

BOOK REVIEWS

Mott T. Greene, 1982. Geology in the Nineteenth Century. Cornell University Press, Ithaca, NY. 324 p., hard cover. \$29.50.

The history of ideas in geotectonics, rather than in geology, is the subject matter of this book. The author describes four grand syntheses of the 19th century of what he calls global tectonics, that is, the origin of mountain ranges around the world and the distribution of continents and oceans. Greene discusses the mechanical motions, interactions, and characteristics of these big rock masses, using pertinent geological evidence from contemporary igneous and sedimentary petrology and geophysics. He does not discuss mineralogy, paleontology, stratigraphy, geomorphology, volcanology, and much of petrology, all quite essential to the development of geology.

With the rise of plate tectonics in recent years, and its great explanatory power, there is clearly a need to go back into the history of geology to look at its progenitors to evaluate the previous all-encompassing hypotheses in geotectonics, to find out what was proposed, and who proposed it. The author has done that valuable task and done it well. He has assimilated a massive literature, evaluated it critically, and produced a readable, useful book on global tectonics.

The early nineteenth century geological hypotheses of Hutton and Werner are reviewed with new perception by the author, untangling misconceptions, especially of Werner. In these first chapters, there are only implications for geotectonics; the plutonism and volcanism of Hutton and the neptunism of Werner and their contemporaries, Jameson, von Buch, and James Hall are limited to these elementary ideas by their provincial geological observations. The stable uniformitarianism of Lyell had little import to tectonics, whereas de Beaumont, inspired by the structures of the Alps, proposed that 20 world-circling chains of mountains were formed by thermal contraction, the first global tectonics hypothesis described by the author. De la Beche, Babbage, and Herschel also called on internal heat and lateral forces to build mountains.

The catastrophic model of the Rogers brothers for forming the Appalachian mountains is described, but their prodigious, classic, and still useful geologic mapping of the northeastern United States is hardly mentioned. Dana and Hall proposed that oceanic subsidence produced adjacent lateral pressures across geosynclines to form mountains, a mechanism adequate for the Appalachians but not for the Alps. The global tectonics of Suess, which is described by the author in overpowering detail, was inspired by the hypotheses of Studer and von der Linth. Suess proposed that episodic great lateral pressures from thermal contraction of the earth formed the great mountain ranges; in his interpretation of earth processes, Suess mediated between strict uniformitarianism and catastrophism. Heim and Collet each added more complete explanations of nappe structures.

The author describes how the results of geophysics began in the late nineteenth century to place limits on geotectonics and to produce new hypotheses. For one thing, contraction was shown to be inadequate to account for the large crustal shortening required by the structural geologists. From measurements of gravity and geodesy, Pratt and Airy, followed by Fisher, Dutton, Reade, and Willis called upon isostatic adjustment to provide power to build mountains. Reyer suggested gravity sliding triggered by localized temperature disturbances as a mechanism for orogeny.

Periodic contraction of ocean basins and emergence of continents, proposed in the very early 20th century by T.C. Chamberlin to account for mountains, is the third global tectonics of the author. The energy source of the decay of radioactive elements to heat the rocks of the crust and upper mantle led Joly to a theory of localized mountain formation in geosynclines, the fourth global tectonics of the author. From studies of the Mid-Atlantic ridge and motion of continents toward the equator, Taylor proposed the first model of continental drift. Wegener's comprehensive hypothesis for drift of continents is well-known, and the author gives him credit for knowing well the contemporary evidence from geology and geophysics. And there the author ends his history.

Greene apparently considered geotectonics to be the essential framework of geology and therefore the touchstone of how the science of geology developed. He wished to decide whether additions to data on geology slowly built a concept of a single global tectonics theory or separate and revolutionary "paradigms" of geotectonics succeeded each other. The author found that no single model ever really prevailed at any time in the history of geotectonics, but that new concepts were continuously introduced and then synthesized to form temporary new hypotheses. As he says, "Unlike those disciplines that in their best moments seem to converge toward fundamentals, geology was constantly faced with dispersive tasks," adding that "...geology was a larger and more difficult enterprise than had previously been imagined."

Scientists in all fields of geology are currently overwhelmed with published applications of plate tectonics to their area of interest. In fact, the author points out that in de Beaumont's time the French geologists and editors had a desire "...to partake of the general theory of the earth as a frame for their work so that it would appear up to date," and that "Today one finds the same phenomenon with regard to the theory of plate tectonics---no matter how conventional the subject, the author generally appends a short final paragraph tugging his forelock in the general direction of the plate margins."

The illustrations are just adequate for a book concerned with structures of spectacular mountains, considering that so many good photos are available. In addition, pictures of the prominent scientists in geotectonics of the

nineteenth century would add considerably to the historical attraction of the book, although with added pictures the nominal price might need to be uplifted. The glossary is necessary and is good.

This book will provide a perspective on how the ideas on geotectonics developed, how much of them are still accepted, and how a unified theory on the subject can be useful. It can serve as a history of geotectonics for geologists at all levels of training and in all fields, especially those who are not familiar with the old literature.

Eugene C. Robertson
U.S. Geological Survey
Reston, VA 22092

C. C. Bates, T. F. Gaskell, and R. B. Rice,
1982. Geophysics in the Affairs of man.
Pergamon Press, Oxford, 492 p., flexicover
\$25.00, hardcover \$60.00.

This is a most readable and valuable book. It is unusual in the Earth sciences to have busy practitioners find the time to describe the professional scientific and administrative world that they were part of during their careers. All three of the authors have been engaged in the commercial search for oil and natural gas and have been actively involved in many aspects of geophysical research. The full flavor of this quite unusual account is given by the emphasis on geophysical enterprise as "an interplay of technical, social, and economic factors." In doing this there is no attempt to write a book in the same mold as science historians, yet it will be of great value to historians of science.

Geophysics in its modern sense encompasses many disciplines such as meteorology, vulcanology, aeronomy, and magnetospheric physics, all part of the activities of the International Union of Geodesy and Geophysics. In this book the authors, through space limitations and their own preference and background, select for discussion mainly that part of geophysics related to exploration for minerals and oil, but there are many strands that run well outside these fields (e.g., a vignette on the teaching of geophysics by Maurice Ewing). They treat key parts of seismology and oceanography and, because they are particularly interested in environmental questions, discuss at considerable length aspects of seismological research related to the monitoring of a nuclear test ban treaty.

The book begins with a brief but fascinating account of the forerunners of modern exploration geophysics up to the end of World War I. Mention is made of the use of acoustic and seismic detectors to locate the position of heavy artillery positions in France during the first World War. Then a history is given of the "golden days of exploration geophysics" when the driving need to find oil in the United States and other countries stimulated highly specialized geophysical methods. The 1939-1945 war years present a mixed but pregnant interlude from which emerged, often by strokes of fate rather than

planning, many of the main figures in modern geophysics. The authors knew first hand many of the applications of geophysics during the 1939-45 war and sketch well how these were sharpened and expanded with the coming peace.

