History of Physics Newsletter

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DIVISION NEWS

MEETINGS

The Division is sponsoring sessions of invited papers at three APS meetings during the early part of 1984: San Antonio (30 January-2 February), Detroit (26-30 March) and Washington (23-26 April). We will also co-sponsor the annual meeting of the Joint Atlantic Seminar in the History of the Physical Sciences to be held at Cornell, 27-28 April. See below for details.

Annual Business Meeting

The annual Business Meeting of the Division will be held at the APS meeting in Washington, DC, 24 April 1984, after the Einstein session (see below), in the Ambassador Room at the Shoreham Hotel.

The agenda of the Business Meeting will include: announcement of results of election of officers; discussion of proposal for a book prize; discussion of plans for other publications such as reprints of books and tutorial articles. Members of the Division who wish to add other items to the agenda should contact S. G. Brush as soon as possible.

As previously decided by the Executive Committee, ballots for election of Vice-Chairperson (to become Chairperson in 1985) and for 2 three year positions on the Executive Committee are being mailed separately to all members of the Division.

Renewal Time!

This is the last issue of volume I of HPN. Subscribers who are not members of the Division should use the form on the inside back cover to order volume II.

Einstein Session at APS

A session of papers entitled "Einstein: From Special Relativity to the Unified Field" will be presented at the APS meeting in Washington, D.C., 24 April 1984, at 2 pm. Emphasis will be on results of research since the 1979 centennial of Einstein's birth. The papers to be presented are:

"Electrodynamic Asymmetries and the Origins of Special Relativity" - **Clark Glymour**, University of Pittsburgh

"Albert Einstein, Empirical Data and Special Relativity" - **Arthur I. Miller**, University of Lowell and Harvard University

""General Relativity," A Three Act Drama by Albert Einstein" - **John Stachel**, Boston University and Einstein Project, Princeton University Press

"Unitary Field Theories" - **Peter G. Bergmann**, Syracuse University and New York University

Computers

A session on the history of computers in physics was held at the joint APS- AAPT meeting in San Antonio, Texas, 2 February 1984. The following papers were presented at the session:

"An Anecdotal View of the Early History of Computing" - **Henry S. Tropp**, Humboldt State University

"How Computers Have Changed Physics Research" - **L. David Roper**, Virginia Polytechnic Institute and State University

"Using Computers to Help Learn Physics: A Short History" - **H.J. Peters**, CONDUIT, The University of Iowa

"The Future of Computing Technology in Physics--The Potentials and Pitfalls" - **A.E. Brenner**, Fermilab

J.S. Rigden presided at the session. (Abstracts of these papers will appear in the "Summaries" section.)

The History of Physics Newsletter (HPN) is published by the Division of History of Physics of the American Physical Society. It is distributed free to all members of the Division. Others may subscribe at $10 per volume (5 issues, total of about 100 pages); there is an additional cost of $5 for foreign subscribers if they want copies sent by air mail. We expect to publish two issues per year.

Editor: **Stephen G. Brush**, Department of History and Institute for Physical Science & Technology, University of Maryland, College Park, MD 20742 (301/454-2724). Associate Editors: **Gloria B. Lubkin**, Physics Today, American Institute of Physics, 335 East 45 Street, New York, NY 10017, and **Kathryn Olesko**, Department of History, Georgetown University Washington, DC 20057. Editorial assistants: **Martin Collins** and **James Beichler**, University of Maryland.

Condensed Matter

A session on the History of Condensed Matter Physics will be held at the APS meeting in Detroit, 28 March at 7:30 pm. The papers cover the development of solid state physics, ranging from the pre-quantum era to the post-war period. The field emerged as a discipline from the convergence of a number of traditional specialties, some of them having long histories. Smith focuses on the earlier roots, Weart examines the social process of the emergence of the modern solid state community in America, while Szymborski analyzes in detail a particular example of this broader development.

