchsel's geological investigations which would have been crucial for the understanding between linguists and geologists.

Some linguists believed moreover that 19th-century linguists borrowed not from geology but from other disciplines, biology in particular. Clemens Knobloch said that the origin of mankind had not much relation to earth sciences because "nature does not have a purpose" (p. 76). Ulrich Wyss, likewise, mentioned that Jacob Grimm had no room for metaphors from the earth history (p. 157). William Dwight Whitney saw some analogy but nothing more between linguistics and geology because "in the formation of geological strata, the ultimate cognizable agencies are the laws of matter" . . . in languages, the ultimate agencies are "intelligent beings" (p. 277).

The only exception among linguists is Frans Plank, who made the effort to include both geological and linguistic explanations in his paper "Language and Earth as Recycling Machines." For instance, he said that Adam Smith, the economic theorist, believed that languages resembled machines. When first invented machines were extremely complex but after succeeding improvements, they became gradually more and more simple and produced their effects with fewer wheels, and fewer principles of motion. "In language, in the same manner, every case of every noun, and every tense of every verb, was originally expressed by a particular distinct word, which served for this purpose and for no other. But succeeding observation discovered that one set of words was capable of supplying the place of all that infinite number, and that four or five prepositions, and half a dozen auxiliary verbs, were capable of answering the end of all the declensions, and of all the conjugations in the ancient languages" (p. 223). Thus Plank explained the progress of language to his colleagues, the geologists. Turning to geology, Plank then gave a good insight into Hutton's reaction to James Burnet's rather pessimistic view of the Earth's future which stated: "For whatsoever moulders or is washed away from [the mountains] is carried down into the lower grounds, and into the sea, and nothing is ever brought back again by any circulation. Their losses are not repaired, nor any proportional recruits made from any other parts of nature." (p. 242). Hutton wanted to find a way to repair the machine, which he did, "thanks to the crucial repair mechanism, reflected, for instance, in intrusive veins of granite . . . observed by Hutton at Glen Tilt and

elsewhere" (p. 244). With these words, Plank introduced the sciences to the humanities.

The relatively few geologists present, Wolf von Engelhardt ("Die Namen der Steine. Zur Sprache in deutschen geowissenschaftlichen Texten des ausgehenden 18. und beginnenden 19. Jahrhunderts"), Otfried Wagenbreth ("Bernard von Cotta's 'Law of Development of the Earth'"), Gordon Y. Craig ("James Hutton's Geological Vocabulary"), and Helmut Hölder ("Sprachliches im Werk des Tübinger Geologen und Paläontologen Friedrich August Quenstedt's als Beispiel 'volknaher' Wissenschaftsvermittlung im 19. Jahrhundert") presented very good papers but touched the field of linguistics only from a distance. Craig's paper ended with the ironic thought: "Even today experienced geologists differ in what is meant by a simple rock name . . . I suppose that that is the way with words!" (p. 409)

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SCENES FROM DEEP TIME: EARLY PICTORIAL REPRESENTATIONS OF THE PREHISTORIC WORLD. *Martin J. S. Rudwick. 1992. University of Chicago Press. 280 p. \$45.00 (cloth).*

Several years ago, Martin Rudwick pointed out to historians the importance of examining visual materials associated with scientific texts. This book, a historical analysis of pictorial representations of prehistory, is the culmination of that effort. Beginning with the discussion of a biblical tradition that still dominated in the eighteenth century, the author examines the origin and development of a form of illustration that by the mid-nineteenth century had become a well-defined genre. In so doing, Rudwick explores largely unknown territory and opens an important new perspective on the history of the earth sciences and for understanding the factors that influence visual forms of scientific representation.

The book offers many noteworthy contributions. First and foremost, are the large number of illustrations, over 100, reproducing the work of nineteenth-century artists and scientists. Most of the creators and their illustrations are relatively obscure, and Rudwick's text is primarily devoted to describing the visual scenes that gradually became an integral feature of paleontological publications. Whole chapters are devoted to the works of Franz Unger and Louis Figuier. Those scientists produced some of the first pictorial images of distinct stages of geological time. They were also innovators in providing public recognition for their artists, thereby creating a partnership between scientist and artist that made the latter more than a mere tech-

nician. The most interesting and substantial section of the book is Chapter Two. There Rudwick examines Cuvier's manuscript drawings of fossil mammals with inferred skin and musculature, pictures that are much more revealing and lifelike than those in his published work. Here too the author discusses the portrayal of William Buckland entering a prehistoric scene, and Henry De la Beche's representation of life in ancient Dorset, a highly innovative illustration that would not be matched for over thirty years.

While the book is principally a descriptive, narrative account of the illustrations, Rudwick also examines interpretive issues. He effectively demonstrates that the development of the genre was due to more than the accumulation of additional and better fossil material. The scenes from prehistoric life are historical constructs, and Rudwick analyzes the factors that influenced the production of those representations. At a time of political and philosophical constraint, visual representations of ancient environments and extinct animals were considered "mere speculations" and remained a marginal activity. Unlike the portrayals of recent animals and environments, which all could verify, the representation of prehistory required the scientist and artist to make the audience virtual witnesses to scenes that no human had ever viewed. In some cases, such as Conybeare's depiction of Buckland entering a prehistoric cave or the imaginative illustrations of prehistoric life and its latter day excavation in a work by August Klipstein and Johann Kaup, contemporaries sought to cross the epistemic barrier between past and present. More frequently, scientists and artists drew on existing practices in landscape and natural-history painting and the established use of accompanying text. Such conventions enabled audiences to comprehend representations of prehistoric life. Other more melodramatic works tapped into the widespread emotional belief in the alien character of extinct creatures.

Rudwick's study is a valuable analysis of the history of this genre; however, his decision to offer only suggestive "interpretive directions" presents some problems. While he emphasizes the influence of landscape and natural-history painting on representations of prehistory, there is little discussion of those traditions. Despite the analysis of ancient scenes as the products of historical construction, the work does not examine a significant aspect of that process: the relationship between existing empirical evidence (the fossils) and pictorial representations. There is no investigation of how theoretical commitments or accepted assumptions, such as the balance of nature, influenced particular portrayals. Rudwick maintains that scientists initiated scenes of prehistoric life, although further analysis of public shows or other aspects of the culture of popular science may provide a stronger case for the impact of popular demand on scientific production. This is a highly important work that discounts any strictly empirical interpretation of the development of pictorial images of prehistoric life and indicates how contem-

porary conventions influenced visual representations. Yet by casting his net so widely and eschewing theoretical interpretation, the author leaves the reader searching for a more detailed, contextualized discussion of scientific and artistic practice and of the dynamic relationship between theory and practice.

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EUSTASY: The Historical Ups and Downs of a Major Geological Concept. Robert H. Dott, Jr., editor. 1992. *Geological Society of America Memoir 180*. 111 p. Published by The Geological Society of America, Boulder, Colorado. 111 p. \$45.00.

Review of this book generated nostalgic recollections. In 1964 when I became editor of the *Journal of Sedimentary Petrology* the science of sedimentology had blossomed out to the extent that it had displaced the science of stratigraphy. During the 1960's and early 1970's while I served as editor, stratigraphy had merged into sedimentology. My co-authored textbook *Principles of Sedimentology* (with John Sanders, 1978) reflected this merger by stating (p. 1) "sedimentology includes sedimentation, sedimentary petrology, stratigraphy, and sedimentary tectonics"; further, sedimentology is defined as "the geology of sedimentary deposits," and "the goal of sedimentology is to enable a geologist to interpret the vertical and lateral relationship of sedimentary strata," a definition which is now again reserved for stratigraphy. In fact, Friedman and Sanders (1978) used the term "megasedimentology for the scientific study of vast regions, including entire sedimentary basins, lithospheric plates, or fold belts."

However, in the 1980's stratigraphy expanded through sequence and seismic stratigraphy so that the successor textbook to "Principles of Sedimentology" had to be renamed "Principles of Sedimentary Deposits: Stratigraphy and Sedimentology" [co-authored with John Sanders and David Kopaska-Merkel, 1992; reviewed in this issue.—Ed.]. Much of this change in emphasis from sedimentology, (i.e., sedimentological processes and facies) to stratigraphy is the direct result of Exxon's seismic and sequence stratigraphy, which is one of the culminating chapters in this volume under review. In fact, the objective of this book is to relate the history of concepts of worldwide changes of sea level from Noah's flood of biblical fame to Exxon's sequence and seismic stratigraphy. According to P. R. Vail, Exxon's seismic sequence stratigraphy ranks with the plate-tectonics revolution as one of the breakthroughs in modern geology.

This book is a collection of nine papers presented at a symposium of the History of Geology Division of the Geological Society of America. I was present at this symposium and noted that the audience sat pa-

tiently through the discussion of the history of sea-level changes (eustasy) through eighteenth to twentieth century thoughts of giants and heroes like de Maillet, Eduard Suess, T. C. Chamberlin, A. W. Grabau, J. A. Udden, Marvin Weller, and Harold Wanless, but their focus was on one of the final papers, more specifically Peter Vail's discussion of the evolution of seismic stratigraphy and the global sea-level curve. Seismic sequence stratigraphy claims compelling evidence of synchronicity of major packages of strata on widely separated continental margins. In his paper Vail shows how his research group at Exxon convinced management of the reality of this synchronicity. Yet many geologists have remained skeptical of this interpretation.

Of the scholars mentioned, the French naturalist Benoît de Maillet (1656–1738) under the title of Telliamed (the author's name spelled backward) explained many original ideas about evolution of celestial bodies and presented the results of his numerous studies of the ocean and of marine sediments. Based on the emergence from the sea of a rock noticed by his grandfather, de Maillet decided that such recent lowering of sea level was part of a more general process. Accordingly, he undertook studies of modern nearshore areas, including observations of the shallow sea floor using a diving apparatus. De Maillet deserves much more credit than he has received heretofore. Many of the naturalists of the eighteenth century in France and elsewhere clearly borrowed liberally from de Maillet's writings; A. V. Carozzi explains details of this borrowing in his chapter.

A. Hallam introduces Eduard Suess, who coined the concept of eustasy. R. H. Dott, Jr. explains T. C. Chamberlin's hypothesis of diastrophic control of worldwide changes of sea level, which he claims to be a precursor of sequence stratigraphy. According to M. E. Johnson, A. W. Grabau, in his *The Rhythm of the Ages*, related what is now called sequence stratigraphy to eustasy. R. L. Langenheim, Jr., and W. J. Nelson argue that the idea of glacially driven eustasy has returned as a favored explanation for Carboniferous cyclothems, and R. C. Buchanan and C. G. Maples state that R. C. Moore was among the last of his contemporaries to accept the importance of glacial eustasy for sea-level changes. In the final chapter, which follows that of Vail, Kendall et al. illustrate the Upper Jurassic and Cretaceous sequences in the Persian or Arabian Gulf and Gulf of Mexico, but present their terms in mechanistic computer simulation.

I enjoyed reading this most interesting volume and recommend it to those interested in the history of geology. As the modern Dutch geologist Ph. H. Kuenen said "no geology without marine geology," and sea-level changes are among the most critical concepts in marine geology.

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OBSERVATIONS AND INTERPRETATIONS OF HAWAIIAN VOLCANISM AND SEISMICITY, 1779–1955. An Annotated Bibliography and Subject Index. Thomas L. Wright and Taeko Jane Takahashi. 1989. University of Hawaii Press, Honolulu 270 pages. Hardcover, \$30.00.

HAWAII VOLCANO WATCH: A Pictorial History, 1779–1991. Thomas L. Wright, Taeko Jane Takahashi, and J. D. Griggs. 1992. University of Hawaii Press, Honolulu 162 pages. Hardcover \$42.00; Softcover \$24.95.

The historical development of volcanology in Hawaii has been admirably documented in two recent books, one by Tom Wright and Jane Takahashi and the other by the same authors along with J. D. Griggs. The first is an extraordinary compilation of references, including not only scientific publications but also newspaper accounts and personal diaries, covering the period from the arrival of the first Europeans down to 1955 when the Hawaiian Volcano Observatory took on its modern form and observations became more formalized and systematic. Following a short introduction and notes on sources, the main body of the book consists of a bibliography with 1298 entries, each with a comment on the nature of the article. These entries are cross referenced in an appendix, first by date of publication and then by serial title and date. Finally, a detailed subject index provides a guide to several hundred individual topics.

The bibliography is confined almost exclusively to American and other English language sources. I find it hard to imagine that any American reference of importance has been overlooked. The only omission of a significant foreign language paper I noted was the 1928 paper in which LaCroix first pointed out the tholeiitic character of Hawaiian basalts. There may be others, but they could not be many. The commentaries accompanying the entries will prove invaluable to anyone looking into these original sources, for they summarize the content of the article and, where appropriate, appraise its importance and reliability. Newspaper accounts of minor eruptions and earthquakes get only a few words, but certain books and important scientific articles have as much as a full page, often with reproductions of original illustrations.

The second book, though it covers the same period, is quite different. Designed to portray the graphic illustrations and observations of early visitors and witnesses of eruptions, it is essentially a collection of 214 photographs, maps, and drawings arranged in chronological order with extensive captions and a brief text. There is only minor duplication of the other volume.