In the fifties and sixties, geophysics expanded rapidly and made very significant impacts upon contemporary life. There is an account of manpower training for geophysics, the advance of new data processing methods, and development of nonexplosive sources for field exploration. There is a rather personal account also of the way that classical seismology had to shake off its dusty past and move into the scientific limelight when national demands arose to find ways to discriminate between underground nuclear explosions and natural earthquakes. This program led to the funding and successful construction of the global seismological network of standardized stations. Because the authors have not personally been close to the wide research effort based on this network, their account is necessarily incomplete and a full history is still needed on the way the world network led to improved understanding of the Earth and its internal structure. Later chapters deal with environmental questions and the way that geophysics has influenced human activities, sometimes in ways not appreciated by environmentalists. Nothing in the nineteen seventies has given extreme environmental groups such a sense of outrage as offshore drilling and the development of ore deposits by large open cut mines. The authors take up many such questions head-on; particularly interesting is their discussion of the possible adverse effects of human activity on the global climate. They speak of "the advocacy school of science" with mild but detectable coolness and place quotation marks around some of the judgmental phrases common in environmental writings today.

One highlight of the book is the way that names of many leading figures are given freely throughout (not only names of innovators in geophysics, but also names of those who are known for their generous donations to research centers and universities). Salary levels and job opportunities are discussed and judgments made concerning them. The authors hold that "over the past six decades geophysicists have been highly productive and financially well-rewarded." In their final chapters, they discuss geophysics as a business, introducing many economic arguments and questions involving interaction between government and private industry. These questions have always been at the forefront of exploration geophysics, always one of the strongholds of private entrepreneurship.

The final chapter is of specialized interest but unusual biographical import. While much of the book is readable in the way a Sunday serial is readable, and much of the narrative is riveting, many of the paragraphs are so packed with ideas and people that it is hard for the authors to explore deeply and critically. In an attempt to get around this problem, the last chapter gives biographies and personal achievements of some of the leading geophysicists of the last four decades. By no means all candidates for such selection are

included, but readers will be pleased to discover, for example, how such scientists as Fank Press, Harold Jeffreys and Keith Runcorn see their main contributions to geophysics.

Bruce A. Bolt
Department of Geology
and Geophysics
University of California
Berkeley, CA 94720

Hunt, Charles B. (editor), 1982. Pleistocene Lake Bonneville, Ancestral Great Salt Lake, as Described in the Notebooks of G. K. Gilbert, 1875-1880. Brigham Young University Geology Studies, volume 29, part 1, 231 p. Soft cover, 8 1/2"x 11". Price, \$12.00

This work, as noted in its preface, is a result of gathering by Hunt of Gilbert's field notes for the former's contribution to an assessment of Gilbert's scientific accomplishments (Hunt, 1980). It is more! This is clearly a labor of love for Charles Hunt who has previously traced with admiration and affection the footsteps of G. K. Gilbert throughout Utah. Hunt notes that he belongs to a considerable group of geologists, including for example the late James Gilluly, who are firmly convinced that Gilbert is the towering figure in American geology. This collection of Gilbert's field notes makes clear the basis of these opinions.

In the first chapter, which is an introduction by Hunt, Gilbert's whole career is briefly traced, as well as is the classic study of Lake Bonneville. There follows a general description of his notebooks, and the plan of the present book. Gilbert's field notes were extraordinarily complete and, while he was yet in the field, he wrote down fully his observations and results. His field sketches are almost legendary; by comparisons with his published sketches it is commonly possible to reoccupy almost exactly his position when he made them. Extraneous detail so common in photographs is omitted and his profuse field sketches contain and clearly exhibit only the relevant information.

Gilbert's thought processes are openly exposed in these notes and, as many have noted, he was an outstanding observer and logician. Hunt (1980) explores this in detail. What was perhaps less clear until Hunt pointed it out by this publication of Gilbert's notes is the remarkable care, completeness, and accuracy of the field observations. Recognizing that one hundred years ago the field equipment and transportation available in Utah were primitive, one is startled to see the marked parallelism between Gilbert's map (p. 8) of the doming of the Bonneville shoreline and the modern version (p. 9) published by Crittenden. At the end of his introduction Hunt gives us a glimpse of the human side of Gilbert - his humor under trying field conditions.

The field notes themselves are masterpieces of lucidity, completeness, and geological acumen. Hunt has done an exceptionally insightful job of adding his Editor's notes. They are unobtrusive and serve

well to expand and clarify where the passage of a century may have dimmed the meaning or references of some of the notes. Carefully selected aerial and ground photographs added by Hunt embellish the original notes and field sketches. He also adds a brief listing of contents at the head of each of the seventeen chapters of his study; and each chapter is based on one of Gilbert's field notebooks.

One of Hunt's addenda is a letter (p. 158) from Joseph Barrell to Gilbert written in 1918, the year Gilbert died. It is a marvelous letter of praise for Gilbert, and makes the reader wish to have been present at a hypothetical meeting of the two men. If one does not wish to read entirely through this work but rather dip into it for brief sections, be certain to read page 158. Incidentally, it is well worth reading parts, if not the whole - any time spent with Gilbert is time very well spent.

Charles Hunt has done an excellent job and rendered a useful service indeed. His introduction, inserted notes, and ideas are valuable additions to the field notes. In reading all or part of this book one can perhaps, under the guidance of a master field geologist, discover once again why he or she became a geologist.

REFERENCES

Hunt, C.B., 1980. G. K. Gilbert's Lake Bonneville studies. In Yochelson, E.L. (ed.), The scientific ideas of G.K. Gilbert. Geol. Soc. Amer. special paper 183: 45-60.

L. Lattman
College of Mines & Mineral Industries
University of Utah
Salt Lake City, Utah 84112

A.E. Leviton, P.U. Rodda, E. Yochelson, & M.L. Aldrich (editors), 1982. Frontiers of Geological Exploration of Western North America. Pacific Division, AAAS & California Academy of Sciences, San Francisco, CA 94118. \$16.95. Soft cover, 7x10, 248 p.

This is an interesting and attractive book. The printing is clean and readable, but I was disappointed at the quality of reproduction of photographs and maps--although such faded and wrinkled originals give the printer an extra challenge.

These papers were presented at a symposium sponsored by Section E of the AAAS Pacific Division, at Moscow, Idaho in June 1979, under the cooperative eye of the University of Idaho and the Idaho Bureau of Mines and Geology. It was one of several such meetings that year which honored the U.S. Geological Survey on its 100th birthday.

The editors have done a creditable job of assembling the 15 papers and nurturing them along the road to publication. The papers are presented as a single shopping list; many readers might wish for two or three topical groupings to help narrow the target for their browsing and serious reading. The price is not

overwhelming, and this book may thus grace many geologists' shelves.

To help those who might hesitate before taking the plunge toward ownership, condensed (or slightly modified) titles are listed below; they have been numbered for ease of reference in the brief discussion that follows.