"The Pre-history of Solid-State Physics" - **Cyril Stanley Smith**, MIT

"The Solid Community: 1930-1960" - **Spencer Weart**, AIP Center for History of Physics

"Experiment, Theory and Politics: The Case of Color Center Research" - **Krzysztof Szymborski**, University of Illinois

The session will be chaired by **Lillian Hoddeson**, University of Illinois

Nominating Committee

In the last issue of HPN, **Sylvan Schweber** was inadvertently left off the list of members of the Nominating Committee. It consists of **Allan Franklin** (chair), **Gordon Baym, Paul Hanle, Linda Wessels**, and **Sylvan Schweber.**

1984 Joint Atlantic Seminar

The 11th annual meeting of the Joint Atlantic Seminar in the History of the Physical Sciences will be held at Cornell University on Friday and Saturday, April 27-28, 1984. It is cosponsored by the APS Division of History of Physics.

The theme of the Friday evening session will be "New Trends and Old Traditions in the Historiography of Science." The meeting will take place in the Hollis Cornell Auditorium in Goldwin Smith Hall. Speakers and topics are: **Lewis Pyenson** (Universite de Montreal) on the social relations of science; **Martin Harwit** (Cornell), modern scientists and modern history of science; **L. Pearce Williams** (Cornell), traditional historical methods and traditional history of science. The session will begin at 7:30 p.m.; registration will be from 7-7:30 p.m.

On Saturday, doctoral candidates and recent Ph.D.s will speak on their research at the Hollis Cornell Auditorium. Senior members of the profession are urged to ask their graduate students or junior colleagues to submit papers as soon as possible to Professor Williams, so that a full schedule can be developed.

Local Arrangements: those who indicate their intention to come to the JAS will receive detailed directions for reaching Ithaca by road and air (there being no rail service), as well as a listing of accommodations.

REGISTRATION FORM
JOINT ATLANTIC SEMINAR

Please return this form (or a copy) by April 1, 1984 to: Prof. L. P. Williams, Department of History, Cornell University, Ithaca, NY 14853.

Registration fees partially defray the administrative costs of the J.A.S.

( ) $8.00 regular
( ) $3.00 students, retired, unemployed (Make checks payable to Cornell University)

Name: _____
Address: _____
_____
Phone: _____

FEATURES

Trajectories in Modern Physics

[Editorial note: One of the purposes of the Division Newsletter is to disseminate material on the history of physics. To achieve this end, the editors will from time to time present a feature article which addresses issues in the history of twentieth physics. Our first article in this series has been prepared by Kathryn Olesko from the interview of Felix Bloch (1905-1983) in the oral history collection of Center for the History of Physics of the American Institute of Physics. The interview, which took place in August 1968, was conducted by Charles Weiner. We thank the Center for the History of Physics and Prof. Weiner for their permission to quote from this interview.]

By his own reckoning, Bloch considered his most important work to be his doctoral dissertation on conduction in metals and his discovery of what he called nuclear induction. The intellectual twists and turns that his work took, however, were in part determined by the unusual contexts in which he practiced physics. After completing his doctorate under Werner Heisenberg, he became in 1932 Privatdozent at the University of Leipzig where the students, within the following year, were among the strongest supporters of Hitler. After quitting the Leipzig position in 1933, Bloch took a Rockefeller Fellowship and was soon offered a position at Stanford which he took at the urging of Niels Bohr. The new American context proved to be of immense significance in reshaping his intellectual orientation. Bloch claimed that he was acutely aware of the lack of any strong distinction between experimental and theoretical physics in the United States. Early in his student days, he had "quite abruptly . . . simply decided [that] . . . I'm more interested in theory than experiment . . . and I dropped experiment cold." Trained as a theoretician, he remarked that at Stanford, "I was the one to preach the gospel." But once in the United States, his perspective changed due to the demands of his research, and, determined to build a neutron source, he began what he called "low-brow work, soldering and whatever is necessary."

Drawing from his work on ferromagnetism, he pursued the idea of polarizing neutrons, an idea he had proposed earlier to Heisenberg in Leipzig. He also tried to reestablish the effect, observed by Dunning, of the magnetization of iron on the transmission of neutrons. Bloch at first was doubtful that Dunning had seen this effect ("I'm sure he thought he had seen it," he remarked) but repeated experiments showed that although the effect was marginal, it was nonetheless present. With the growth in importance of his experimental work, he became convinced that Stanford had to build its cyclotron in order to produce "neutron sources for the purposes of the magnetic study of them." With the assistance of I. I. Rabi, Bloch raised $4000 from the Rockefeller Foundation; the remaining $1000 cost of the cyclotron was "scraped together" from university sources. His cyclotron was of simple design (20 inch, air-cooled, and able to accelerate deuterons to about 2 million volts). But polarization experiments using the cyclotron were soon interrupted by the Manhattan Project.