The quality of reproduction of the illustrations is excellent. At least half of these are in color, including many spectacular photographs of recent eruptions. The selections and choice of scales seemed to have been made with popular sales in mind. A modern mystical drawing of questionable value is included twice, once at full page size, while the first map of the island of Hawaii, made by a member of Cook's crew, is reproduced on such a small scale that it is almost useless. The first map of Kilauea Caldera is so small that, even with a magnifying glass, I could not read the lettering.

The commentary is not a history of the volcanoes but an account of how early events were recorded and how, with time, these developed into systematic scientific observations. Although most of the early observations were made by nongeologists, mainly missionaries, their quality is surprisingly good. In fact, as the authors point out, they tend to be better than those of some of the experienced geologists who seemed more intent on proving pet theories than providing factual accounts.

The most significant scientific product of this period was, of course, the establishment of the permanent observatory at Kilauea. This was achieved mainly through the perseverance and resourcefulness of one man, Thomas Jaggar. Many of the modern techniques, such as seismic monitoring, measurements of deformation, sampling of gases, and drilling, were developed during the years he was director. Thus, although some of the European volcanoes, such as Vesuvius and Etna, have much longer records and older observatories, the work in Hawaii has been an unsurpassed contribution to modern volcanology.

This has clearly been a labor of love for Tom Wright and his colleagues. I understand that it is a prelude to a historical account of studies of Kilauea Volcano that Wright is writing in collaboration with Richard Fiske. If the quality of the present books is any measure of what is to come, we have something important to look forward to.

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THE STERNBERG FOSSIL HUNTERS: A DINOSAUR DYNASTY. Katherine Rogers. 1991. Mountain Press Publishing Company, Missoula, Montana. 288 p. Softcover. \$12.

This is a biographical account of four very professional fieldmen and specimen preparators who, from the 1870's through the 1970's, did the backbreaking work of getting fossils, especially vertebrates, out of the ground and into the public view. I recommend this book to anyone. The author, a retired professor of journalism, holds the reader's interest, and uses very

little scientific jargon. She blends entries from field notebooks with published sources to describe the family life and day-to-day work of four Kansas men who found a very odd way to make a living. Anyone, with any background, can enjoy this book. For the person who knows a bit about the history of paleontology, the book is especially fascinating.

The Sternbergs were a unique phenomenon in global intellectual history. From the 1870's through 1916, they were one unit: a trail-blazing father who was joined by his maturing sons as itinerant, free-lance fossil collectors and preparators. After 1916, each of the four Sternbergs stayed in the fossil business but became independent from the rest of the family. The father, Charles Hazelius Sternberg (1850–1943), grew obsessed with fossils as a young boy. When it came time to go to college, he gave it a whirl, although he was not well prepared. He soon left to become a fossil collector for Edward D. Cope. This led to a career as an independent agent. Sometimes he worked on his own, finding, excavating, and preparing fossils, hoping to sell them to a museum or school. Sometimes he worked on contract with a museum or with a person, such as Othniel C. Marsh, or Henry F. Osborne, or others.

While Charles Sternberg traveled extensively, and remained a productive fieldman almost until the day he died, he did marry and occasionally helped to raise three children who survived into adulthood: George Fryer Sternberg (1883–1969), "Charlie" (Charles Mortram) Sternberg (1885–1981), and Levi Sternberg (1894–1976). When the children were young, Mrs. Anna Reynolds Sternberg made a home for them at several sites in Kansas. As the boys grew old enough to stand the rigors of life in the field, Charles took them with him. George, for example, completed the fifth grade and then began a seventy-year-long career as a background person in paleontology.

While Charles led a hand-to-mouth, nomadic existence for virtually all of his life, his sons sought greater stability. The year 1916 found the four Sternbergs working together for the Geological Survey of Canada. They decided to go their own ways, parting amicably. Charlie, who became the author of many scholarly articles, settled into regular employment with the Geological Survey of Canada and the National Museum of Canada. Levi, who eventually received two honorary doctorates, joined the Royal Ontario Museum. A decade later, George settled into the campus museum of Kansas State Teachers College at Fort Hays. He kept summers free to wander as his father had.

The four Sternbergs found and prepared some extraordinary vertebrate fossils, including a number of dinosaurs with skin recovered through very careful excavation. Sternberg fossils are now on display in Denmark, Germany, Great Britain, and in many parts of North America. Prof. Rogers offers a long list of institutions with exhibits that bear the mark of this unique family.

The field notes of George Sternberg, which form

much of the basis for this book, record the very demanding conditions in which the Sternbergs worked, from Patagonia to Canada. Professor Rogers' text captures some of the uncertainties of expert field men, who were far from affluent, and whose livelihood depended upon good working relationships with people such as Zittle, Leidy, Frick, Gilmore, Kindle, etc. This book is unique. It is the saga of one really divergent American family. And, it is an off-beat source of insight into the history of American paleontology. For those who enjoy nonfiction, Professor Rogers' book is also a good "read," a well-written book, with many excellent photographs from George Sternberg's immense personal collection.

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THE LIFE OF A FOSSIL HUNTER. *Charles H. Sternberg. 1990. (Originally published in 1909.) Indiana University Press, Bloomington, Indiana. 286 p. Hardcover, \$29.95. Softcover, \$12.95.*

Each summer dozens of scientists from around the world make a pilgrimage to the Western Interior of North America to collect the remains of ancient animals that once swam, flew, or roamed the prehistoric landscapes of that area. Many of these modern-day explorers travel in four-wheel drive trucks or ATV's, have electric- or gas-powered jackhammers and saws, and use equipment ranging from backhoes to helicopters to remove fossil bones from a site. But even with the modern conveniences that paleontologists have today, there are many similarities between their field work and that of paleontologists of over a century ago. Charles Hazelius Sternberg's book provides us with a window to view paleontological research during the past century.

Field paleontologists today will be able to relate to many of the incidents described in this book. As in the past, hundreds of hours each year are still spent wandering over unvegetated badlands searching for fossil remains. Camps are still usually a considerable distance from civilization, and burlap and plaster are still part of state-of-the-art collecting procedures. Although confrontations with Indians are no longer a problem, there are still many reasons for concern when doing field work in the western states. Treacherous ridges and bluffs must be traversed in search of fossiliferous deposits, and weather conditions can change suddenly. But the drive to discover rare fossil resources continues to call like a siren to paleontologists. Sternberg summed it up well when he wrote: "What is it that urges a man to risk his life in these precipitous fossil beds? I can answer only for myself, but with me there were two

motives, the desire to add to human knowledge, which has been the great motive of my life, and the hunting instinct, which is deeply implanted in my heart" (p. 203). "... I would make it my business to collect facts from the crust of the earth; that thus men might learn more of the introduction and succession of life on our earth" (p. 17). Today, at a time when commercialization of vertebrate fossils runs rampant, it is instructive to reflect on these philosophies for collecting. Sternberg writes: "There was no money in fossils at that early day, but I prized more highly than money the promise in the letter that my specimens would be studied by competent authority, and that I should receive credit for my discoveries" (p. 20).

This book is exciting to read to anyone who has spent time in the West. It clearly portrays the life and times of a fossil collector who lived and worked in this area of North America for over 50 years. Charles Sternberg (1850–1943) was responsible for the collection of some of the premier skeletal remains that currently reside in museums around the world. Sternberg's book also illustrates to those working in the field that extensive journals are important to enlighten and excite future generations. As this book has been out of print for many years, its re-publication will allow the modern generation of established and aspiring paleontologists to see the challenges of work in the field. This book is also a true "western," filled with all the romance of the West including buffaloes, Indians, and stagecoaches. It depicts a part of the wild West rarely portrayed in books or films. Sternberg's anecdotes of collecting and interactions with the prominent paleontologists of his time are fascinating. He tells a timeless story and paints a vivid picture of the way paleontology was over 100 years ago.

Sternberg not only describes the collecting of specimens and where they eventually were displayed, but he also weaves an exciting story of how the ancient animals lived many millions of years ago. Although referring to fossilized plants, the following statement aptly sums up Sternberg's view on all prehistoric organisms "... the glorious picture is only for him who gathers the remains of these forests, and by the power of his imagination puts life into them" (p. 17). He goes on to write that: "It is thus that I love creatures of other ages, and that I want to become acquainted with them in their natural environments. They are never dead to me; my imagination breathes life into 'the valley of dry bones,' and not only do the living forms of the animals stand before me, but the countries which they inhabited rise for me through the mists of the ages" (p. 204). Sternberg was a true "Big Game Hunter of Ancient Times." He worked throughout western North America in geologic ages ranging from the Permian to the Pleistocene, collecting animals ranging in size from rodents to elephants and in diversity from plants to marine reptiles. Many of his interpretations regarding these fossil remains are still today being discussed (e.g., the stance of dinosaurs and taphonomy of certain sites).

Eighty-four years after it was first published (Henry Holt and Company, 1909) this scientific autobiography of one man's work in the field is unparalleled. The book consists of 11 chapters, an exciting Foreword written by Rudolf Raff, an interesting Introduction done by Henry Fairfield Osborn, and a useful 4-page Index. Raff's 13-page Foreword sets the stage for the unique story of Sternberg's life in the West in the late 1800's and early 1900's and ties episodes during this time with other Western events. The book's price is reasonable, quality of production very good, and format easy to read. Included in the 50 figures in this book are photos of field work and specimens on display in museums around the world, as well as excerpts of Sternberg's field diaries.

Along with this book, Sternberg's 1917 work entitled "Hunting dinosaurs in the Bad Lands of the Red Deer River, Alberta, Canada" (re-published in 1985 by NeWest Press, Edmonton, Alberta) and Katherine Rogers' 1991 book entitled "The Sternberg fossil hunters: A dinosaur dynasty" (published by Mountain Press Publishing Co., Missoula, Montana) make a nice trilogy dealing with the contributions of Charles H. Sternberg and his relatives to the science of paleontology.

The discovery of fossils in the West by Sternberg and his contemporaries during the late 1800's and early 1900's was highly influential in the development of American paleontology. The bases for many modern paleontological concepts and field techniques were founded on the work done at this time. Today, fossils collected by these workers highlight exhibit and research collections in museums throughout the world. Raff states it well in his Foreword when he writes: "He and other turn-of-the-century collectors gathered immense collections of fossils that made possible the remarkable development of American paleontology and filled exhibit halls of the great museums. These discoveries, and the spectacular museum displays built around them, made the American public aware of the age of the earth and its extraordinary history. The dinosaur galleries of museums retain their popularity, and in more than one instance they have hooked impressionable children on careers in science" (p. xxii). The popularization of prehistoric animals today, as exemplified by this year's release of the movie "Jurassic Park," more than likely was also influenced by the discoveries of Sternberg and his cohorts.

Because historical accounts are fundamental to the development of our science today, I strongly recommend this book to anyone interested in the collection of fossil vertebrates. Awareness of the historical and educational importance of the natural heritage we know as the fossil record is necessary for not only the continued advancement of the science, but also the preservation and protection of these non-renewable scientific resources.

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CENTENNIAL HISTORY OF THE GEOLOGICAL SOCIETY OF WASHINGTON, 1893-1993. Eugene C. Robertson, editor. 1993. *Geological Society of Washington*. 165 p. Softcover, \$10.00.

This little 165-page book documents the history of what must be one of the oldest, if indeed not the oldest, local geological society in the United States. Founded in 1893, mostly by members of the U.S. Geological Survey in the Washington, D.C. area as a forum for exchanging ideas on an informal basis, it has had a long and distinguished history. For most of the time, the Geological Society of Washington (GSW) has met at the Cosmos Club. From the 109 founding members, it grew to almost 1200 in 1975, but since that time has down-sized to about 650 members. The Society publishes neither proceedings nor journal, although it has chronicled more than 1200 meetings to date.

The story consists of four parts. The first part is a history of events—the Founding; Early History, 1893–1904; Middle History, 1904–1943; Late History, 1943–1992; GSW and the Cosmos Club; Sleeping Bear Award; Women Members; and Previous Anniversary Celebrations, which includes the 1000th meeting in 1975. The chronological part is followed by 40 selected biographies of founders and other early members. The third part consists of summaries of 55 important talks given to the Society, and the last part is a series of tables of data on the Society, compiled by Jeff Grossman of the U.S. Geological Survey.

The book was edited by Gene Robertson of the U.S.G.S. and contains contributions from 20 others. It is well written and edited and most of all informative. Here you can read about the Sleeping Bear Award, which is awarded annually to the person who has "done or said something in genuine good humor at one of the meetings"—all-time winner is Ellis Yochelson, with 4 such awards. You can read about the relation of the U.S.G.S. and the Cosmos Club to the GSW; the Pick and Hammer Club also has a place in this history.

Standard format of the meetings, which are usually held on the second and fourth Wednesday of each month, is the presentation of three 20-minute papers. More than 3350 presentations have been given at 1232 meetings through the years since the first scientific meeting on Wednesday, March 8, 1893. Florence Bascom was the first woman to give a paper in April 1901. The 1000th meeting in April 1975 must have been one of the 100-year highlights, with papers by George Wetherill on uranium-lead dating of ancient rocks, Fred Vine and Drummond Matthews on global tectonics and ocean basins, and Senator Jack Schmitt on planetary geology. What an array of talent has crossed the stage at the Cosmos Club for the GSW!