- 1.-The USGS at 100; Advancement of Geology in the Public Service (Thomas B. Nolan & Mary C. Rabbitt)
- 2.-Clarence King's Role in Advancement of Geology in the Public Service, 1867-1881 (Clifford M. Nelson & Mary C. Rabbitt)
- 3.-John Boardman Trask; Physician/Geologist of California, 1850-1879 (Alan E. Leviton & Michele L. Aldrich)
- 4.-Thomas Condon; Oregon's Pioneer Geologist--Scientist, Teacher, Preacher (Ellen T. Drake)
- 5.-I. C. Russell; Frontiersman of Science (Mary C. Rabbitt)
- 6.-Alfred Hulse Brooks and Alaska's Geological Exploration, 1898-1924 (Dwight Loren Roberts)
- 7.-The USGS in the Pacific Northwest, last 100 years (A. E. Weissenborn & Thor H. Killsgaard)
- 8.-Metamorphic Rock Studies in Western North America, last 100 years (Rolland R. Reid & Johnnie Sue Reid)
- 9.-Paleozoic Rocks of Western North America, Retrospect and Prospect (William B. N. Berry)
- 10.-Mesozoic Stratigraphy in Southern and Central Alaska, the Tectonic Key (David L. Jones & Norman J. Silberling)
- 11.-Cenozoic Stratigraphy West of the 100th Meridian (V. Standish Mallory)
- 12.-Quaternary Research in the Northwest, 1805-1979; Early Government Surveys and the USGS, and a Look Ahead (Richard B. Waitt, Jr.)
- 13.-Volcanic Studies in the Pacific Northwest, last 100 years (D. A. Swanson)
- 14.-Mineral Deposits of the Western U.S. (Charles F. Park, Jr.)
- 15.-Tectonics of the North American Cordillera, Evolving Concepts (J. W. H. Monger & G. A. Davis)

First, a quick look at the two bookends. The Foreword, by Yochelson (USGS) and Rodda (California Academy of Sciences) deals mainly with the USGS and its predecessor national surveys, while also noting that the California Division of Mines & Geology had its origins in 1851. Monger (Geological Survey of Canada) and Davis (UCLA) are authors of the final paper, appropriately about tectonics; they remind us that despite advances in concepts brought about by modern techniques, the latter will only "supplement but never supplant the continual need for more and better geological field mapping, the original method of understanding tectonic problems." (p. 242)

Clarence King, we are still (or again) listening, a century later!

Now, for the rest of the papers--some of which are treated out of sequence in this review. Former USGS Director Nolan and USGS historian Rabbitt lead off with a readable account of highlights of the road that the USGS has traveled--and paved for other travelers--through the past century. They comment that it "illustrate[s] a continuing ability to utilize the products of intellectual curiosity in the solution of practical problems that arise in our economy." (p. 11)

As a result, the "real and lasting contribution made by the Survey...[is] that it has been one of the essential contributors to the development of this nation to the international power that it is today." (p. 17)

The role of Clarence King (No. 2) has been described many times, and by many people--but this short piece by Nelson (USGS) and Rabbitt is a pleasure to read, and the photos and maps help one to be there.

The account of Trask (No. 3), one of the longer papers in the book, tells us not only of his being State Geologist as early as 1854, but also that he had helped found the California Academy of Sciences a year earlier. The story of this remarkable physician is told by the masterful weavers of historical threads, Leviton (CAS) and Aldrich (AAAS).

Paper No. 4 describes the life and scientific contributions of an amazing pioneer preacher/scientist/teacher in Oregon. Thomas Condon, the minister who discovered the John Day fossil beds, described the sequence that changes from Cretaceous marine fossils below to the forests and mammals of the overlying Tertiary lake beds, and he made major contributions to the genealogy of the horse. Today, when the evolution/creationism debate is again heard in the land, it is rewarding for a scientist to read the words of this preacher, who said that

"Christendom had survived the Copernican revolution and Galileo's heresy and the acceptance of the great antiquity of the earth...but warned [that] 'the church cannot put herself in a position of chronic antagonism to science without harm.'" (p. 73)

We need more Thomas Condons, to give "free public lectures all through [their] careers".

Paper No. 5 is the story of an extraordinary explorer/scientist, I. C. Russell, who joined the USGS in 1880. Of particular interest to this reviewer are the results of his summer geologic work in the Pacific Northwest after 1892, when he became a faculty member of the University of Michigan. The special attention that Russell gave to water supply is emphasized in Rabbitt's paper; she praises not only his energy and industry but more importantly, his "attractive literary style, coupled with his skill as a photographer and in sketching, [which] makes his reports enjoyable reading even today." (p. 79)

Waite, of the USGS, in his report on the Quaternary (No. 12), says that observations before 1867 by early explorers and the Pacific Railroad surveys were casual although, he notes, often perceptive. Of the great geological reconnaissance surveys during the 12 years that preceded formation of the USGS in 1879, only G. K. Gilbert's report on the Henry Mountains was highly influential in the Pacific Northwest. Until 1913, the USGS performed broad reconnaissances into Quaternary history and surficial processes of the Pacific Northwest. The succeeding 30-year period, however, was virtually barren of USGS research on the Quaternary there. The last 30 years witnessed a rebirth of USGS interest in the Pacific Northwest, with increased surficial mapping, much of which was still necessarily reconnaissance. Waite's report though causes one to ponder whether full acknowledgment has been given to important Quaternary research conducted in the Pacific Northwest by university and other non-USGS people.

Volcanic studies in the Pacific Northwest (No. 13) are a particular feather in the USGS cap--especially the prediction of the current hazardous situation presented by many volcanoes along the Cascade chain from mid-California northward into British Columbia. Swanson's excellent account, by the way, is supplemented by a short addendum to Waite's paper, which provides a brief update in recognition of Mount St. Helen's cataclysmic eruption on May 18, 1980. Swanson neatly weaves a thread through his chronology of studies--unlike another paper (no. 7), which is little more than a dry recital of a sequence of publications that appear as blips on the screen of time.

Two papers--one on metamorphic rocks (No. 8) and the other on Cenozoic stratigraphy (No. 11)--read like very thorough, and enjoyable, annotated bibliographies. Two other papers unfortunately lack obvious historical color; the one on Paleozoic rocks (No. 9) is a state-of-the-art review, and the one on Mesozoic stratigraphy (No. 10) is a solid technical paper.

Park's brief treatment of mineral deposits of the Western United States (No. 14), while a rewarding review of the world as seen by a mineral explorationist, should be read as far more than that. Park has a message for all of geology. He repeats the commandment that formed the basic theme of his two books in the last decade or so, warning that the affluence which the developed countries have come to enjoy is truly in jeopardy. He reminds us that "our form of government responds to the will of the majority of its citizens." (p. 214)

If our descendants in the U.S. are going to be able to honor the USGS at the end of its second hundred years of public service--as we have just done at its centennial--we must pay more attention to Park's thesis. It takes no more than a quick look at the budgetary and programmatic reversals that have befallen that leading institution of governmental research, to appreciate the portent of Park's statement--and the challenge that it presents to the geological community of scholars,

professionals, and scholarly professionals; (some readers might even include professional scholars in that list.)

As many of us are becoming aware, and as more of us are beginning to say publicly, professional geoscientists must become more involved in communicating with the many non-geologic publics, all of whom have an interest in our mineral, water, and land resources, and in the means to solve problems relating to their use.

In fact, a unique contribution of G. K. Gilbert, himself a masterful communicator for the USGS nearly a century ago, was

"his willingness and ability to communicate with nongeologists, so that such people could reap a greater benefit from the scientific work that Gilbert and his associates had performed for the Survey." (Agnew, 1980, p. 91)

The past, among other things, is prologue; it is also an important key to the present--and thus to the future. What better way to understand the "why" of what happens today than to read about the people and listen to the voices of the past? It is not only instructive, but can also be fun. Geologists in other parts of the United States should also appreciate the message and taste the enjoyment of reading parts or all of this publication

References

Agnew, Allen F., 1980. G. K. Gilbert and Ground Water, or 'I Have Drawn This Map with Much Reluctance' in Yochelson, Ellis L., ed., The scientific Ideas of G. K. Gilbert: Geol. Soc. America, Spec. Paper 183: 81-91.