"[We] were all asked to join it and do whatever we could. And it was assigned to us here at Stanford to determine the energy distribution of the neutrons emitted in the fission process, which was a rather important question for the chain reaction." Soon thereafter, Bloch was recruited in 1943 by Oppenheimer for Los Alamos but he found the environment not to his liking: "I found then that the nuclear physics that was going on there, special theoretical work, really didn't interest me. I didn't fit in there. That was not what I wanted to do." By November 1943 he left Los Alamos for the Radio Research Laboratory at Harvard. Despite his initial discontent with war-related research Bloch later had to admit that such work was crucial for the development of American physics. "People felt that through their war work they came in contact with other fields of science which they had not been acquainted with before. And I believe at least part of this sudden quick development of physics after the war was due to this phenomenon." In contrast, he observed that European physics had "fallen very much behind in the war in two very important aspects. The first was electronics, because radar techniques were far more developed here and of course in England, too. . . . And the second thing was clearly atomic energy. On both these things the Europeans were clearly behind."

By early 1945, Bloch was able to return to his neutron projects and realized that "one doesn't really need molecular beams to study the nuclear magnetic resonance . . . one should be able to do it in condensed matter. . . . So I had this idea then of what I called nuclear magnetic induction." His

research on the measurement of magnetic fields in atomic nuclei was awarded the Nobel Prize in 1952, shared with E.M. Purcell. This was a long-standing project which was interrupted only by a brief and apparently unenjoyable interlude in 1954-55 while he was the first director of CERN.

Speaking of the satisfaction that one can gain in doing research, Bloch remarked:

"[For] immediate satisfaction, one of the greatest joys that a scientist can have is when a good idea hits him. That is when headaches which have been brewing in his mind for some time come together to a solution. That happened to me a few times. . . . Those are moments of elation which might last for a day or a week or two, or something like that. . . . Then, of course, there are also long range satisfactions--that is to say, the development of a certain line, like this resonance work after the war, which extended over many years. It was not a period of constant happiness. I mean there were ups and downs, but by and large it was a time of great satisfaction. . . . I may say that my discoveries have never had the glare of the novelty of, let us say, the discovery of the neutron--I mean something totally unexpected almost. None of them were of that type. . . . This supreme joy of hitting something really important that nobody ever suspected before I have not had. Very few people have had that."

A brief professional biography of Felix Bloch by L. I. Schiff and R. Hofstadter was published in Physics Today, December 1965, pp. 42-43. An obituary by Hofstadter appears in Physics Today, March 1984, pp. 115-16.

ANNOUNCEMENTS

Booksellers

We plan to publish a list of booksellers who offer catalogues of books relating to history of physics. Readers who can contribute the names and addresses of such booksellers, not already included in the Isis Guide to the History of Science, are encouraged to send them to the Editor.

GUEST EDITORIAL

The Decline of the Obituary as a Source for the History of Modern Science

by John Lankford

Professor George Siscoe of UCLA recently discussed in these pages the remarkable efflorescence of discipline- specific history of science. Few would take issue with his characterization. From fields as diverse as electrical engineering and computer science through chemistry, physics, geophysics and astronomy there is an explosion of historical concern that has produced centers, institutes and divisions within professional societies, while journals and newsletters grow apace. Notwithstanding this new interest in science history, however, we are losing a major historical resource. Traditionally, the obituary has been an important source of historical data. But since 1960, both the quality and quantity of obituaries have fallen off. It should be a major goal of historical divisions within profesional organizations, as well as of editors and directors of research centers, to see that this alarming trend is reversed.

I became sensitive to the problem when I embarked on a collective biography of the American astronomical community. To test my findings I sampled eleven European, British and American astronomical journals at twenty-year intervals from 1920 through 1980. The complete study will be published in the April 1984 issue of the Bulletin of the American Astronomical Society.