The thumbnail-sketch biographies are revealing and interesting. The list reads like Who's Who in American geology at the turn of the nineteenth century. Included are many geogiants such as N. H. Darton, S. F. Em-

mons, G. K. Gilbert, Waldemar Lindgren, W. J. McGee, G. P. Merrill, J. W. Powell, C. D. Walcott, and Bailey Willis; two are women, Florence Bascom and Ellen Hayes. Interestingly enough, all except three (and, of course, the two women) have facial whiskers. Fifteen of the men have full beards—the dress for the day. The pictures of the geogiants are alone worth the price of the book.

This little book is a fascinating trip into the past to learn of the history of one of the premier geological societies in the country. For the most part, the story is told through the individual members of the Society who played a part in the story. The book is recommended unconditionally for all interested in the development of the science of geology in the U.S.

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THE PORT ORFORD, OREGON, METEORITE MYSTERY. Roy S. Clarke, Jr., editor. 1993. *Smithsonian Contributions to the Earth Sciences Number 31*. 43 p. Softcover. (To obtain a free copy, write to Smithsonian Institution Press, Attention: Series Section, 470 L'Enfant Plaza, Room 7100, Washington, D.C. 20560).

The Smithsonian Institution periodically publishes a series entitled "Contributions to the Earth Sciences." The present monograph combines a historical study by historian Howard Plotkin (John Evans and the Port Orford Meteorite Hoax, pages 1–24) and a scientific study by Vagn F. Buchwald and Roy S. Clarke, Jr. (A Mystery Solved: The Port Orford Meteorite Is An Imilac Specimen, pages 25–43). This unusual combination is appropriate, because the Port Orford meteorite affair began around 1860, early in the Smithsonian Institution's history. Throughout the twentieth century the myth of this lost meteorite has plagued the Smithsonian in the form of repeated requests for help in finding it.

As curator in charge of the collection that now houses the Port Orford specimen, Roy Clarke provided Plotkin with the information on the mystery. When Vagn Buchwald, a metallurgist from the Technical University of Denmark, arrived in Washington for a sabbatical, he and Clarke combined their talents to scientifically investigate the specimen. Both historian and scientist provide convincing evidence that the specimen was part of an elaborate hoax.

Lost treasure stories always fascinate, and this tale was apparently hatched by one John Evans around 1859. After two years of running over budget in reconnaissance geological surveys of southern Oregon, he claimed to have found a massive meteorite on an Oregon mountainside near Port Orford. He presented as evidence a small specimen alleged to have been chipped off the main body of the meteorite. Evans'

death and the start of the Civil War in 1861 (within one day of each other) put a stop to his attempt to get further funding to search for it.

The most intriguing thing about the so-called Port Orford meteorite was that it was a rare type called a pallasite, a stony-iron meteorite composed of large single glassy crystals of olivine embedded in a network of nickel-iron. Only three such meteorite falls were known in 1859. Plotkin convincingly concludes that the Port Orford meteorite specimen was a prop in a deliberate and elaborate hoax, and further concludes that the specimen was actually from the well-known Imilac, Chile, meteorite shower. Buchwald and Clarke, in their detailed analyses of known Imilac specimens and the Smithsonian's "Port Orford" specimen, largely substantiate this claim.

Both papers are well written. Plotkin's paper will be of interest to historian and scientist alike. Buchwald and Clarke's paper is one that will appeal more to scientists interested in the specific techniques of meteorite study, but historians should also consult this paper to be aware of the methodology involved. The juxtaposition of these papers makes the task convenient.

The Port Orford meteorite fraud is perhaps comparable to the diamond swindle of 1872. But the diamond swindle was destined to be brief; when it was solved by future U.S. Geological Survey director Clarence King, an international scandal was averted. The Port Orford meteorite mystery is rather like the Lost Dutchman treasure tale—based on fact or totally fictitious? Or was. Thanks to this excellent "contribution to the earth sciences," the mystery can now be stamped "Solved."

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SPENCER BAIRD OF THE SMITHSONIAN. E. F. Rivinus and E. M. Youssef. *Smithsonian Institution Press, Washington, D.C. and London*. 1992. 228 p. Hardcover, \$29.95.

There are some persons who, though not primarily earth scientists, have nevertheless exercised a profound influence upon the development of our science through their social, political or financial contributions. Though their names might not figure largely in standard histories of geology or geography, their activities have helped to shape those histories more directly than the work of many distinguished researchers. In consequence, biographical studies of such persons deserve proper and full consideration in this journal.

Spencer Fullerton Baird (1823–1887) was originally a collector of natural history specimens, subsequently an ornithologist of distinction and a major contributor to research in marine biology, especially ichthyology.

Yet few persons have influenced the development of the earth sciences so profoundly, not only in north America but as exemplar to other nations world-wide. For Baird was the second Secretary of the Smithsonian Institution; it was through his activities that the U.S. National Museum of Natural History came into being and took shape, and it was under his aegis that the Museum became a cornerstone of research in science.

However, posterity has treated Baird shabbily. As the authors comment (p. 4):

... time has not been kind to the reputation of this nineteenth-century man of distinction. Within the Smithsonian itself, many interested visitors attend programs in the Baird Auditorium several times weekly, but few pay heed to its name or encounter there anything to arouse their curiosity in that direction. In an unlighted corner near one of the two entrances stands a marble bust of a broad-faced, bearded man with a kindly expression, labeled for any who will take the trouble to read it "Spencer Fullerton Baird". However, there is no evident connection between the bust and the auditorium, and indeed, a first impression regarding the bust might be that someone had put it there to get it out of the way.

In the antebellum years, only the scion of a family that was wealthy, distinguished, or both wealthy *and* distinguished could conceivably have contrived a career in natural history. Baird had the right background; his father was a leading Pennsylvania lawyer, his mother exceptionally well connected in social terms. He was fortunate also in having an oldest brother, Will, who was energetically interested in field sports and natural history. Soon they were making expeditions together. At the end of 1842, Spencer wrote in his diary:

During the past year I walked about 2100 miles in one pair of laced boots, half-soled three times. Shot about 650 birds, of which 75 wild ducks, 5 crows, 6 hawks, 3 owls. (p. 27).

This was not sheer slaughter. Already Spencer was building up what was to become a major collection of bird skins and other biological specimens which would be an early contribution to the Smithsonian's holdings; by then, they filled two railroad freight cars (p. 27). Moreover, his brother and he were beginning to publish their ornithological and botanical observations. Spencer's own work was recognized by his appointment as professor of natural science and curator at his alma mater, Dickinson College, Carlisle, Pennsylvania, in 1845. The appointment was at first honorary, but within a year he was given a salary. He was also gaining friends in Washington, Joseph Henry among them; in 1850, he became Assistant Secretary under Henry, beginning his lifelong service at the Smithsonian Institution.

Spencer Baird was an ideal subordinate, "honest, consistent, and dutiful" (p. 69) and, moreover, a "workaholic". As the authors point out:

The extent of his correspondence, personally handwritten during those early years, beggars the imagination. On January 1, 1861, Baird noted in his journal:

During the past year my own individual correspondence was as follows:

Letters written, registered, and copied, 3050

Pages filled of quarto letterbook copied by self, 2100

Of these about 60 letters and 20 pp. copies were on private business. All the rest strictly Smithsonian.

Of the 3050 letters 190 and upwards were drafts of letters for Prof. Henry. (p. 60).

And all this, in the days before good carbon papers, let alone Xeroxing facilities!

In particular, Baird built up a network of contacts with naturalists world-wide, persuading them to contribute specimens to, or exchange specimens with, the growing Museum. Between 1850 and 1861, the holdings of the Smithsonian expanded from 6000 to over 150,000 specimens (p. 81). In addition, by 1863 some 95,000 specimens had been sent to *other* museums and institutions (p. 88). Baird was unfailingly courteous to correspondents, persuading such august organizations as the Hudson's Bay Company into lending aid to his agent (p. 88) and beguiling even such difficult persons as the Hungarian naturalist John Xantus (p. 88, 92, 97). Only the egocentric and prickly Louis Agassiz failed wholly to succumb to Baird's charms (p. 98-102).

Baird had collected fossil bones during his outings with his brother in Virginia and Pennsylvania (p. 28). Though never becoming a palaeontologist, he continued to be enthusiastic about fossils, especially of vertebrates (p. 91). He was a patron of the group of young naturalists who styled themselves the Megatherium Club (p. 94) and helped to develop the Museum's mineralogical galleries, for example negotiating the acquisition of the Tucson meteorite (p. 96). He was also to found the Wood's Hole Oceanographic Institution and virtually singlehandedly to inaugurate fisheries research in the United States.

The diversity of his concerns, and the levels of success that he achieved in each, are alike astonishing. As the authors remark:

An essential key to Baird's success in this development was his outstanding managerial talent. He had an extraordinarily systematic memory in which he kept every administrative detail accessible—a capability he had already demonstrated in both his taxonomic work and his management of the Smithsonian's international exchange program. As secretary, his demonstration of this talent proved awesome as he kept the funding and accounting for four diverse and complex entities separate and in order. The interest on the Smithsonian fund, supplemented on occasion by private donations for special purposes was the source of the financing for the Smithsonian Institution. The United States National Museum was funded by congressional appropriations channelled through the Department of the Interior. Federal appropriations covered the operations of the Fish Commission and were allocated directly to the commission. And after 1879 congressional funds were directed to the Smithsonian for the Bureau of American Ethnology and routed through the United States National Museum. Baird accepted direct personal responsibility for each of these entities and handled all their complexities with such precision that he was never questioned on his administration of any account for which he was responsible. (p. 129)

However, there were prices to be paid. Spencer Baird was a reluctant and rare public speaker and unwilling to involve himself in controversy, scientific or social

(p. 109); to do so might harm his acceptability to the public at large and adversely affect his performance of his duties. Moreover, there was an underlying lack of self-assurance. This had two consequences: "... his instant defensiveness in the face of any criticism which he regarded as directed at him, and the fact that he was clearly unwilling to appoint and share responsibility with a deputy in any of his major activities." (p. 177).

Beyond doubt, his devotion to his perceived duty had serious effects on his family life. His marriage to Mary Helen Churchill had been one of love; her invalidism was in origin genuine, but it became a means for her to secure attention from him that she would not otherwise have gained. Their daughter Lucy was much beloved, but the need to look after her mother during Spencer's absences made it hard for her to develop a life of her own. Lucy never married and, indeed, gained no independence until after both her parents were dead. By then, it had come too late.

Yes, Spencer Baird's devotion to his duties was costly to his family. Yet perhaps that was inevitable, in so great a life in science. As the authors remark (p. 185):

Baird's personal collections constituted the seed stock from which have grown the Smithsonian's world-famous collection of zoological taxonomy and the equally notable National Philatelic Collection. As a collector of collectors he personally made and nourished the contacts whose additions in their turn contributed so importantly to Smithsonian greatness in the fields of anthropology and zoology.

They note also (p. 187) that:

Baird's most important contribution as a naturalist was the introduction into American scientific description of a degree of precision which had not been there before.

Practical evidence of Baird's heritage for naturalists is to be found in the nomenclature of genera and species which still bear his name. It has been noted that his name was given to one genus and over a dozen species of fish, and over twenty-five species of mammals, birds, fishes, mollusks, and other forms of life have at one time or another borne his name, together with several fossil or extinct forms of life.

Spencer Baird should not be forgotten: and, in this admirable biography, the authors have done their best to ensure that he *will* not be forgotten. For a balanced and readable assessment of the life and attainments of this most distinguished American, they merit high praise.

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THOMAS SAY: NEW WORLD NATURALIST. *Patricia Tyson Stroud. 1992. University of Pennsylvania Press, Philadelphia, Pennsylvania. 340 p. Hardcover, \$24.95.*

Almost from the time of his death, the scientific reputation of American naturalist Thomas Say (1787–1834) was unfairly maligned. Patricia Tyson Stroud's full-length biography of Say, the first to be published since Harry Weiss and Grace Ziegler's biography in 1931, reestablishes an accurate, sensitive portrait of this front-ranking zoologist. Hardly a branch of natural history was left untouched by Say's critical eye and descriptive pen. His prodigious labors, steadfastly conducted from the remote outpost of New Harmony, Indiana, were increasingly frustrated by mounting obstacles and disappointments. Yet Say's lifetime accomplishments won him international recognition in the fields of entomology and conchology.

The son and grandson of Quaker physicians, Thomas Say received early encouragement to pursue scientific studies from botanist William Bartram and more importantly from his regular attendance at Charles Willson Peale's Philadelphia Museum. There, he was exposed to the fullness of reptilian, mammalian, and invertebrate life which rapidly developed into a life-long passion for acquiring and disseminating natural knowledge. Say was a founding member of the Academy of Natural Sciences (1812) and quickly became one of its most active contributors. As Curator of its collections and Editor of its *Journal* (launched in 1817), Say was determined that newly discovered flora and fauna of his native land would be described by American, rather than foreign, naturalists. While in Philadelphia, he became acquainted with geologist William Maclure, whose patronage exerted the greatest influence on Say's subsequent career.