Allen F. Agnew
Geological Consultant
3660 NW Roosevelt Drive
Corvallis, Oregon 97330

Edwin B. Eckel, 1982. The Geological Society of America-- Life History of a Learned Society. Geological Society of America Memoir 155, 167 p., illus. \$24.50. Hard cover.

What is a learned society? How is such an organization conceived, birthed, nourished and kept flourishing for nearly 100 years? Why do groups of people with common interests get involved with the complexities of a corporate enterprise? What good is it, in the long run?

These questions are tackled in Ed Eckel's well-written, fascinating biography of the Geological Society of America. This is no mere dry recounting of history; it is a highly personal view of the Society to which Eckel, and several hundred other highly motivated people, have dedicated their time, effort and lives to assure the successful "...promotion of the Science of Geology in North America."

Although this book retains historical perspective, it is not a chronology of GSA's development. The chapters are topical, and

they show how the Society actually works, in terms of such things as: Investment Management, Membership, Publications, Governance, Research Grants, Meetings, etc. All these activities involve people--scientists who are enough involved to provide advice and guidance, but, more importantly, headquarters staff who breathe life and purpose into an otherwise inert corporate body. Eckel is especially sensitive to this, as the dedication of his book indicates; "To the many devoted women of the GSA staff...only a few appear in these pages, but all have contributed to the health and continuity of the Society."

It is remarkable how few people actually keep a scientific society alive. During its first 70 years, GSA had only 5 chief executive officers, 3 editors and 7 treasurers. One of these, Henry R. Aldrich, was actually Secretary for 18 years and Editor for 25--holding both offices simultaneously for nearly two decades.

Of course, the Society was smaller during much of that time, growing slowly from about 100 original members to about 800 after 60 years. This was the period when GSA could properly be termed a "learned society." Why "learned"? My dictionary defines learned as: "Of or pertaining to learning... characterized by, especially, scholastic learning; erudite...." And GSA certainly fulfilled that definition during its first 6 decades. It became an exclusive organization composed of Fellows who were known mainly for their academic erudition. Not a few of them were true scholastics.

In Chapter 5, Eckel delineates the growth of this exclusivity. Originally, GSA was truly democratic, welcoming all who worked in geology or taught it. Gradually, however, Fellowship came to be considered an honor achieved only by invitation and by vote of the entire Fellowship. Only a few Fellows were elected each year, and their proportion of the total geological community dwindled yearly until 1947. In 1948, the Bylaws were changed in response to pressures to democratize the Society. Major changes were made and a new Member class was established. The result, unfortunately, was only to produce a quasi-democracy (Eckel's term). Rather, the GSA became a two-class society and, after further reforms in 1971, a three-class society that included Student members. However, the dam of exclusivity had been breached and the Society would never again be the same.

Explosive growth followed, with total membership passing 5,000 by 1960 and 8,000 by 1970; membership apparently has been stabilized at about 12,500 since 1974. The 1948 reforms also separated the regional geographic sections from the technical divisions and provided for election to Fellowship by three-quarters vote of Council. As the Society grew, its membership shifted perceptibly from predominantly academics and government employees to nearly half industry geologists by 1981.

More changes followed in the 1970's, heralded by the move of headquarters from New York City to Boulder, Colorado, where offices were housed in the strikingly beautiful new

building at the foot of the Rockies. The occupation of this new corporate headquarters in the hinterland presaged the most recent phase of Society growth. The old elitist-academic image had faded, only to be replaced by the quasi-democracy of the 1950's and 1960's. In the past decade, GSA has moved towards computerized management, established a separate foundation to fund an elaborate Decade of American Geology leading to the celebration of GSA's 100th birthday, and instituted sweeping changes in its publications program.

In the final chapter and epilogue, Eckel peers into his crystal ball to predict that GSA's major emphasis on publications, meetings, research support and cooperation with other societies will not materially change, but that the search for new funds to support ever-greater expectations will be the key to sustained and healthy growth.

Let us hope that the move to computer- and business-oriented techniques, both in society and investment management, will not alter the basic Society goals. Continued close monitoring of Society affairs by knowledgeable scientists, and responsibly executed headquarters functions by a professional staff, are essential to GSA's future well-being.

The Geological Society of America, after a long proud history of service to geology, has achieved an enviable position as a "teaching" society rather than a "learned" one. It now serves its members, and the geologic profession as a whole, as well as any comparable organization. Ed Eckel's book tells us how it got that way. It's delightful reading, and I recommend it to all scientists who wonder why they organize, what they expect from a scientific society, and how such groups function.

J. Thomas Dutro, Jr.
U.S. Geological Survey
Washington, D.C. 20560

William Glen, 1982, "The Road to Jaramillo. Critical years of the revolution in earth science." Stanford University Press, Stanford, California. xx, 460 pages, 36 figures, 3 appendices, cloth. \$37.50.

The bird-dog trail of development of the many disconnected events that culminated in the conception and "proof" of sea-floor spreading is viewed by a Californian geologist, who is a self-professed "inexperienced" historian of science. The source material is primarily published and unpublished works from post World War II to 1981, personal correspondence, interviews (70 preserved on tape) with more than 100 respondents, administrative and laboratory records, memorabilia, and "other primary historical materials," now archived in toto at the Bancroft Library, University of California at Berkeley. It is a well-documented book, but footnote gossip labeled "unattributed on request" should have been omitted.

The three-part book deals with (1) development of the potassium-argon method for dating geologically young rocks, (2) dating of

young magnetic rocks and formulation of a time scale of reversals of magnetic polarity, and (3) applications of the terrestrially derived magnetic time scale to the "unique pattern of parallel magnetic stripes on the ocean floor." (The first two parts were taken from Glen's doctoral dissertation.) Focus of the history on essentially three centers of investigation results in much repetition--even the figure captions are usually a repeat of text material without further illumination--and diffusion of the variety and magnitude of the international contributions. The title arises from the author's view that the key discovery in 1965 of a polarity reversal at about 0.9 million years near Jaramillo Creek, New Mexico, by Richard Doell, Brent Dalrymple, and Allan Cox led to the interpretation of oceanic magnetite profiles (especially that of the Eltanin leg 19 crossing of the East Pacific Rise) and confirmation of the concept of constant sea-floor spreading.

The book overly dramatizes the multitude of events, described in one place as "coincidence of more modest increments of progress," that Glen believes to be the revolution in earth science comparable to the great contributions of Copernicus, Darwin, and Einstein. In spite of such overstatements, the story is indeed fascinating reading for anyone who has watched this modern history unfold. Attempts are made to explain a few simple geological terms such as pluton, magma, and tuff, but most readers outside the geological community will probably find it difficult reading. The emphasis on priority of publication will clearly ruffle the feathers of many of the participating groups, and the attention of a number of individuals will be captured by Glen's offhanded dismissal of some important contributors (e.g., Rutten). The biostratigraphers get short shrift, yet Glen concludes that the deep-ocean cores coupled to biostratigraphic zonation provide "a more complete and finely detailed magnetic record of the time interval they represented than was obtainable from other studies." The provincial views expressed will no doubt stimulate some of the participants to write their own versions of the evolution of the magnetic time scale and its impact on the acceptance of the concept of sea-floor spreading.