Since about 1960 the number of obituaries published by leading astronomical journals has fallen off dramatically. The Astrophysical Journal and Astronomical Journal have stopped publishing obituaries. It appears that American astronomers now leave these responsibilities to the major European journals or to such publications as Sky & Telescope or Physics Today. There is also a tendency toward very short obituaries. Since 1960 we see an overall decline in quality of those which appear. Short notes are inferior to longer memorials. They simply cannot convey as much information. These trends mean that rank-and-file members of the profession frequently pass unnoticed from the scene. Scientists who merit lengthy notices are the leaders of the guild and will be subjects of obituaries in several journals as well as biographical memoirs of major academies.

These tendencies are reflected in Nature and

Science. The British journal reached its highwater mark in 1940 and in 1960 and '80 registered declines of 63% and 86%. For 1960 and '80 it appears Nature published no brief obituaries at all. Since 1980 Nature has abandoned the publication of obituaries. The peak for Science came in 1960, and in 1980 the decline measured 82%. Unlike Nature, the editors of Science opted for the short obituary that increasingly takes the form of a one sentence notice.

I am sure these findings can be replicated in other disciplines. The decline of the obituary has produced a crisis in documenting the history of modern science. It will become more and more difficult to write the history of the recent past.

What is to be done? History-conscious scientists and scholars who specialize in the history of specific disciplines must begin to work toward a solution. With appropriate modifications my suggestions for the American astronomical community may be generalized to other sciences. Key to my approach is a "publication of record." The AAS is fortunate in having such a vehicle in its quarterly Bulletin. The first two numbers of each volume of the BAAS carry annual reports by department chairs and directors of observatories and research centers. Why not have them take responsibility for obituaries as well? These individuals are strategically located. They know immediately when a colleague dies. They have access to sources of biographical information in the form of files assembled for hiring, promotion and tenure decisions, salary review, appointment to distinguished chairs and the like. It would be a simple matter to have the Historical Astronomy Division prepare a guide for those who write these notices. To be sure, this plan might entail the appointment of an assistant editor of the BAAS for obituaries, but the practice is common for many social science journals.

The "publication of record" approach has a hidden benefit. Colleagues can take the opportunity afforded by writing an obituary to perform another service for posterity. In cooperation with chairpersons or directors they can contact the family of the deceased in order to rescue his/her papers--personal and professional correspondence, notes, drafts, laboratory notebooks and other manuscript materials--and deposit them in their institutional archives. If the institution has no provision for organizing and caring for manuscript materials, they should contact the Associate Director of the Center for the History of Physics, Ms. Joan Warnow, at the AIP in New York. Often manuscripts are lost forever as offices are cleaned out by custodians, or families unwittingly destroy materials of incalculable value for the history of science.

Implementation of these suggestions may test the commitment of some scientists to history. They may perceive a confrontation between the use of scarce resources for doing science or for doing the history of science. Time, energy and dollars must be expended to solve the obituary crisis. Page charges will, in some instances, be an issue. Professional societies should be willing to absorb page charges for obituaries in the interest of the community as a whole. But I have heard other opinions expressed. Clearly, the family cannot be expected to bear these charges. Obituaries are not paid advertisements!

It might be appropriate to close with a few remarks on the ideal obituary. The ideal obituary performs both memorial and archival functions. Indeed, the most enduring memorial we can provide is an obituary that carefully documents a life devoted to science. The design of an ideal obituary must take into account potential users. These include undergraduate and graduate students; professional scientists and, perhaps, amateurs; and historians of science and social scientists concerned with various aspects of the development of science in the recent past. Given this range of potential users, the following data must be included: social and professional information, scientific activities of the individual and some indication of his/her character and personality.

A few guidelines may be of value. An obituary is not an exercise in genealogy. Factual precision is greatly to be desired. Be sure to include the life dates of an individual as well as dating phases of his/her education, professional experience and scientific contributions.

The following is a tentative outline of the ideal obituary. Section one should deal with (A) origins, including information on the economic, social and intellectual background of the family as well as any special encouragement from family members for going into science, (B) the education of the individual from elementary school through

the Ph.D., stressing special influences and/or experiences leading to a career in science including the role of mentors and sponsors, (C) post-doctoral training and (D) data on the individual's marriages and family life.