Stroud has thoroughly researched and engagingly presented the years of Say's travels as a field naturalist—to Spanish Florida with Maclure (1817–18) and accompanying the twin expeditions led by Major Stephen H. Long of the U.S. Topographical Engineers, to the Rocky Mountains (1819–20) and the St. Peters River (1823). Whether exploring and describing plant and animal specimens new to science or recording the cultural practices and languages of various native American tribes, Say's experiences are vividly brought to life. A rich collection of drawings and paintings, many reproduced in full color, supplements the well-crafted text.

In 1825, Say was persuaded to follow Maclure (in the company of other scientists, artists and educators) to Robert Owen's utopian socialistic community, located on the banks of the Wabash River. Although intending to visit only a short time, Say found himself being drawn into the 'vortex of experiment' at New Harmony, and he only ventured away once with Maclure to Mexico. But the community's educational and social objectives were soon shattered by factionalism, and its bonds thereby dissolved. It is Stroud's belief that Say's perceived debt of obligation to Maclure (who along with Owen departed for good) caused him to remain and work against overwhelming odds. Say also married one of the teaching assistants, Lucy Sistare, who contributed the majority of illustrations for his

conchological publications. But wilderness isolation, estrangement from Academy affairs and the gradually dominant roles he was forced to play in Harmonist life (amidst the enmity, illness and deaths of others), rapidly took their toll on Say's own psychological and physical condition. That he nonetheless printed six numbers of the *American Conchology* is a permanent reminder of his ceaseless dedication to advancing knowledge of the country's native 'productions'. Not until David Dale Owen began publishing the results of his geological surveys of western territories would Thomas Say's scientific work performed at New Harmony be overshadowed.

Stroud argues that Say's efforts reflect a transition from that of field to cabinet naturalist. More precisely, this change epitomizes a broader trend of specialization away from the tradition of Gilbert White's *Natural History of Selborne* (1789), which had placed its emphasis on the accurate description of animal habits and habitats. Leaders of the newer biological studies found it increasingly necessary to provide detailed taxonomic characteristics of their specimens, with a reduced treatment of behavioral and environmental features. We must remember that Thomas Say was largely self-educated; indeed, no university training in the natural sciences could be found at that time. Only learned societies like the Philadelphia Academy, struggling into existence within America's largest cities, could yet attempt to fill this void. Thomas Say was one of the first, and most important, advocates of the use of type specimens for natural history cabinets, and he urged that public museums serve as repositories for the safe-keeping of such collections.

American natural history in the early nineteenth century remained a discipline without theoretical underpinnings. Yet the preeminent importance of classification practiced by Say (and others) should not be undermined. As Stroud has written, "Taxonomy formed the foundation without which the study of theory and behavior could not proceed" (p. 198). Given the enormous diversity of unknown plant and animal specimens to be found in the new world, it is not surprising that a compilation of its basic members would become the naturalist's first endeavor.

Stroud's biography of Thomas Say has given historians of science much more than an in-depth examination of this naturalist's life. She has also produced a moving narrative of the major scientific activities which transpired during and beyond the early climactic phase at New Harmony. In this regard, she has substantially supplemented the more philosophically-oriented study of that community's legacy published by Charlotte M. Porter (*The Eagle's Nest: Natural History and American Ideas, 1812-1842*; 1986). One may still find agreement with the opinion of George Brown Goode, expressed in "The Beginnings of American Science: The Third Century" in 1887: "But for their sacrifice to the socialistic ideas of Owen, Say and [Charles Alexandre] Lesueur would doubtless be counted among the most distinguished of our natu-

ralists, and the course of Americal zoological research would have been entirely different." Stroud's masterful study has given us ample reasons for reinstating Thomas Say's high standing in early American natural science.

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DARWIN'S DESOLATE ISLANDS: A NATURALIST IN THE FALKLANDS, 1833 AND 1834. Patrick Armstrong. 1992. Picton Publishing (Chippenham) Ltd., Chippenham, England. [x] + 147 p. Hardcover, price not indicated.

Charles Darwin's life has been examined in almost microscopic detail in a plethora of publications, yet his two visits to the Falkland Islands have received only cursory attention. The reason is evident; while his time in the Galapagos Islands was to prove seminal to the development of his concept of natural selection, his visits to the Falklands occurred too early in Darwin's career, while he was still only a fledgling naturalist, to generate concepts of comparable profundity. Nevertheless, as Dr. Armstrong shows in this groundbreaking study, those visits did have a lasting influence on Darwin's scientific development. They provided an early exercise in collecting techniques (of geological, as well as biological, specimens); they demonstrated how an apparently dull landscape could acquire interest when rock outcrops came under study. By presenting him with the difficult problem of the immense stone-runs, they challenged Darwin's catastrophist concepts; and the unruly, often murderous behaviour of the early inhabitants jarred his social concepts by demonstrating very clearly "man's inhumanity to man."

Dr. Armstrong's researches for this book were meticulous. He examined the Darwin Archive in Cambridge University Library, he compared Darwin's notes with his published texts, and he visited the Falklands, striving to determine as exactly as possible the course of Darwin's journeys there. The photographs he took, often placed alongside illustrations from Darwin's notebooks or published works, are truly illuminating; the maps drawn under Dr. Armstrong's supervision are excellent and helpful. Moreover, Dr. Armstrong has gained a genuine empathy with the young Darwin of the Falkland visits:

To examine a rock exposure that Darwin described, to wander along a sea-shore from which he collected shells, to photograph plants within a few metres of where he collected his own specimens, enables an enquirer to "enter the mind of the subject" to a greater extent than the scholar confined to the muniment room or library. (p. 5)

Unfortunately, such careful research and sensitivity do not guarantee good writing. The earliest pages of Chapter 1 are so forbidding that they must have caused

numerous readers to return this volume to the book-seller's shelves. For me, the use of such conjunctions as "And", "But" and "Thus" to begin sentences and even paragraphs causes pain (but perhaps I am old-fashioned, at a time when the rules of English grammar are being so comprehensively jettisoned). Unfortunately, there are more significant impedances to reading. The use of fullstops (periods) is capacious—for example, they are used neither between initials (e.g., "BJ Sullivan", p. 8) nor after abbreviations (e.g., "del", p. 33). Commas are in general over-used, turning some sentences into a machine-gun spatter (p. 39, para 3 provides an example) and colons misused (e.g., p. 22, line 30; p. 49, last line). The word "Quaternary" acquires ambiguity, since it is not capitalized (p. 85, line 1; p. 124, line 4). There are incorrect uses of singular and plural forms (e.g., "... some fronds of kelp has drifted . . .", p. 30, last line) and some definite omissions (e.g., p. 22, line 15 "Covington's diary indicates and that . . .").

An additional problem for the reader is that proof-checking has been careless at best. Among many examples are: "almost" (p. 14, line 10); "scarely" (p. 25, line 3); "exitements" (p. 22, line 33); "succintily" and "smail" (p. 28, lines 7 and 30); and "appaling" (p. 131, line 3). The few French phrases and quotations are particular sufferers: for example, Darwin is described improbably as a "medicine manqué" (p. 15, 4 lines from foot) while, on p. 91 alone, we have "endoit", "quantitité" and "négligiemment" (lines 17, 27, 29). The renderings into English are inexact and, when we are told (p. 22, lines 2–4) of one such that "The translation . . . loses something . . .", we agree and know why!

Another failure is the inconsistent provision of supplementary information. When footnotes are provided, they are as precise and as useful as might be expected from so careful a researcher. But, all too often, they are not. As examples: "The Professors Rogers" (p. 77) are not identified; the definition of solifluction by S. G. Andersson (p. 81) is not referenced; and "Mr. Kerr's notion" (p. 81) is left unexplained. Careful editing would have eliminated many of these errors, but alas! it was not done.

This is, then, a ground-breaking book, presenting excellent research but marred by poor writing, editing and proof-checking. The research is, beyond question, valuable and the original approach praiseworthy. One can only regret that careful preparation was not matched by careful presentation.

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EARTH INTERPRETERS: F. M. FRYXELL, GEOLOGY, AND AUGUSTANA. *David A. Schroeder and Richard C. Anderson (Editors).* 1992. *Augustana*

College Library, Rock Island, Illinois 61201. 207 p. Softcover, \$17.00. [Order from the Augustana Library]

Few small colleges have the reputation and mystique in the geological world of Augustana College, and most of this renown is due to the labor of Fritiof M. Fryxell. His life at Augustana is a marvelous illustration of how far-reaching a teacher's influence can be. As an inspiring teacher, Fryxell, who served as a role model and mentor to many students during his time at Augustana, has had a greater impact on our science than he would have had had he chosen a non-academic career in geology. Therefore, it is both fitting and proper to produce a volume such as this one to honor the man, Fryxell, and the College, Augustana. Unfortunately Dr. Fryxell died before the volume was produced.

There are two major sections to the volume, but only the first few papers concern the history of the geology department and/or Dr. Fryxell's long and illustrious career at Augustana. These include a brief look at Fryxell's tenure at Augustana (Conrad Bergendoff), the first 75 years of geology at Augustana (Richard C. Anderson), Fryxell's involvement in founding the National Association of Geology Teachers in 1937–38 (Rudolph W. Edmund), and the naming of geologic features in Alaska and Antarctica after the College and Dr. Fryxell (Troy L. Péwé). Robert E. Bergstrom's paper traces both the rise of what today is called "Environmental Geology" and Fryxell's activity as an environmental geologist long before there was a name for such activity.

The environmental geology paper serves, also, to set the stage for the remainder of the volume, for the other 11 papers are devoted not to Fryxell, the College, or to the history of geology, but to a wide range of geologic topics that somewhat mirror Fryxell's own broad geological interests: interests that he passed on to those students who prepared the 11 articles. They cover such diverse topics as interpreting garbage in sedimentary terms (Jean E. Bogner), ethics and the practice of geologists (Meredith E. Ostrom), the development of geologic mapping in the United States (David C. Hedlund), geomorphology and the "Multiple-Working Hypotheses" (Keith M. Hussey and Charles E. Carson—the only listed author not associated with Augustana), plate tectonics and Gondwanaland (James W. Collinson and William R. Hammer), geosynclines and plate tectonics (Charles F. Kluth), the problem of explaining mass extinctions (A. A. Ekdale), how chert is formed (Earle F. McBride), and three papers concerning petroleum geology (John B. Hendren, Richard N. Benson, and C. Anders Bengtson). Each is an original article written expressly for this Fryxell volume.

Space does not permit a detailed review of each paper, but a few comments are in order about some of them, especially the paper by Meredith E. Ostrom concerning ethics. Long before ethics and our professional activity became a topic of conversation and litigation,

Fryxell was at the forefront of the issue. Ostrom starts his paper with a 1948 quotation from Fryxell, part of which reads, "We realize full well, now, that the greedy exploitation of our natural resources, if pursued as heedlessly as in the past, must inevitably lead to ruin; . . . At least in principle we hold that no single generation has exclusive right to the resources of the land, but rather that each generation holds in trust, for a season, the good and the beautiful things of the earth." (p. 75). Unfortunately almost 50 years later, we still haven't taken this message to heart in our society. In an appendix to the paper (pgs. 82–88), Ostrom lists 25 short hypothetical scenarios involving ethical choices. This list would provide the starting point for a senior (or graduate) level seminar on ethics. Few geologic curricula specifically include the aspect of ethics in our geological activity, and we need to fill that void. Ostrom's paper is a good place to start.

Kluth's description of geosynclines in the world of plate tectonics could be very useful to anyone trying to incorporate the older literature, which uses the geosynclinal terminology, with the modern set of terms. Table 1 and Figure 2 (pgs. 136 and 137) very nicely relate the old terms with their plate tectonic equivalents and, in my mind, support an old saying, "The real truth never changes, the only change is in what we think truth is". We still look at the same rocks, but arrive at different conclusions.

All the papers in this book deserve to be read, not just because they demonstrate the influence of a teacher like Fryxell, but because they are interesting scientific papers. This volume is a fitting tribute to Dr. Fryxell: teacher, geologist, scholar.

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EXPLORING THE EARTH: Progress in Geophysics Since the 17th Century. *Selected papers from the symposia of the Interdivisional Commission on History of the IAGA, during the IUGG/IAGA Assembly, held in Vienna, 1991. Edited by Wilfried Schröder, Michele Colacino, and Giovanni Gregori. 1992. Interdivisional Commission on History of the International Association of Geomagnetism and Aeronomy (IAGA), Bremen-Roennebeck, Germany, 283 p. Soft cover, 23,—DM.*

This volume is a compilation of nineteen papers on assorted geophysical topics presented at the IUGG/IAGA Assembly in Vienna in 1991. For example, S. Débarbat's paper (in French) is a review of women involved in astronomy and geophysics in France since the 17th century. She draws some comparisons to

American female astronomers, documents cases of distinguished researchers, and looks hopefully to the prospects of women scientists. Also of note are L. M. Barreto's survey of the prehistory and history of the National Observatory of Brazil, and an account, by M. Colacino and M. R. Valensise, of the Accademia del Cimento and the development of meteorology in Italy.