The major contribution of the book is the case made for the need to maintain a broad spectrum of basic research as opposed to applied programmatic research. The necessary equipment (e.g., a static-mode mass spectrometer of adequate precision, the slow spinner magnetometer, and deep-sea coring devices for sediments) was generated for reasons unrelated to the ultimate goal. The motivation and determination of the proponents were enhanced by the competitive groups: the reversalists, who believed the polarity of the earth's magnetic field reversed for specific intervals of time, were spurred on by the directionalists, who suggested that movement of continents was required to account for ancient magnetic pole positions and were chided--and occasionally ridiculed--by the fixists (antidrifiers), who held that the continents were not mobile and the ocean

basins were permanent. The enormity of the data base required to achieve the end result is evident. The slow acquisition and digestion of observations advanced to a point where several groups arrived at the same conclusions almost simultaneously. Many conclusions represented the articulation by one group of an already developed idea almost ready for explicit statement by other groups. Glen treats quite fairly the independent development by Vine and Mathews and by Morley of the hypothesis of alternately magnetized stripes formed as newly generated basalt spread from the mid-ocean ridges. He also gives due credit for the concurrent recognition of what was later named the Jaramillo event by Dalrymple, Doell, and Cox of the U.S. Geological Survey, Menlo Park, and by Pitman, Herron, Opdyke, and others at the Lamont-Doherty Geological Observatory.

Glen describes how some data were acquired by operations characterized as "bootleg" or with money "surreptitiously diverted" from other grants. Such support was negotiated with the help of perceptive administrators. He also cites lost opportunities where the administrators in some organizations prevented, either knowingly or unknowingly, the necessary interactions between rock magnetists and young-rock geochronologists. Many references are made to the "remarkable number of fortuitous circumstances" that led to the final synthesis. As Glen states (p. 72), "The crucial links of historical chains are often forged of pure opportunity." He illustrates how chance meetings of investigators, unusual combinations of talent, and especially scientific lineage influence the development of an idea. There was indeed a small club of people highly interrelated by the same tutorial professors, visits, sabbaticals, specimen exchanges, and attendance at national meetings. Group discussions or the appearance of "trigger" papers are commonly cited as precursors to new hypotheses. Among the almost random speculations, one idea would be favored by a measurement or an observation, and the spark would set off a new round of endeavor. To quote Cox, "No central committee planning the future of earth science could conceivably have guessed that this [discovery] would happen." The case thereby rests for a broad spectrum of basic research as requisite for the generation of new ideas!

Many gems of wisdom are quoted throughout the book to which most readers will relate. Some examples are:

"The persons who interpret the analyses must collect the samples" (Curtis and Evernden, p. 73).

"If scientists are going to work on problems, they have to be allowed to work on their own problems and thus do their best work" (Goldich, p. 89).

"... it was cheaper for each research group to have its own machine tools, the idea being that equipment was a lot cheaper than personnel" (Doell, p. 181).

"... the major breakthroughs would come in the interdisciplinary fields" (McDougall on Jaeger, p. 210).

Glen expands (p. 314) on the last quotation by observing that "geophysicists too often lacked the geological training and perspective required to apply their physical data to the construction of broadly encompassing geological models and overviews." Nevertheless, Glen concludes that "Those operating with ease at disciplinary interfaces were predictably most often in possession of diverse and seemingly unrelated elements required for the synthesis of broad conceptual constructs--a pattern not peculiar to earth scientists."

Perhaps the most sparkling gem and the most significant statement of the book appears as Appendix A entitled "A Note of Concern." It is a quotation from G. B. Dalrymple, who questions present-day emphasis on short-term, quick-fix relevance and mission-oriented research when the long-term payoff is in basic research. An audible cheer issued when this reviewer read that Dalrymple believed "basic research is a demonstrably worthwhile endeavor and could be sold even in today's climate."

Although the book is not a penetrating analysis of the scientific achievements themselves, Glen has indeed gathered together a substantial mass of information when it was still relatively fresh in the minds of the participants. Future science historians will be grateful for this detailed compilation. The evaluation and weighing of the contributions will probably come with future hindsight, which unfortunately tends to draw a solid line through diffused border zones that should remain dashed.

H. S. Yoder, Jr.
Geophysical Laboratory
2801 Upton St., N.W.
Washington, D.C., 20008

"Eduard Suess 1831-1914" edited by A. Tollmann & E. Kristan-Tollmann, 1981, (no date given), 100 p. Paperbound. Available, for 50 Austrian shillings, from the Oesterrichische Geologische Gesellschaft, c/o Geologische Bundesanstalt, Rasumofskygasse 23, A-1031 Vienna, Austria.

The 150th birthday of Eduard Suess was celebrated by an exhibit at the Natural History Museum and by publication of this work by the Geological Society of Austria. "Das Antlitz der Erde" is the classic by Suess, but few today have read it, even though its volumes are available in English and French as well as the original German. This compilation may spark more interest in its author outside of Europe; the man who named Gondwanaland deserves to be well-known worldwide. The work consists of seven articles; three have English abstracts. Erich Thenius writes on the Gondwanaland as Eduard Suess perceived it in 1885 and its importance in both geologic and biologic sciences; Alexander Tollmann considers Suess' contributions to tectonic studies in general and Helmut Flügel writes on "Die paläozoische Tethys: Fakten, Fiktionen, Fragen." Helmuth

Zapfe reminds us of Suess's contributions to paleontology. Josef Donner adds quite another dimension in writing of Suess as the father of the first pure spring water system to be installed in Vienna. Othmar Kühn summarizes the life work of Suess, and a particularly appropriate paper is another summary of his life's work by his son Franz Eduard Suess written 50 years ago. The papers are all illustrated, some with original notes or sketches, making this a handsome publication, very well worth the modest cost.

Ellis L. Yochelson
U. S. Geological Survey
Washington, D.C. 20560, USA

"A geological miscellany" compiled by G.Y. Craig and E.J. Jones. 216 p. Hardcover. Orbital Press, Box 141, Oxford, OX1 1TZ, England. 9.95 pounds sterling (plus 1.45 pounds sterling for handling and surface mail outside of the United Kingdom).

This book is marvellous!!! Individual items range in length from one line to four pages. If you want to know John Woodward's instructions on collecting fossils, when Mary Anning was struck by lightning, the proper requirements for setting up a New Zealand Geological Survey field camp, Mark Twain's description of Kilauea, or scores of other items, this is the place to go. A history of the Pick and Hammer Club attributed to Ellis Yochelson is an ancient anonymous item, but apart from this blemish everything about the book is satisfying, including typography, binding, and price. Items have a humorous (or humorous) aspect, but this is not just a collection of funny pieces about geology. It is a compilation to be picked up and thumbed through time after time. The book jacket states "The Geological Miscellany is an entertainment" and to my knowledge that quote is one of the few times that this form of literary assessment has been accurate. I recommend without reservation that every geologist purchase this collection of gems and write to the authors encouraging them to begin work on another.

Ellis L. Yochelson
U. S. Geological Survey
Washington, D.C. 20560, USA

"Paleontological Research Institution: Fifty years, 1932-1982" by Katherine V.W. Palmer. Paperbound, 29 pages. Paleontological Research Institute, 1259 Trumansburg Road, Ithaca, NY 14850, USA. \$5.00 (plus \$.88 for postage and domestic handling).

The Paleontological Research Institution (PRI) is well-known as the publisher of Bulletins of American Paleontology and Palaeontologica America. This history presents some details of how G.D. Harris came to found the organization which produces these series. After his death, PRI was a one-woman show for many years. This slim history, the last publication written by the late Dr. Katherine Palmer, is a special 50th Anniversary Publication of PRI. As such, it is highly specialized, but could be useful to anyone who

is investigating the operation of small scientific enterprises, a type of organization which shows great variability. It does not present as much of the history as one might like to know about this organization, but it is all the history one is ever likely to obtain for this interval. In honoring Dr. Harris, Dr. Palmer has shown her own selfless devotion to this organization. For many years PRI was virtually penniless, yet somehow the determination of Dr. Palmer and her colleagues kept it going and they published noteworthy paleontological studies. Sales of this publication will probably be miniscule, but it is particularly appropriate that PRI published this account as a tangible memorial to a dedicated scientist.

Ellis L. Yochelson
U. S. Geological Survey
Washington, D.C. 20560, USA

"100 Jahre Paläontologisches Institut der Universität Wien 1873-1973" by F. Steininger & E. Thenius, 1973, 68 p., 12 pls. Paperbound. Available upon request from the authors at the Institut für Palaeontologie der Universität Wien, Universitätsstrasse 7/11, A-1010, Vienna, Austria.

In Europe, the tradition of an institute for paleontology separate from geology has been common. In this usage, paleontology includes stratigraphy and often a great deal more of "soft-rock geology." One of the longest enduring of these institutes is in Vienna; Suess, Neumayer, Waagen, and Diener are only four of the distinguished paleontologists one associates with it. The authors devote four chapters to the organizational history, the first giving a summary up to 1903 when the institute was clearly defined and the second to the era of Carl Diener. Overlapping with and partly competing with the organization of Diener was a separate Paläobiologisches Institut under Othenio Abel; the difference in training and outlook provided by these two professors is the subject of a third chapter. The remainder of the publication is concerned with consolidation of these two groups, decimation of the university by World War II and the subsequent rebuilding of this distinguished institution. Photographs of numerous illustrious paleontologists add considerable life to the narrative, as do views of the old laboratories and even the floor plans of the building. This little history is well worth having; we can only applaud the generosity of the Institute for distributing it free of charge.

Ellis L. Yochelson
U. S. Geological Survey
Washington, D.C. 20560, USA

Robert Rakes Schrock, 1982. Geology at M.I.T. 1865-1965. A History of the First Hundred Years of Geology at the Massachusetts Institute of Technology. I. Departmental Operations and Products. Cambridge, Mass., and London, England; The MIT Press, xxvi + 1035 pp., \$45.

This volume completes R.R. Schrock's History of Geology at M.I.T. 1865-1965. The first volume (1977) consisted of biographies

and bibliographies of the geology faculty during the Institute's first century; the present volume, subtitled "Operations and Products", mainly details the administration of geology at M.I.T. The sections on operations describe how M.I.T.'s geology programs acquired space for teaching and research, collections of books and specimens, and money to finance their activities. Here Schrock also considers the adaptation of the curriculum to meet changes in student interests, the importance of outside evaluation, and the development of research programs. "Products" include numbers of graduates, their publications and those of the faculty, and the results of M.I.T.'s geosciences research programs: in geology per se, crystallography, geochemistry and geochronology, geophysics, and geophysical exploration techniques and oceanography. Lists of the thesis titles of M.I.T. geosciences graduates and of books written by faculty and graduates are included in extensive appendices. The volume also contains indices (subject and name) for the two-volume work.

Schrock conceives of this work as "the stuff of history", (p.v.); as a compilation of material (much of it from the M.I.T. archives and from Schrock's own correspondence with M.I.T. geologists) that will be useful to future historians. This assessment is accurate: the book is essentially a reference work, its chapters designed for independent use. Further, as the subtitle suggests, the book's contents reflect a chairman's-eye view of history (Schrock was chairman of M.I.T.'s Course XII: "Geology and Geophysics" from 1949 to 1965). Little attention is paid to matters external to department administration such as the place of M.I.T. geology in the development of modern geology or the M.I.T. administration's view of its geology programs. There is also relatively little here about what it was like to be an M.I.T. geology student or about the intellectual climate in which students and faculty worked. Two notable exceptions are a chapter on crystallography and mineralogy in which Martin Buerger describes his student days at M.I.T. and explains the evolution of his crystallographic research, and Schrock's chapter on "Women in Geology at M.I.T." which contains biographies of the 29 women who obtained degrees in geology from M.I.T. Schrock surveyed the 23 of these geologists still living and includes lengthy quotations from several respondents. These describe the gravitation of women toward particular specialties within the geosciences (micropaleontology, for example) as a result of institutional restrictions (all-male field camps) and prejudices within the profession.

While this book will certainly be of interest to those with some connection to M.I.T. geology, it will also be useful to historians examining institutional and social aspects of modern American geology. Here its chief merit is its inclusiveness. Similarly detailed examinations of the development of geology at other institutions will do much to show whether M.I.T. is unique in the directions its geosciences programs have taken.

Christopher Hamlin
Lyman Brigg School
Michigan State University
East Lansing, MI 48824

Rarely, if ever, has the history of a geological organization been so thoroughly documented as that of the Texas Bureau of Economic Geology. In this book W. Keene Ferguson carries the Bureau's history from 1909 to 1960, building on his "Geology and Politics in Frontier Texas, 1845-1909" published in 1969. The quality of this documentation stems from the outstanding qualifications of the author, who was trained through the Master's level in geology and holds a Doctorate in history and also from the willingness of the Bureau's Director, W.L. Fisher, to encourage a thorough, independent historical analysis.

This book deserves attention both because it is informative history and because the subject is significant. The Texas Bureau of Economic Geology is one of the major State Geological Surveys and, indeed, a premier geological organization of any type. In his preface, Dr. Ferguson states that this group of professionals has a "definite personality", and "In fact, the history of public geological research in Texas is the story of dedicated, inquisitive scientists shunning the higher salaries and opportunities offered by private enterprise to serve their science and the State of Texas". This is a fascinating story and the Texas Bureau serves as an excellent example of this type of institution.

The book is rich in information about personalities, politics, and their interrelationships and thus provides insight into how scientific accomplishments are achieved. Geologists will not only learn a little geology here, but, importantly, will learn much about what it takes to do geology. The many research accomplishments of the Bureau are identified; however, the role of a scientific unit in working with industry, academia, and government is appropriately granted greater emphasis.

The Directors of the Bureau from 1909 to 1960, William B. Phillips, Johan A. Udden, Elias H. Sellards, and John T. Lonsdale, were influential scientists and interesting people. Many prominent, familiar geologists appear in these pages, for the Bureau attracted and benefited from some of our most productive colleagues. Informative biographical information appears throughout the book.

State Geological Surveys, by their nature, tend to be dynamic and, sometimes provocative, institutions. Their science is tested in immediate, public applications. Quality, innovation, and service are essential. The examples and standards of the Texas Bureau provide lessons applicable widely in the profession. Dr. Ferguson approves of and often applauds the Bureau's geologists and their accomplishments. I find no basis for questioning his objectivity, however, as they are praiseworthy.

As an example of Dr. Ferguson's insight, the reviewer is particularly intrigued by the chapter titled "The U.S.G.S. vs. the B.E.C."