Other papers review the work of particular scientists, including, for example, Francesco Algarotti (b. 1712) in Italy, John Allan Broun (1817–1879) in India, Georg von Neumayer (1826–1909) in Australia and polar regions, Loránd Eötvös (1848–1919) in Hungary, and Gerhard Fanslau (1904–1982) in Germany. C. O. Hines recounts his involvement in the early days (ca. 1959) of gravity waves in an article previously published in *Pageoph*; and A. Udias repeats his inventory of Jesuit geophysical activities which appeared recently in *Eos*. Some of the papers announce new initiatives in historical data compilation; others document geophysical activities in particular nations or institutions. There are "Notes on Contributors," but it appears that all of the authors are (or were) practicing geophysicists and are historians by avocation. None of the authors utilize archival materials.

Turning to the volume as a whole, there is no apparent order to the papers, either thematically, chronologically, or geographically. Nor is there any evidence of intervention by the editors in the individual contributions. The editors assembled the volume (rather than truly editing it) from "camera ready" conference papers, most of which, even allowing for translation problems, read like first drafts. All but two of the papers are in English, yet it is painfully obvious that none of the editors are fluent in that language.

In their introduction the editors make the unsubstantiated claims that, "History of science is the same as the history of the knowledge and interpretation of Man's environment" (p. 8), and, "History of mankind is *per se* history of science" (p. 9). The editors also "very humbly" point out that their Interdivisional Commission on History (IDCH) is "the unique body inside IUGG" to address such issues (p. 10). They also claim that the quality of this volume and its predecessors "is the best index of the quality and number of people" working on these issues, and that "the gentle monotonic growth" of historical consciousness within the discipline, "can already be appreciated by looking at the progression in time of the books of the IDCH Proceedings" (pp. 10–11). None of these claims are substantiated by this volume. You will not find here, for example, the interdisciplinary sophistication of a Rabb, the thematic focus of a Lamb, or the interpretive power of a Ladurie.

This is unfortunate, because many of the papers, if carefully rewritten and properly reviewed and edited, would be unique and substantial contributions to the history of geophysics. Even without knowing the priorities of the IAGA or its commitment to history, it is safe to say that the international geophysics community can do better than this.

LOOKING TO THE PACIFIC FOR GEOLOGICAL ANSWERS. The Fourth Edgeworth David Day Symposium. D. F. Branagan and K. L. Williams, editors. 1991. *The Edgeworth David Society, Department of Geology and Geophysics, University of Sydney, Sydney, Australia* 2006. 130 p. Softcover, US\$20.00. (Postage included; order from D. F. Branagan, at the above address; make checks payable to "Edgeworth David Society.")

Edgeworth David was a pioneer Australian geologist with a wide range of interests, as befits the Victorian geologist he was. The Edgeworth David symposia, named in his honor and held at the University of Sydney, focus on topical reviews reflecting these broad interests. The present collection of papers, presented at the 1991 symposium, is divided into four parts that address somewhat cursorily a wide range of subjects within the purview of Southwest Pacific regional geology. Part I (3 papers) focuses on history and the Great Barrier Reef. Part II consists of 1 abstract and 2 papers on sedimentation and sea level. Part III contains 2 papers on mineral potential in the Pacific, and Part IV has 3 contributions on volcanism and tectonism. Also included is the keynote address by S. R. (Ross) Taylor "The Pacific: An Interplanetary View." The volume is dedicated to Charles Edward Marshall, who reactivated Pacific research in the University of Sydney's Department of Geology and Geophysics in the 1950's.

The papers vary in length. "Interglacial and drowned interstadial barriers on a stable Pacific margin" by Peter Roy consists of an abstract plus two figures; John Walshe's "Mineralization of the Lachian fold belt and the Pacific Rim—some comparisons" is a summary and a reference list. The longest paper is by David Falvey—"Petroleum resource potential of Pacific island arcs." All but one of the contributing authors are affiliated with Australian institutions.

Part I will be of most interest to historians of geology. David Branagan's discussion of "Edgeworth David and the Pacific," includes an account of the involvement of the University of Sydney in Pacific science beginning in the nineteenth century. The introduction of Peter Flood's paper on "Development of the Great Barrier Reef" briefly discusses history of scientific theories concerning coral reefs. In "Eastern Australian Marine Geosciences 1700–1970—a brief historical account," Edgar Frankel shows that many recent major achievements are founded on detailed work performed during the early investigations of the region.

Editors David F. Branagan and Ken L. Williams say in their introduction, "Despite the advent of computer technology, the short time between receiving papers from authors and going to press gives us only limited

opportunities to edit and standardise text and references. So as editors we have no hesitation in blaming the authors for any noticeable shortcomings in this volume!" However, if the figures had been integrated into their respective texts rather than simply grouped at the end of each paper, the volume's appearance would have been considerably enhanced.

Historic illustrations from Edgeworth David's publications on the Great Barrier Reef are scattered throughout the volume. These xeroxed reproductions are not uniformly sharp, but historic black-and-white photographs and figures accompanying the submitted papers are clean. Two beautiful color xerox illustrations add a nice touch: Ray A. Binns' paper on "Tectonic, volcanic and hydrothermal activity in the western Woodlark Basin of Papua New Guinea: implications for mineral exploration" includes colored pictures of samples from hydrothermal deposits from Franklin Seamount. The frontispiece photograph (taken by co-editor Branagan) of a basaltic islet off Norfolk Island is an excellent example of columnar basalt; the significance of this picture is that Edgeworth David studied petrology of the Norfolk Island rocks in 1885, his first work in the Pacific region.

This collection will be of most interest to anyone interested in geology of the southwestern Pacific. The papers of Part I will be consulted profitably by science historians for an introduction to Australian geologic endeavors.

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PRINCIPLES OF SEDIMENTARY DEPOSITS: Stratigraphy and Sedimentology. Gerald M. Friedman, John E. Sanders, and David C. Kopaska-Merkel. 1992. *Macmillan, New York*. 717 p. Hardcover, \$66.00.

Principles of Sedimentary Deposits: Stratigraphy and Sedimentology is an extensive update of Friedman and Sanders *Principles of Sedimentology*, a widely used textbook published in 1978. All three authors of this new book are associated through the Northeastern Science Foundation in Troy, New York.

This comprehensive summary of the geology of sedimentary deposits is organized into five parts; the Introduction explains what is included in each part and includes a well-advised suggestion to read the book's preface. Part I, a single chapter, introduces sedimentary deposits from both a historical and a current perspective. Part II (3 chapters) summarizes sedimentary particles and their aggregates: sediments and sedimentary rocks. Part III (2 chapters) presents advances in sequence and seismic stratigraphy, eustasy, and global stratigraphic cyclicity. Part IV (8 chapters) deals with sedimentary processes and facies architecture. Part V (3 chapters) is entitled "Large-Scale Patterns of Sedi-

mentary Deposits"; these chapters deal with extraterrestrial influences on sedimentation, stratigraphic correlation, and basin analysis. All chapters end with a list of suggestions for further reading.

As one might expect in a book by authors active in the history of earth sciences, a key feature in this textbook is the historical background of significant concepts in the study of sedimentary deposits. Part I includes an extensive discussion of early ideas about the connection between sedimentology and sea-level changes. It contains exceptional detail for a text not primarily designed for a history-of-science course; for example, no reader will ever again think of Antoine-Laurent Lavoisier only for his contributions to chemistry. Chapter 6 on seismic stratigraphy includes an encapsulated history of the ideas on turbidity currents and the development of the echo-sounder, precision

depth-recorder, and seismic-reflection profiles. Chapter 17 on basin analysis contains an abbreviated history of the concept of sea-floor spreading and plate tectonics.

This book is intended for both undergraduate and graduate students and should serve them well. The text is well written, and photographs and drawn illustrations are of consistently good quality. The 36-page single-spaced bibliography features attention to detail such that each title is edited for proper use of hyphens! (The frequent use of "sic" may be distracting to some readers). Most importantly, the book sets a high standard for incorporation of historical material into a text.

Gretchen Luepke, U.S. Geological Survey, 345 Middlefield Road, Menlo Park, California 94025

ANNOUNCEMENTS

HISTORY OF GEOLOGY GROUP SET UP BY GEOLOGICAL SOCIETY

The Council of the Geological Society, London, has agreed to the formation of a new specialist Group on the History of Geology. John Thackray, Hugh Torrens, and John Fuller are, respectively, acting Chairman, Secretary, and Treasurer. Membership will be open to all.

The main objects of the group are to encourage an interest, knowledge and enthusiasm for the history of geology, particularly among Fellows of the Society; to encourage existing researchers, to recruit new ones, and to provide a forum in which they can meet and discuss their work; to raise the profile of history of geology in other related societies by means of joint meetings; and, through the Committee, to give the Geological Society a voice in the history of geology. The group aims to raise awareness of British contributions in the history of earth sciences by holding joint meetings with European, American, and other international organizations. It is not intended to publish a journal or to compete in any way with established societies in the fields of history of science or natural history.

There will be an inaugural meeting of the Group at the Geological Society on Tuesday, October 4, 1994, at which the objects and future activities of the group will be discussed, officers and a committee elected, and a pair of inaugural lectures delivered. If you would like further details of this meeting, together with information about the group, please write to J. C. Thackray, History of Geology Group, Geological Society, Burlington House, Picadilly, London W1V 0JU United Kingdom.

GEOLOGICAL SOCIETY OF AUSTRALIA EARTH SCIENCES HISTORY SPECIALIST GROUP

The Earth Sciences History Group, founded in 1984, organizes symposia, field excursions and publishes a newsletter (about 16 pages an issue) twice a year. For information, contact David F. Branagan, Dept. of Geology and Geophysics, University of Sydney, Sydney, Australia 2006. Tel: (02) 692-2918 or 958-7127; Fax: (02) 692-0184.

GEOLOGICAL SOCIETY OF NEW ZEALAND HISTORICAL STUDIES GROUP

The Historical Studies Group organizes symposia and field excursions, and publishes a newsletter (about

40 pages) about yearly. For information, contact Alan Mason, 75A Argyle Street, Herne Bay, Auckland 1002 New Zealand.

"FRIENDS OF GEOCLIO"

Who are the Friends?

Persons interested in the history of earth sciences, which is construed broadly to comprise the geological, marine, and atmospheric sciences. Friends thus include scientists, historians, philosophers, sociologists, archivists, librarians, and others sharing interests in the historical study of the earth sciences.

Where are the Friends?

The Friends dwell within HESS—the History of Earth Science Society—but are not part of HESS. Hence, the Friends have no officers, dues, or by-laws.

What do the Friends do?

1) They communicate by *electronic newsletter* to keep informed of forthcoming lectures, meetings, field trips, excursions, and important publications of mutual interest having to do with the history of the earth sciences. They also share information about the content and location of archives that already exist or are in the making. (The current officers of HESS are making arrangements for such an electronic newsletter. In the meantime you may send messages to la-porte@cats.ucsc.edu.)

2) They sponsor *meetings*, usually on a triennial cycle, dealing with a single topic or theme of interest where participants can discuss work-in-progress relating to the topic or theme. No abstracts will be required for the meeting, nor will there be formal papers or subsequent publication of results. However, a short report describing highlights of the discussions that take place during the meeting may be published in relevant newsletters or journals.

3) For a given meeting there will be a *trio of convenors*—the GeoClio Trio—who organize and plan the meeting, at least one of whom is a historian of science and a scientist historian.

4) Guidelines for the meetings will follow *Penrose guidelines*, including especially: an isolated site (but easily accessible to international travelers); an intensive three-day program; a single, focussed issue; and some 50 to 80 participants, with graduate students representing about 10 percent of attendees. The con-

venors will make every effort to generate funds to subsidize graduate student participation, if at all possible.

Cordially,

Léo Laporte
(laporte@cats.ucsc.edu)

Naomi Oreskes
(naomi.oreskes@mac.dartmouth.edu)

Ken Taylor
(ktaylor@uoknor.edu)

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INTERESTING PUBLICATIONS

Since the start of this journal, Founding Editor Gerald M. Friedman has prepared this column. Contributors wishing to list recent books and papers of interest to our members are requested to send them to Gerald M. Friedman, Brooklyn College and Graduate School of the City University of New York, % Northeastern Science Foundation, Inc., Rensselaer Center of Applied Geology, P.O. Box 746, Troy, NY 12181-0746 U.S.A.