This suggests an interesting contrast to the encouragement of support for State Surveys by John Wesley Powell during his term as Director of USGS noted in the volume covering 1845-1909. In the present study Bureau scientists are found to have been upset by omission of credit for their contributions, professional jealousy, lack of consultation, and inadequate State authority in joint projects. One must chuckle at the sprinkling of pithy quotes such as that from Phillips' 1914 letter to Udden: "I suppose that if the world continues to revolve the U.S.G.S. will after a while ascertain that there are some people in the world besides themselves." Nevertheless, mutually beneficial cooperative research was accomplished in several areas.

The book includes 15 plates of photographs, 591 documenting notes, 23 biographies and memorials, and 22 pages of other material, but no index. The extensive use of appendices, amounting to half the text, sometimes breaks the continuity of reading, but enhances the usefulness of the book as a reference work.

It all seems to be here: interesting personalities, important science, and a touch of drama, all presented in scholarly fashion. I am pleased to recommend highly the "History of the Texas Bureau of Economic Geology, 1909-1960".

Robert R. Jordan
Department of Geology
University of Delaware
Newark, Delaware

Wilifred Schröder, 1982, Disziplingeschichte als Wissenschaftliche Selbstreflexion der historischen Wissenschaftsforschung. Eine Darstellung unter Heranziehung von Fallstudien der Wissenschaftsgeschichte der Geophysik. Bern: Peter Lang, 86 pages. SwFr. 27.

Wilifred Schröder commends the study of the history and philosophy of science to his earth science colleagues as a necessary adjunct to fruitful work in an age in which the investigator is deluged with publications; by following the course or trajectory of disciplinary development, one can chart a course through the wilderness.

Along the way he proposes an outline of some major theories of scientific change (Kuhn, Popper Lakatos), some biographical material for the reader's consideration, and a brief chronology and bibliography of historical research on auroras and noctilucent clouds.

The style of presentation is that of Gerhard Radnitsky's Contemporary Schools of Metascience: telegraphic, suggestive and programmatic. It maps out areas for research, introduces some techniques for studying the history of a single discipline (such as citation analysis, professionalization data and so on) and announces the "program" of disciplinary history.

The monographic sections on auroras and meteorological topics (about ½ the book) are Prof. Schröder's own research, and this reviewer found them of interest. The

summaries of philosophy of science and historical techniques represent Prof. Schroder's own attempts to master these developments, and contain nothing new in substance or method. In fact, the presentation is weakened here by Schröder's reliance on diagrams drawn from Hall's (1976) History of the Earth Sciences during the Scientific and Industrial Revolutions...; a book of which one reviewer said "a sequel is threatened". Readers interested in learning philosophy of science are referred to the original sources instead.

In short, the book promises a good deal more than anyone could deliver in 86 pages (or 860 for that matter). This ground has been reasonably well covered, the program long announced: its time to get on with the writing of the history of geophysics.

Mott T. Greene
Skidmore College
Saratoga Springs, New York

REPORT OF SECRETARY FOR 1982

During 1982 the society successfully completed all items necessary at this stage to satisfy the U.S. Internal Revenue Service for provisional non-profit status; there is a two year delay before final status is granted. The constitution was adopted in November at the Geological Society of America and officers were elected for 1983. Hereafter, most society business can be conducted by mail.

Having reached our immediate goal of a journal, it was agreed that in 1983, volume 2 should consist of two issues. Presumably Earth Sciences History will remain at that point for some time, although as finances allow, the size of the issues will be increased.

President Kitts has devised a nominating procedure, and the first election will be held in conjunction with mailing of dues notices. At the end of 1982, society membership was 197.

It is my sad duty to announce the first death of a member. Jules Braunstein was an early and staunch supporter, who arranged for our organizational meeting in New Orleans. He will be missed.

Respectfully submitted,
Ellis L. Yochelson,
Secretary

REPORT OF TREASURER FOR 1982

During 1982, two sources of funds were noted. \$375.00 was donated as a result of an appeal to launch the organization. For 1982, dues of \$295.45.00 and \$382.49 in contributions were received. Total funds for 1982 were \$3712.49. During the year \$2976.44 was expended for printing and mailing. At the close of 1982, the balance on hand was \$736.05.

In addition to those persons listed in volume 1, 27 others have since contributed

toward publication. Two authors of our inaugural issue have provided funds to help defray the cost of printing of their papers. As noted, this issue has been largely underwritten by the friends of George White. Thus, we face 1983 in sound financial condition. We are greatly in debt to Mrs. Sue Friedman for considerable volunteer effort both with the journal and with keeping the society accounts in order.

It is projected that if membership reaches 300 and subscriptions reach 200, the society will be financially stable and able to distribute two issues per year of about 72 pages each. Payment of printing costs by authors and other contributions may allow us to print more pages. Although membership in our new organization is increasing faster than anticipated, subscriptions to libraries and institutions are lagging. Members can assist in obtaining subscriptions by calling Earth Sciences History to the attention of librarians.

Walter Kupsch in Canada and Hugh Torrens in Great Britain served as Assistant Treasurers in a most productive manner. It would be helpful to have Assistant Treasurers in other countries, if anyone would care to volunteer.

Respectfully submitted,
Ellis L. Yochelson,
Treasurer

CONSTITUTION

Article 1. NAME AND PURPOSE. The name of the organization shall be the History of Earth Sciences Society. The purpose shall be to promote interest and scholarship in this discipline by publishing, organizing meetings, supporting the efforts of other associations displaying similar interests and other such similar scholarly and scientific endeavors.

Article 2. MEMBERSHIP. The society is an international organization. Membership shall be determined by interest in the subject and is not otherwise restricted.

Article 3. OFFICERS. The officers of the society shall consist of: president-elect, president, past-president, secretary, treasurer, editor, program officer and two councilors.

ARTICLE 4. COUNCIL. The officers of the society shall constitute the council which will manage the society and shall perform their duties in such a manner as to insure that the scholarly nature of the organization shall be preserved and safeguarded. The council shall have the authority to incur financial obligations which are appropriate to the aims of the society.

ARTICLE 5 AMENDMENTS. Members may petition the council to circulate an amendment to constitution or by-laws, provided this is submitted by 25 members in good standing. Any petition to amend must be circulated with the next regular mailing of correspondence concerning society business. Amendments to the

by-laws which receive a majority vote by mail shall be approved. Amendments to the constitution shall require a two-thirds majority of those voting by mail before being approved.

ARTICLE 6 OPERATION. This organization is organized and shall be operated exclusively for charitable and educational purposes within the meaning of section 501(c)(3) of the United States Internal Revenue Code of 1954. No part of the net earnings shall inure to the benefit of, or be distributable to members, trustees, officers, or other private persons, except that the organization shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions to further the purposes of the organization. No substantial part of the activities of the organization shall be carrying on of propaganda or otherwise attempting to influence legislation. The organization shall not participate in, or intervene in any political campaign on behalf of any candidate for public office, including the publishing or distribution of political statements. Notwithstanding any provision of these articles, the organization shall not carry on any other activities which are not permitted to be carried on by an organization exempt from the Federal income tax under section 501(c)(3) of the Internal Revenue Code of 1954 (or corresponding provision of any future United States Internal Revenue Law) or by an organization to which contributions are deductible under section 170(c)(2) of the Internal Revenue Code of 1954 (or corresponding provision of any future United States Internal Revenue Law).

BY-LAWS

1. Terms of officers- The President-elect, President, and past-President shall each serve a year and shall not be eligible for reelection. The Secretary, Treasurer, Editor, and Program Officer shall each serve for three years and shall be eligible for reelection to a second term. Councilors shall be elected for a term of two years and shall twice be eligible for reelection.