- Anonymous, 1993, A tribute to John Phillips: *Geology Today*, v. 9, p. 7-8.
- Anonymous, 1992, Canada: the GSC at 150: *Geology Today*, v. 8, p. 209-210.
- Anonymous, 1993, Canada: What happened to Logan's fountain?: *Geology Today*, v. 9, p. 129-130.
- Atherton, M. P., 1993, Volume 150 celebration paper: Granite magmatism: *Journal of the Geol. Soc., London*, v. 150, p. 1009-1023.
- Bagnold, R. A., 1991, Libyan sands travel in a dead world (originally published in 1935). Michael Haag Ltd., Box 369, London NW3 4ER, UK, \$11.95.
- Baker, V. R., 1992, Uncertainty and tolerance in science and decision making: *Arizona Journal of International and Comparative Law*, v. 9, p. 253-258.
- Benítez, Miguel, 1992, La première édition du *Tellamed*: *Trans. Int. Congr. Enlightenment*, v. 8, p. 1750-1753.
- Berberman, Sanford H., 1992, The Royal Geographical Society, E. G. Ravenstein, and a map of eastern equatorial Africa—1877-1883: *Imago Mundi*, v. 42, p. 106-119.
- Berner, Robert A., 1988, Robert Minard Garrels, August 24, 1916-March 8, 1988: *Biogr. Mem. Nat. Acad. Sci.*, v. 61, p. 195-212.
- Bevan, A., 1993, Meteorites and mammon: *Mineralogical Society Bull.*, v. 98, p. 3-7.
- Biermann, Kurt-R., 1993, "Ein Preusse weiss, was er von Bayerns König zu erwarten hat": Maximilian II. von Bayern und sein Ratgeber Alexander von Humboldt: *Kult. Tech.*, v. 1, p. 35-37.
- Black, Jeremy, 1992, Maps and charts: The historical atlas: A perspective from 1992: *Stor. Storiogr.*, v. 21, p. 91-114.
- Bork, K., 1994, Cracking rocks and defending democracy. The life and times of Kirtley Fletcher Mather. *Pacific Division of the Am. Assoc. Adv. Sci.*, 340 p. \$26.95.
- Bowen, Robert, 1993, Universal ice: Science and ideology in the Nazi state. Belhaven Press, London, 189 p.
- Boylan, P. J., 1992, Save the world's historic oil and gas sites: *Geology Today*, v. 8, p. 51-52.
- Branagan, D. F., Gibbons, G. S., & Williams, K. L., editors, 1991, Geological mapping of two southern continents: I. The geological mapping of Australia; II. The geology of Antarctica, The first and second Edgeworth David Day Symposium, presented by the Edgeworth David Society, University of Sydney Printing Services, Univ. of Sydney, 144 p. \$16.00 (incl. postage).
- Branagan, D. F., & Williams, K. L., 1991, Looking to the Pacific for geological answers: Fourth Edgeworth David Day Symposium, presented by the Edgeworth David Society. University of Sydney Printing Services, Univ. of Sydney, 130 p.
- Branagan, D., 1992, Richard Owen, Thomas Mitchell and Australian science, a commemorative symposium: *Journal and Proceedings, Royal Society of New South Wales*, v. 125, p. 93-94.
- Branagan, D. F., 1993, Samuel Stuchburg: A natural history voyage to the Pacific, 1825-27 and its consequences: *Archives of Natural History*, v. 20, p. 69-91.
- Bryden, D. J., 1993, Magnetic inclinatory needles: Approved by the Royal Society? *Notes Rec. Roy. Soc. Lond.*, v. 47, p. 17-31.
- Burich, Keith R., 1992, "Stable equilibrium is death": Henry Adams, Sir Charles Lyell, and the paradox of progress: *New Engl. Quart.*, v. 65, p. 631-647.
- Burkhardt, F., & Smith, S., editors, 1992, The correspondence of Charles Darwin, volume 7: 1858-9. Cambridge University Press, 706 p., \$59.95.
- Burkhardt, F., Porter, D., Browne, J., & Richmond, M., editors, 1993, The correspondence of Charles Darwin, volume 8: 1860. Cambridge University Press, 706 p., \$59.95.
- Burkhardt, F., & Burkhardt, A. S., 1993, A calendar of the correspondence of Charles Darwin, 1821-1882. Cambridge University Press, 740 p., \$150.00.
- Butcher, N. E., 1993, Sheffield and Reading—John Ruskin (1819-1900) and Phoebe Walder (1899-1992): *Geologists Assoc. Circular*, No. 898, p. 23.
- Camerini, Jane, R., 1993, Evolution, biogeography, and maps: An early history of Wallace's Line: *Isis*, v. 84, p. 700-727.
- Campbell, C. J., 1991, The golden century of oil 1950-2050—the depletion of a resource. Kluwer Academic, £64 (UK).
- Carozzi, A. V., & Newman, J. K., 1993, A manuscript of Horace-Bénédict de Saussure on the origin of coal; Oratio de Lithantrace (1770): Science, Business, and Environmental Politics: *Archs Sci. Genève*, v. 46, p. 1-36.
- Champlin, P., 1994, Gentleman geologist of the gilded age. University of Alabama Press, 288 p., \$49.95.
- Cleevely, R. J., & Chapman, S. D., 1992, The accumulation and disposal of Gideon Mantell's fossil collections and their role in the history of British palaeontology: *Arch. Natur. Hist.*, v. 19, p. 307-364.
- Colbert, Edwin H., 1992, William Diller Matthew, palaeontologist: The splendid drama observed. Columbia Univ. Press, New York, 27 p., \$45.00.
- Coleman, R. G., 1993, Historical aspects of geologic studies in the Red Sea basin, p. 3-10. In: Coleman, R. G., *Geologic evolution of the Red Sea*. Oxford University Press, New York, 186 p.
- Cooper, John A., 1992, The life and works of George Bax Holmes (1803-1887) of Horsham, Sussex: A Quaker vertebrate fossil collector: *Arch. Natur. Hist.*, v. 19, p. 379-400.
- Cremona, Michael A., & Thompson, Richard L., 1993, The hidden history of the human race: Forbidden archeology. Bhaktivedanta Institute, San Diego, 914 p., \$39.95.
- Cwyner, L. C., Bennett, K. D., & MacDonald, G. M., 1993, James Cunningham Ritchie: *Review of Paleobotany and Palynology*, v. 79, p. 1-5.
- Danzer, Gerald A., 1991, Images of the earth on three early Italian woodcuts: Candidates for the earliest printed maps in the west. The Hermon Dunlap Smith Center for the History of Cartography, occasional publication 5. Newberry Library, Chicago, 35 p.
- Dean, D. R., 1992, James Hutton and the history of geology. Cornell University Press, Ithaca, 303 p.

- Donovan, Desmond, 1993, Let's get it right about de la Beche: *Geologists Assoc. Circular*, No. 898, p. 26.
- Doyle, Peter, 1993, The lessons of Crystal Palace: *Geology Today*, v. 9, p. 107–109.
- Doyle, P., & Robinson, E., 1993, The Victorian "geological illustrations" of Crystal Park Palace: *Proc. Geol. Assoc.*, v. 104, p. 181–194.
- Effland, Anne B. W., & Effland, William R., 1992, Soil geomorphology studies in the U.S. Soil Survey program: *Agr. Hist.*, v. 66, p. 189–212.
- Emery, K. O., Dietz, R. S., & Kuhn, G. G., 1993, Influence of Francis Parker Shepard on marine geology: *Mar. Geol.* v. 115, p. 153–156.
- Espinosa, A., INGEOMINAS, 75 años, 1916–1991: Una historia de investigación aplicada al desarrollo de Colombia: *Sociedad Venezolana de Historia de las Geociencias*, v. 47, p. 46–50.
- Fernlund, Kevin J., 1993, William Henry Holmes: Explorer of the Americas from the Yellowstone to the Yucatan, 1872–1895: *Diss. Abstr. Int.*, v. 54, p. 290.
- Ferreira, Martin Portugal V., 1989, Um professor de mineralogia e arte de minas e político liberal do século XIX: Roque Fernandes Thomaz: *Rev. Univ. Coimbra*, v. 35, p. 255–269.
- Finch, David, 1993, Turner Valley tales and truths: *CSPG Reservoir*, v. 20, p. 1–2.
- Fleming, James R., 1992, T. C. Chamberlin and H₂O climate feedbacks: A voice from the past: *EOS*, v. 73, p. 505, 509.
- Flemming, B. W., & Reineck, H.-E., 1993, Sektion Meeresgeologie I, 175 Jahre Senckenbergische naturforschende Gesellschaft, Jubiläumsband II, p. 247–250.
- Franco, Loredana, 1993, The old globes in Friuli-Venezia Giulia (Italy): *Nuncius*, v. 8, p. 169–195.
- Friedman, G. M., Sanders, J. E., & Kopaska-Merkel, D. C., 1992, Principles of sedimentary deposits: Stratigraphy and sedimentology. Macmillan, New York, 717 p. [This book presents a historical background of key concepts in the study of sedimentary deposits.]
- Friedman, G. M., 1993, History of uranium discoveries in eastern Canada, a personal account. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-206.
- Fritscher, Bernhard, 1992, Kant und Werner: Zum Problem einer Geschichte der Natur und zum Verhältnis von Philosophie und Geologie um 1800: *Kant Stud.*, v. 83, p. 417–435.
- Fritscher, Bernhard, 1993, Vulkane und Hochöfen: Zur Rolle metallurgischer Erfahrungen bei der Entwicklung der experimentellen Petrologie: *Technikgeschichte*, v. 60, p. 27–43.
- Furr, T. W., 1993, The Oklahoma board on geographic names: A historical sketch. *Oklahoma Geology Notes*, v. 53, p. 44–50.
- Gamboa, P., & Mederos, A., 1992, Breve bibliografía del profesor Jose Royo y Gomez: *Boletín de Historia de las Geociencias en Venezuela*, v. 46, p. 11–18.
- Gams, I., 1993, Origin of the term "Karst" and the transformation of the Classical Karst (kras): *Environmental Geology*, v. 21, p. 110–114.
- Gardiner, B. G., 1993, Edward Forbes, Richard Owen and the Red Lions: *Archives of Natural History*, v. 20, p. 349–372.
- Garbowska, Jadwiga, 1992, Poglady Krzysztofa Kluka na surowce koplane. (Krzysztof Kluk on fossils): *Kwart. Hist. Nauk. Tech.*, v. 37, p. 97–109.
- García de Cuevas, G., 1992, Fuentes para el estudio de los alemanes en Venezuela, siglo XVI: *Encuentros*, v. 6, p. 3–6.
- Geschwind, C.-H., 1993, Becoming interested in experiments: American igneous petrologists and the geophysical laboratory, 1905–1960: Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-256.
- Gould, Stephen Jay, 1990, In touch with Walcott: *Natural History*, v. 7, p. 10–19.
- Gould, Stephen Jay, 1993, The fungal forgery. *Natural History*, v. 102, p. 12–21.
- Grases, J., 1993, Empleo de la escala de intensidades de Mercalli para la evaluación de sismos pasados: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 7–17.
- Grases, J., 1993, Ingeniería sísmica, una nueva disciplina: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 18–20.
- Guthorn, Peter J., 1991, America's last independent hydrographer. *Imago Mundi*, v. 41, p. 72–80.
- Günzel, Hermann, 1991, Alfred Wegener und sein meteorologisches Tagebuch der Grönland Expedition, 1906–1908. Schriften der Universitätsbibliothek Marburg, Universitätsbibliothek, Marburg, 101 p.
- Hacqubard, P. A., 1993, Alexander Rankin Cameron, renowned Canadian coal petrologist: *Int. Journ. Coal Geol.*, v. 24, p. 1–5.
- Hamm, Ernst P., 1993, Bureaucratic Statistik or actualism? K. E. A. von Hoff's History and the history of geology: *Hist. Sci.*, v. 31, p. 151–176.
- Hamm, Ernst P., 1993, Goethe on granite: *Diss. Abstr. Int.*, v. 53, p. 2957.
- Hanks, James, 1992, Ptolemy's Geography in the Renaissance. In: Rodney G. Dennis (editor), The marks in the field: Essays on the uses of manuscripts. The Houghton Library, Cambridge, Mass., p. 119–127.
- Harley, J. B., & Woodward, David, editors, 1992, The history of cartography, v. 2, Book 1: Cartography in the traditional Islamic and South Asian societies. University of Chicago Press, Chicago/London, 579 p., \$125.
- Harper, J. A., Exploration strategies and blind luck—The historical search for gas in the Lower Devonian Oriskany Sandstone in Pennsylvania. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-206.
- Hauner, Ulrich, 1992, Fossilien des Regensburger Raumes in Naturalien Kabinetten des 18. Jahrhunderts: *Acta Albertina Ratisbon*, v. 48, p. 67–106.
- Hawthorne, Frank C., 1993, Minerals, mineralogy and mineralogists: Past, present and future: *Canadian Mineralogist*, v. 31, p. 253–296.
- Hawthorne, Frank C., 1993, Minerals, mineralogy and mineralogists: Past, present and future; addendum: *Canadian Mineralogist*, v. 31, p. 772.
- Hoppe, G., 1992, Abraham Gottlob Werner (1749–1817) und Berlin: *Der Aufschluss*, v. 43, p. 257–266.
- Hsu, Kuang-Tai, 1993, Nicolaus Steno and sources: The legacy of the medical and chemical traditions in his early geological writings. *Diss. Abstr. Int.*, v. 53, p. 4452.
- Hufbauer, K., 1991, Exploring the sun: Solar science since Galileo, Johns Hopkins University Press, Baltimore/London, 370 p.
- Hutchinson, T. P., Version 2 (History and Archaeology) of essentials of statistical methods. Rumsby Scientific Publishing, 152 p.
- Jacob, Christian, 1992, L'empire des cartes: Approche théorique de la cartographie à travers l'histoire. Michel Albin, Paris, 537 p.
- Kaharl, V. A., 1991, Water baby—The story of Alvin. Oxford University Press, 356 p., \$21.95.
- Karrow, Robert W., Jr., 1993, Mapmakers of the sixteenth century and their maps: Biobibliographies of the cartographers of Abraham Ortelius, 1570. Based on Leo Bagrow's A. Ortelii Catalogus Cartographorum. xxx + 846 pp. Speculum Orbis Press, Chicago. (Published for the Newberry library.) \$110.
- Kidd, Robert B., 1994, Twenty-three years of British participation in scientific ocean drilling: *Geoscientist*, v. 4, p. 9–13.
- Krause, David, J., 1992, The making of a mining district: Keweenaw native copper, 1500–1870. (Great Lakes Books), Detroit, Mich., Wayne State University Press, 297 p., \$19.95.
- Kristsky, Gene, 1992, Darwin's Archaeopteryx prophecy: *Arch. Natur. Hist.* v. 19, p. 407–410.

- Laporte, L. F., 1993, Paper-trail of G. G. Simpson as scientist-soldier (poster). Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-37.
- Landa, E. R., 1993, Charles Thomas Jackson, Physician/Chemist/Geologist: A life of conflict and controversy. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-256.
- La Sota, K. A., & Jones, J. R., 1992, Seventy-five years of earth science educators at the University of Pittsburgh. *Compass of Sigma, Gamma, Epsilon*, v. 69, p. 233.
- Levere, T. H., 1993, Science and the Canadian Arctic. A century of exploration 1818–1918. Cambridge University Press, 438 p., \$64.95.
- Livermore, Lin, 1991, Running line-recollections of surveyors. U.S. Dept. Interior. Bureau of Land Management, Washington, D.C., 66 p.
- Livingstone, David, N., 1992, The geographical tradition: Episodes in the history of a contested enterprise. Blackwell, Oxford, 434 p.
- Major, John S., 1993, Heaven and earth in early Han thought: Chapters three, four, and five of the *Huainanzi*. State University of New York Press, 388 p.
- Martyn, Katherine, 1993, J. B. Tyrrell: Explorer and adventurer: The Geological Survey years, 1881–1898. An exhibition in the Thomas Fisher Rare Book Library, University of Toronto. University of Toronto, Toronto, 72 p.
- Mason, Brian, 1992, Victor Moritz Goldschmidt. Father of modern geochemistry: *Geochemical Soc. Spec. Publ.* 4, Trinity Univ., San Antonio, Texas, 189 p.
- Mathé, G., 1993, Ernst Kalkowsky (1851–1938), Geologe, Hochschullehrer und Museumsdirektor: Beiträge zur Biographie sächsischer Geowissenschaftler: *Abhandlungen des Staatlichen Museums für Mineralogie und Geologie zu Dresden*, v. 39, p. 7–20.
- Mathew, William M., editor, 1992, Agriculture, geology, and society in Antebellum South Carolina: The private diary of Edmund Ruffin, 1843, University of Georgia Press, 368 p., \$50.00.
- Matkin, Joseph, 1992, At sea with the scientific: The Challenger letters of Joseph Matkin. Philip F. Rehbock, editor, University of Hawaii Press, Honolulu, 415 p.
- McColloch, G. H., Jr., 1993, Development of the New River smokeless coalfield of southern West Virginia: Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-207.
- Middleton, Gerald V., 1988, The wit to distinguish or the role of physics in geology: *Geoscience Canada*, v. 15, p. 209–211.
- Middleton, Gerald V., 1993, A short history of clastic sedimentology. In: *Clastic Tidal Sedimentology*, D. G. Smith, G. E. Reinson, B. A. Zaitlin & R. A. Rahmani, editors. *Can. Soc. Petrol. Geol. Mem.* 16, p. ix–xv.
- Mignolo, Walter D., 1992, Putting the Americas on the map: Geography and the colonization of space: *Colon. Latin Amer. Rev.*, v. 1, p. 25–63.
- Miller, E. Willard, 1992, The College of Earth and Mineral Sciences at Penn State. Pennsylvania State Univ. Press, 402 p.
- Mohr, Paul, 1992, A continental rift centenary (letter to editor): *Geology*, v. 20, p. 94–95.
- Moore, Ellen J., 1983, Wendell Phillips Woodring, June 13, 1891–January 29, 1983: *Biogr. Mem. Nat. Acad. Sci.*, v. 61, p. 499–515.
- Mora, M. C., 1992, R. M. Stainforth: Su contribucion a la estratigrafia en Venezuela: *Boletin de Historia de las Geociencias en Venezuela*, v. 46, p. 1–10.
- Moraes, Antonio Carlos Robert, 1991, Notas sobre identidade nacional e institucionalização da geografia no Brasil: *Quipu*, v. 8, p. 349–360.
- Myrne, R., 1993, Map of the geology and contours of London and its environs (first published in 1856). London Topographical Soc., republication, 4 colour sheets and 6 b/w text pages all 46 × 59 cm in a card folder. £20.00 (+ p.&p.). Send orders to: London Topographical Society, Bishopsgate Institute, 230 Bishopsgate, London EC2 4QH, England.
- Nebeker, Frederik, 1991, Astronomy and the geophysical tradition in the United States in the 19th century: A guide to the manuscript sources in the Library of the American Philosophical Society. American Philosophical Society Publication 16, American Philosophical Society, Philadelphia, 114 p.
- Ordaz, J., 1987–88, Datos para la historia de la Petrologia en España en el siglo XIX: *Rev. Inv. Geol.*, v. 44/45, p. 17–29.
- Osterbrock, D. E., Gwinn, J. A., & Broashear, R. S., 1993, Edwin Hubble and the expanding universe: *Scientific American*, v. 269, p. 84–89.
- Owen, Tim, & Pilbeam, Elaine, 1992, Ordnance Survey: Map makers to Britain since 1791. Ordnance Survey, Southampton, HMSO, London, 196 p.
- Palme de Osechas, C., 1993, Destrucción de la Iglesia de San Alejo y de la Capilla de la Asunción en Boconó por el terremoto en 1801: *Sociedad Venezolana de Historia de las Geosciencias*, v. 48, p. 21–22.
- Palme de Osechas, C., 1993, Reevaluación del terremoto de Trujillo del 29-09-1886: *Sociedad Venezolana de Historia de las Geosciencias*, v. 48, p. 23–28.
- Palme de Osechas, C., 1993, Los terremotos de los años 1674, 1775 y 1886 en Trujillo: *Sociedad Venezolana de Historia de las Geosciencias*, v. 48, p. 29–44.
- Pardo, Georges, 1988, Hollis Dow Hedberg, May 29, 1903–August 14, 1988: *Biogr. Mem. Nat. Acad. Sci.*, v. 61, p. 215–244.
- Parvo, Arvi, 1992, Down under—mineral heritage in Australasia (an illustrated history of mining and metallurgy in Australia, New Zealand, Fiji, and Papua New Guinea). Australasian Institute of Mining and Metallurgy Monograph 18, Victoria, Australia, 310 p.
- Petroleum Frontiers, 1988, v. 4, Western Illinois: Current debate on shallow play: *Drilling Activity: A historical overview*, p. 11–17.
- Prescher, Hans, 1993, Carl Walther Fischer (1897–1979), Mineraloge, Museumsmann, Schuldirektor, Wissenschaftshistoriker, Beiträge zur Biographie sächsischer Geowissenschaftler: *Abhandlungen des Staatlichen Museums für Mineralogie und Geologie zu Dresden*, v. 39, p. 21–54.
- Purcell, R. W., & Gould, S. J., 1992, Finders, keepers. Eight collectors. Hutchinson Radius, London, U.K., 157 p.
- Feineck, H.-E., & Flemming, B. W., 1993, Abteilung für Meeresforschung, 175 Jahre Senckenbergische Naturforschende Gesellschaft, Jubiläumsband II, p. 245–246.
- Robertson, E. C., editor, 1993, Centennial History of the Geological Society of Washington, 1893–1993, The Geological Society of Washington, % Mineralogical Society of America, 1130 17th St., NW, Suite 330, Washington D.C. 20036.
- Robinson, Arthur H., 1992, It was the map-makers who really discovered America: *Cartographica*, v. 29, p. 31–36.
- Robinson, Eric, 1993, Gerald Friedman, fifty not out. . . : *Geologists Assoc. Circular*, No. 898, p. 10.
- Robinson, Eric, 1993, Mantell restored: *Geologists' Association Circular*, No. 902, p. 26.
- Roed, M. A., 1993, Geologging the past. John Hobson and the bullion pit: *Geology*, v. 22, p. 59–62.
- Rogers, Katherine, 1991, The Sternberg fossil hunters—a dinosaur dynasty. Missoula, Montana, Mountain Press Publishing Co., 288 p., \$12.00.
- Rolfe, Ian, 1993, A torch for Bev: *Geologists Assoc. Circular*, No. 898, p. 21.
- Romm, J. S., 1992, The edges of the earth in ancient thought: geography, exploration and fiction. Princeton University Press, Princeton, N.J., 228 p.
- Rose, Gillian, & Driver, Felix, editors, 1992, Nature and science: Essays in the history of geographical knowledge. Historical geography research series, 28. Historical Geography Research Group, 79 p.
- Rose, E. P. F., & Rosenbaum, M. S., 1993, British military geologists:

- Through the second world war to the end of the cold war: *Proceedings of the Geologists' Assoc.*, v. 104, p. 95–108.
- Rudwick, Martin J. S., 1992, Scenes from deep time: Early pictorial representations of the prehistoric world. University of Chicago Press, Chicago, 280 p.
- Rupke, N. A., 1993, Richard Owen's vertebrate archetype: *Isis*, v. 84, p. 231–251.
- Russell, J. B., 1991, Inventing the flat earth: Columbus and modern historians. Praeger Publishers, New York/Westport, Conn., 117 p., \$16.95.
- Sabine, P. A., 1991, Geologists at war—a forensic investigation in the field of wartime diplomacy: *Proc. Geol. Assoc. London*, v. 84, p. 139–143.
- Savage, L. E., 1993, Time charts of historical cartography: I. Antiquity: Dept. of Geology, Brooklyn College, Brooklyn, NY 11210. (Charts only).
- Savage, R. J. G., 1993, Volume 150 celebration paper: Vertebrate fissure fauna with special reference to Bristol Channel mesozoic faunas: *Journal of the Geol. Soc., London*, v. 150, p. 1025–1034.
- Sawyer, J. S., 1992, Reginald Cockcroft Sutcliffe, 16 November, 1904–28 May 1991: *Biogr. Mem. Fellows Roy. Soc.*, v. 38, p. 347–358.
- Schaaly, S., & Ziegler, W., 1992, Messel. An insight into the history of life and the earth. Clarendon Press, Oxford, U.K. 322 p.
- Schaer, J.-P., 1991, Emile Argand 1879–1940. Life and portrait of an inspired geologist: *Eclogae Geologicae Helvetiae*, v. 84, p. 661–670.
- Schefbeck, Günther, 1991, Die österreichisch-ungarischen Tiefsee-Expeditionen, 1890–1898. Weishaupt, Graz, 292 p.
- Schmidt, Peter, Das Alexander-von-Humboldt-Kolloquium vom November. 1991—Eine Nachlese, Aus: Zeitschrift für Freunde und Förderer der Technischen Universität Bergakademie Freiberg, Freiberg 2, 1. p. 26–30.
- Schmidt, Peter, 1992/93, Erstes internationales Symposium über das kulturelle Erbe geo- und montanwissenschaftlicher Bibliotheken an der TU Bergakademie Freiberg. Aus: Zeitschrift für Freunde und Förderer der Technischen Universität Bergakademie Freiberg, Freiberg 2, 1. p. 31–32.
- Schmidt, Peter, 1994, Zum Briefwechsel Alexander von Humboldt-Ferdinand Reich unter besonderer Berücksichtigung der Begriffe “Gelehrtennachlaß” und “Geophysikgeschichte”. Aus: Beiträge zur Alexander-von-Humboldt Forschung.-Berlin 18, p. 257–269.
- Schneiders, B. R., 1993, Finding future mines via the records of past exploration: The role of Ontario's assessment file database: Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-206.
- Schröder, Wilfried, & Wiederkehr, Karl Heinrich, 1992, Georg von Neumayer (1826–1909) und die internationale Entwicklung der Geophysik. I. Teil: Meteorologie. II. Teil. Erdmagnetismus: *Gesnerus*, v. 49, p. 45–62.
- Schubert, C., 1993, Contribuciones de Wilhelm Sievers y A. Jahn a la glaciología venezolana: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 63–66.
- Schwarzenbach, F. H., 1992, Towards new horizons: John Haller, 1927–1984. Verlag der Fachvereine und Schweizerische Stiftung für Alpine Forschungen, Zürich, Switzerland, 128 p., \$59.00.
- Seibold, Ilse, 1992, Der Weg zur Biogeologie: Johannes Walther (1860–1937), ein Forscherleben im Wandel der deutschen Universität. Springer, 196 p.
- Seibold, Ilse, & Seibold, E., 1993, Neues aus dem Geologenarchiv (1992), Vier Deutsche in der Frühzeit der Geowissenschaften in Japan: *Geol. Rundsch.* v. 82, p. 601–603.
- Sellwood, B. W., 1993, Volume 150 celebration paper: Structure and origin of limestones: *Jour. Geol. Soc., London*, v. 150, p. 801–809. [This paper relates to H. C. Sorby's (1826–1908) presidential address of 1897.]
- Shepherd, Robert, 1993, How Hannibal conquered geology: *Geology Today*, v. 9, p. 102–106.
- Shorthand, M., editor, 1993, Science and nature: Essays in the history of the environmental sciences, (BSHS monographs, 8), British Society for the History of Science, 291 p., \$19.00.
- Siems, P. L., 1993, Schmidt—an early German mining geologist: Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-256.
- Skwara, T., 1992, Old bones and serpent stones, A guide to interpreted fossil localities in Canada and the United States. Volume 2: Western sites. Blackburg, Virginia, McDonell and Woodward Publishing Company, 301 p., \$14.95.
- Slotten, Hugh Richard, 1993, The dilemmas of science in the United States: Alexander Dallas Bache and the U.S. Coast Survey: *Isis*, v. 84, p. 26–49.
- Smith, J. C., compiler, 1993, Georges Cuvier. An annotated bibliography of his published works. Washington, D.C., Smithsonian Inst. Press, 251 p., \$48.00.
- Soder, P., 1993, Otto Renz (1906–1922): *Sociedad Venezolana de Historia de las Geociencias*, v. 47, p. 42–45.
- Sonntag, Otto, 1990, The correspondence between Albrecht von Haller and Horace-Bénédict de Saussure (Studia Hallerina, 3). Hans Huber, publishers, Bern/Stuttgart, 507 p.
- Stein, Julie K., & Linse, Angela R., editors, 1993, Effects of scale on archaeological and geoscientific perspectives. Geological Society of America, Special Paper 283, 91 p.
- Stephenson, Richard W., 1993, “A plan whol[l]y new.” Pierre Charles L'Enfant's plan of the city of Washington. Geography and maps division, Library of Congress, Washington, 85 p.
- Stride, A. H., 1992, The first geological use of side-scan sonar. *Geology Today*, v. 8, p. 146–150.
- Summerhayes, C. P., 1992, Exploring the deep-sea floor in the 1990's and beyond: *Geology Today*, v. 8, p. 128–136.
- Sweeney, D., 1993, Why Mohole was No Hole: *American Heritage of Invention and Technology*, v. 9, p. 55–63. [History of the plans to drill the Mohorovicic discontinuity.]
- Taylor, E. F., 1993, Early exploration for hydrocarbons in the North American Arctic. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-207.
- Taylor, M. A., & Torrens, H. S., 1992, The local geologist 8: The local geological historian: *Geology Today*, v. 8, p. 102–107.
- Tobias, Phillip V., 1994, Piltown unmasked: *New York Academy of Sciences*, v. 34, p. 38–42.
- Torrens, Hugh, 1994, 300 years of oil: Mirrored by developments in the west midlands. British Association Lectures, Geol. Soc., London, p. 4–8.
- Toynnton, Bob, 1993, The local geologist II: Sheffield's chert and flint research group: *Geology Today*, v. 9, p. 109–113.
- Travaux du comité français d'histoire de la géologie (COFRHIGÉO), 1992, Troisième série, Maison de la Géologie, 77, rue Claude Bernard, 75005 Paris, 129 p.
- Tresise, G., 1993, Triassic footprints from Lymm Quarry, Cheshire in the collections of Warrington Museum: *Archives of Natural History*, v. 20, p. 307–332.
- Trümpy, R., 1991, In the footsteps of Emile Argand: Rudolf Staub's Bau der Alpen (1924) and Bewegungsmechanismus der Erde (1928). *Eclogae Geologicae Helvetiae*, v. 84, p. 661–670.
- Urbani, F., 1992, Mariano Eduardo de Rivero y Ustariz (1798–1857): Pionero de la mineralogía y geoquímica de Venezuela: *Boletín de Historia de las Geociencias en Venezuela*, v. 46, p. 18–48.
- Urbani, F., 1992, Las minas de cobre de Aroa a la luz de la relación de Manuel Gaytán de Torres, 1621: *Boletín Geológico y Minero* (Madrid), v. 103, p. 156–185.
- Urbani, F., 1993, Notas históricas sobre la Escuela de Geología, Minas y Geofísica. Part 1, Breve cronología documentada (1937–1942): *Sociedad Venezolana de Historia de las Geociencias*, v. 47, p. 1–41.

- Urbani, F., Murria, J., y Singer, A., 1993, III Jornadas Venezolanas de historia de las geociencias. Programa y resúmenes: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 54–57.
- Urbani, F., y Paparoni, G., 1993, Emblemas de la Sociedad Venezolana de Geólogos: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 54–60.
- Urbani, F., El petróleo de Pedernales según P. J. Ayres, 1842: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 61–62.
- Van Riper, B., 1993, Men among mammoths. Victorian science and the discovery of human prehistory. University of Chicago Press, Chicago, 267 p., \$16.95.
- Vargas, Milton, 1991, Louis Agassiz and the story of geological surface formations in Brazil: *Quipu*, v. 8, p. 379–388.
- Voisey, A. H., 1991, Sixty years on the rocks—memoirs of emeritus Professor Alan H. Voisey, 134 p. [Available from G. H. McNally, Secretary, Earth Sciences History Group, Dept. of Applied Geology, University of New South Wales, Australia, A\$22.00, overseas US\$22.00 includes postage.]
- Vogt, J., 1993, Coup d'oeil a la sismicite historique des trois Guyanes. Essai de sismologie historique et d'histoire des sciences: *Sociedad Venezolana de Historia de las Geociencias*, v. 48, p. 1–6.
- Walters, R. F., 1993, Fairport and Gorham, the earliest oil fields in Kansas; their history and impact on the environment, 1920's–1990's. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-206.
- White, M. C., 1993, Volunteers compile AGU's history: *EOS*, v. 74, p. 468.
- Widing, Richard, 1992, What about (geological) workers? *Geology Today*, v. 8, p. 99–101.
- Wilhelms, D. E., 1993, To a rocky moon. A geologist's history of lunar exploration. Univ. of Arizona Press, Tucson, 477 p., \$29.95.
- Wilson, A. J., 1992, The professionals: Institution of Mining and Metallurgy, 1892–1992. Institution of Mining and Metallurgy, Great Britain, 398 p.
- Wobus, R. A., 1993, T. Nelson Dale: Diminutive giant in New England geology. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-256.
- Woodfork, L. D., 1993, Ebenezer B. Andrews and the West Virginia “oil break,” early insights concerning the nature of, and geological controls on, hydrocarbon accumulations. Geol. Soc. Am. 1993 Annual Meeting, Boston, p. A-206.
- Wyss, M., Koyangi, R. Y., & Cox, D. C., 1992, The Lyman Hawaiian earthquake diary, 1833–1917. U.S. Geological Survey Bulletin, 2027, Government Printing Office, Washington, D.C., 34 p. \$2.75.

CALENDAR

1994

Mar. 19-21—Interdisciplinary Perspectives on the History of the Earth Sciences, GSA Penrose Conference, San Diego. Léo Laporte, Sciences Department, University of California, Santa Cruz, 95064. Phone: (408) 459-2248. Fax: (409) 459-3074.

May 17-19—Geological Association of Canada/Mineralogical Association of Canada, Annual Meeting, Edmonton, Alberta. J. W. Kramers, Alberta Geological Survey, Box 8330, Station F, Edmonton, T6H 5X2. Phone: (403) 438-7644. Fax: (403) 438-3364.

June 6-10—Mining History Meeting, Golden, Colo. Colorado School of Mines. Mining History Association, Box 15030, Denver, 80215.

June 12-15—American Association of Petroleum Geologists, Annual Meeting, Denver. AAPG, Box 979, Tulsa, Okla. 74101. Phone: (918) 584-2555. Fax: (918) 584-0469.

June 19-24—American Nuclear Society, Annual Meeting. New Orleans. Meetings Department, American Nuclear Society, 555 N. Kensington Avenue, LaGrange Park, Ill. 60525. Phone: (312) 352-6611.

July 1-5—Hydrometallurgy International Meeting, Cambridge, England. Society of Chemical Industry and Institution of Mining and Metallurgy. SCI, 14/15 Belgrave Square, London, England SW1X 8PS. Phone: 071 235-3681. Fax: 071 823-1698.

July 4-8—History of Geology in the Pacific Region, International Meeting, International Commission on the History of the Geological Sciences, Sydney, Australia. INHIGEO, % Earth Resources Foundation, Dept. of Geology and Geophysics, University of Sydney, New South Wales, Australia, 2006. Phone: (02) 552-6136. Fax: (02) 552-6058.

July 5-9—Foraminifera International Meeting, Berkeley, Calif. FORAMS '94, Museum of Paleontology, University of California, Berkeley 94720. Phone: (510) 642-1821. Fax: (510) 642-1822.

July 7-9—History of the Earth Sciences Society, Annual Meeting, Troy, N.Y. Gerald Friedman, Northeastern Science Foundation, Rensselaer Center of Applied

Geology, Box 746, 15 Third St., Troy, N.Y. 12181. Phone (518) 273-3247. Fax: (518) 273-3249.

July 10-15—Environmental Geotechnics, International Meeting, Edmonton, Alberta. International Society for Soil Mechanics and Foundation Engineering, and Canadian Geotechnical Society. D. C. Sego, First International Congress on Environmental Geotechnics, Dept. of Civil Engineering, University of Alberta, Edmonton, Alberta T6G 2G7, Canada. Phone: (403) 492-7228. Fax: (403) 492-8198.

July 31-Aug. 6—Seminar on Extinction, Marine Biological Laboratory, Woods Hole, Massachusetts. Ronald Rainger, Dept. of History, Texas Tech University, Lubbock, TX 79409. Phone: (806) 742-3744. Jane Maienschein, Department of Philosophy, Arizona State University, Tempe, AZ 85287. Phone: (602) 965-6105.

Aug. 21-24—American Association of Petroleum Geologists, International Meeting, Kuala Lumpur, Malaysia. AAPG, Box 979, Tulsa, Okla. 74101. Phone: (918) 584-2555. Fax: (918) 584-0469.

Sept. 12-16—International Volcanological Congress, Ankara, Turkey. Ayla Tankut, Dept. of Geological Engineering, Middle East Technical University, 06531, Ankara. Phone: 90-4-210-1000, ext. 2682 or 2679. Fax: 90-4-210-1263.

Oct. 13-16—History of Science Society, Annual Meeting, New Orleans, Louisiana. Clark Elliott, University Archives, Harvard University Library, Cambridge, Mass. 02138. Phone: (617) 495-2462. Richard Kremer, Department of History, Dartmouth College, Hanover, NH 03784. Phone: (603) 646-2228. Fax: (603) 646-2810.

Oct. 24-27—Geological Society of America, Annual Meeting. Seattle. Vanessa George, GSA, 3300 Penrose Place, Boulder, Colo. 80301. Phone: (303) 447-2020. Fax: (303) 447-1133.

1995

Jan. 5-8—American Historical Association, Annual Meeting, Cincinnati, Ohio. Robert L. Harris, Jr., African Studies and Research Center, Cornell University, 310 Triphammer Road, Ithaca, NY 14850.

Mar. 5-8—American Association of Petroleum Geologists, Annual Meeting, Houston. AAPG, Box 979, Tulsa, Okla. 74101. Phone: (918) 584-2555. Fax: (918) 584-0469.

Mar. 6-9—Society for Mining, Metallurgy, and Engineering, Annual Meeting, Denver. SME, Box 625002, Littleton, Colo. 80162-5002. Phone: (303) 973-9550. Fax: (303) 979-3461.

May 15-19—Exploring the Tropics, International Meeting, Townsville, Queensland, Australia. Russell Myers, 171GES, National Key Centre in Economic Geology, James Cook University, Townsville, Q4814. Phone: 077 814486. Fax: 61-77-815522.

June 11-16—American Nuclear Society, Annual Meeting. Atlantic City, NJ. ANS 555 N. Kensington Avenue, LaGrange Park, Ill. 60525. Phone: (312) 352-6611.

June 12-16—Ordovician System, International Meeting, Las Vegas, Nev. Margaret Rees, Dept. of Geosci-

ences, University of Nevada, Las Vegas 89154-4010. Phone: (702) 739-3262. Fax: (702) 597-4064.

July 2-14—International Union of Geodesy and Geophysics meeting, Boulder, Colo. UGG General Assembly, % American Geophysical Union, 2000 Florida Ave. N.W., Washington, D.C. 20009.

Oct. 10-14—Paleoceanography, International Meeting, Halifax, Nova Scotia. Larry Mayer, Ocean Mapping Group, Dept. of Surveying and Engineering, Box 4400, Fredericton, New Brunswick, Canada E3B 5A3.

Oct. 26-28—History of Science Society, Annual Meeting, Minneapolis, Minnesota.

Nov. 6-9—Geological Society of America, Annual Meeting. New Orleans. Vanessa George, GSA, 3300 Penrose Place, Boulder, Colo. 80301. Phone: (303) 447-2020. Fax: (303) 447-1133.