2. Dues- The annual dues will be fixed by the council. Once dues have been fixed, the council shall have the option to raise them by no more than US \$1.00, provided that this option is not invoked more than twice in three years. Any proposed larger increase in dues must be voted upon by the membership and must receive a majority of those voting before going into effect. The Treasurer shall determine the most economical method of collecting dues and shall have the authority to collect dues in various currencies.

3. Membership and its Privileges- Membership in good standing within the society shall be determined by payment of dues. The Treasurer shall decide if it is necessary to remove a member from the rolls. Once dropped, a former member may rejoin upon payment of dues and shall receive the benefits of membership. Only members may serve as officers of the society and may be appointed to committees by the council. The society shall publish a journal. Members shall receive the society

journal annually and any other mailing as is deemed appropriate.

4. Sections- Regional sections may be established for the purpose of holding meetings or cooperating with various other organizations when it is to the advantage of the membership residing in that section. A section shall be established upon petition by 25 members in good standing. Members of a section must be members of the society. The section shall have the power to govern its own affairs, provided that it does not contravene the constitution and by-laws of the society.

5. Governance- The Council shall attempt to meet annually, but shall have the power to conduct business by mail. At annual meetings a quorum shall consist of the president and three other members of the council. Any votes taken by mail shall carry only by a majority of the council. The presiding officer of any regional sections which may be established shall have the privilege of attending council meetings and shall be asked to aid the council in its deliberations during his/her term, but shall not vote.

6. Nominations and Elections- The council shall appoint a nominating committee, which may not contain any members of the council, to prepare a slate of officers. This slate shall be submitted to the membership for mail ballot. Any member in good standing may be nominated provided that his name is accompanied by a nominating petition with the signatures of 25 members. The Secretary shall place all names so received on the ballot, along with the official slate; nominating petitions must be received 60 days in advance of the ballot mailing. The Secretary shall appoint a committee to count the ballots and report election results. Should any vacancies occur between annual elections, the council shall have the power to fill them until the next election.

7. Dissolution- In the event of dissolution of the society all assets shall be divided among: Royal Society of London; Geological Society of America, and History of Sciences Society. However, if at the time of dissolution, the beneficiary organizations no longer exist, are unqualified distributees, or are unwilling or unable to accept these assets, then organizational assets will be distributed exclusively for the charitable organization or organizations which are so qualified under section 501(c)(3) of the Internal Revenue Code of 1954 (or corresponding provision of the future United States Internal Revenue Law).

ANNOUNCEMENT

HISTORY, PHILOSOPHY AND SOCIOLOGY OF SOIL SCIENCE

The ISSS Council has established a new Working Group on the History, Philosophy and Sociology of Soil Science. Though the subject matter naturally encompasses the subjects of all existing Commissions, to comply with ISSS rules the new Working Group has been attached to its Commission V.

The Working Group will collect biographical material on prominent soil scientists

and their careers in the various countries, and prepare a chronological list of milestones in the development of soil science. It will consider the establishment of biographical archives and historical libraries at some university. Questions such as when was the term pedology used for the first time, the concepts of soil, their recognition and definition as natural bodies in ancient times will also be dealt with. Questions falling within the realm of sociology will include aspects of manpower - the number of soil scientists in the various countries, their training and employment possibilities.

Prof. D. H. Yaalon, Department of Geology, Hebrew Univ., Jerusalem, 91000, Israel, will serve as the first Chairman. Mr. E. J. B. Cutler, Department of Soil Science, Lincoln College, Canterbury, New Zealand, has agreed to serve as Secretary. Anyone wishing to contribute actively to the program of the working group should contact one of the officers.

CALENDAR OF EVENTS

1983

23-25 March - History of Geology Symposium: Evolution of Geological Concepts in the Northeast United States. Northeastern Section GSA meeting, Concord Hotel, Kiamisha Lake, NY. Contact: William M. Jordan, Convenor, Department of Earth Sciences, Millersville State College, Millersville, PA 17551.

26-31 May - American Association for the Advancement of Science, Annual Meeting, Detroit (AAAS Headquarters, 1776 Massachusetts Avenue, NW, Washington, DC 20036). "Science versus non-science": Jointly sponsored by sections on History and Philosophy of Science and Education, and including papers on creationism by Philip Kitcher and Michael Ruse.

30 May-3 June - American Geophysical Union, Spring Meeting (AGU Headquarters, 2000 Florida Avenue, NW, Washington, DC 20009. May include historical sessions.

27 June-19 August - History of Modern Physical Science. This seminar will survey major discoveries of 19th and 20th century geophysics, astronomy and physics. Contact: Stephen G. Brush, Inst. for Physical Science and Technology, University of Maryland, College Park, MD 20742.

10-24 July - Geology of the William Smith country, England. Contact: the Geology Tutor, Extra Mural Dept., University of Bristol, Bristol, England.

15 July-5 August - Origins of Geology, course and field trips to classical sites in England, Scotland and Wales. Contact: Dorothy L. Steller, Dept. of Geology, Cypress College, Cypress, CA 90630.

15-27 August - Historical Events or People. IAGA Interdivisional Commission on History. IUGG 18th General Assembly, Hamburg, Germany. Contact: W. Schroder, Hechelstrasse 8, D-2820, Bremen-Roennebeck, Germany.

27 August - Krakatau Eruption Centennial Symposium, Jakarta. Contact: Didin S. Sastrapradua, Indonesian Institute of Sciences, Box 250, Jakarta, Indonesia.

27-30 October - History of Science Society meetings, Burndy Library, Norwalk, CT. Contact: Dr. Audrey Davis (Secretary), National Museum of Natural History, Room 5000, Smithsonian Institution, Washington, DC 20560.

31 October-3 November - Geological Society of America, Annual Meeting, Indianapolis. "Some significant geological ideas originating from the study of cratons." Contact: Ursula B. Marvin.

INFORMATION FOR CONTRIBUTORS

Earth Sciences History welcomes contributed manuscripts. All manuscripts submitted should be double spaced throughout and accompanied by illustrations no larger than page size; please do not send original photographs and figures. Manuscripts are critically examined by at least two reviewers and if accepted for publication, are then returned to the author for revision.

In order to keep production costs low, authors are expected to prepare their own camera-ready copy which also has the advantage of insuring that no errors are introduced into the manuscript. Details of preparation will be provided by the editor upon acceptance of a manuscript. Although there is some variation among manuscripts, approximately three pages will form a printed page. All illustrations should fill either a single column or a double column in width. No oversize illustrations are permitted.

All papers are in English and are to have an abstract. **Earth Sciences History** will be delighted to publish an additional abstract in a language other than English, if supplied by the author.

General details on preparation of a manuscript in the style of **Earth History** are given in **Northeastern Geology**, V.1, No.1, p.1-8, 1979 and V.2, No.1, p.1, 1980.

Because the contributors to **Earth Sciences History** come from a variety of disciplines and backgrounds, latitude is allowed on "American" and "European" spelling; but such details must be consistent within a paper. Likewise, the style of references cited may vary among papers, but must be consistent within a paper. In general references style should conform either to that of the **U.S. Geological Survey** or the journal **ISIS**.

No footnotes are allowed. All notes should be numbered and placed in a separate section at the end of the text and preceding the references.

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