The second section focuses on the scientific career: (A) Major fields of research and teaching. (B) Primary contributions to science. (C) Most important papers and books with dates. (D) Contributions to instrumentation. (E) Assessment of overall impact on the discipline as (1) researcher, (2) teacher, (3) colleague, (4) administrator and (5) other forms of impact. (F) Honors and awards. (G) International activities.

A final section deals with the personality and character of the individual. Here colleagues and former students have a special contribution to make. They can provide anecdotes that reveal the basic human qualities of the deceased. Remember, however, that these specific stories should be used sparingly and illustrate specific points about the subject.

If remedial measures are not taken, the history of science will enter the twenty-first century in a very anomalous position. We will know a great deal about eighteenth- and nineteenth-century founders of modern science, but will have lost many of the women and men who built the edifice of twentieth century science. Future generations will have little more than faceless names attached to papers and books or bloodless entries in citation indices. History without people is a chilling prospect.

[John Lankford is Professor of the Social History of Modern Science, University of Missouri at Columbia, Columbia, MO 65211]

PRIZES

Pfizer Award - Book Prize

Each year at its annual meeting the History of Science Society presents the Pfizer Award, sponsored by Charles Pfizer & Co., Inc., to the author of a work of exceptional distinction, dealing in a substantial manner with the history of science and published in any of the three preceding calendar years. The author must be American or Canadian. The 1984 Pfizer Award, for which books published in 1981, 1982 or 1983 are eligible, consists of $2500 and a medal. Nominations must be submitted to Prof. Roger Stuewer, School of Physics & Astronomy, University of Minnesota, Minneapolis, MN 55455, by **May 15, 1984.**

Schuman Prize for Student Essay

The competition for the annual award established in 1955 by Ida and Henry Schuman of New York City for an original essay in the history of science and its cultural influences, is open to graduate students in any college, university or institute of technology. The prize consists of a cash award of $250 plus reimbursement of travel expenses to the annual meeting of the History of Science Society at which the prize is announced, not to exceed $250. Papers submitted should be in English, approximately 8,000 words in length (exclusive of footnotes), and thoroughly documented. It is hoped that the prize-winning essay will merit publication in Isis.

Essays may be submitted to Prof. Edith Sylla, Chair, HSS Committee on Honors & Prizes, History Department, Box 8108, North Carolina State University, Raleigh, NC 27695-8108, and must be postmarked by July 1, 1984. It is requested that three copies of each essay be sent and that the names and institutions of the contributors be placed on a separate title page so that they may be removed before being read by members of the committee. The announcement of the prize- winning essay is usually made at the annual meeting of the History of Science Society.

Singer Prize for Essay

The British Society for the History of Science has established the Singer Prize, to be awarded every two years for an unpublished essay based on original research on any aspect of the history of science, including mathematics. Professor Charles Singer (1876-1960), the distinguished historian of science and medicine, was a founder-member, and the first President of the Society. The prize consists of 250 pounds.

The competition is open to authors who have not reached 30 years of age by 30 September 1984. Essays must not exceed 6000 words (excluding footnotes), must be fully documented, typewritten in double line spacing and submitted in English. Each entry should contain a separate title-page giving the author's name, title of essay, institution (if any), address and date of birth, so that this information can be removed before the essay is circulated to the judges. Essays should be submitted to Dr. G. N. Cantor, Department of Philosophy, University of Leeds, Leeds LS2 9JT, England, UK, with the words "Singer Prize" written clearly on the envelope, and **must be received no later than 30 September 1984.** The prize-winning essay will be announced at the Annual General Meeting of BSHS.

QUERIES

Pyroelectric Materials

"We are preparing a historical account of the research and development of pyroelectric materials as sensors for infrared detectors, with special emphasis on the period from 1940 to 1960. We would greatly appreciate receiving information on this subject."

---Sidney B. Lang, Dept. of Chem. Eng., Ben Gurion Univ. of the Negev, 84120 Beer Sheva, Israel; Ernest H. Putley, Royal Signals and Radar Estab., Great Malvern, Worcester, U. K. [send information to Lang]

Jung & Pauli

"I am investigating Carl Jung's idea of "synchronicity" and the interaction he had with physicists in the evolution of this concept. According to Jung the idea first came to him early this century, during conservations with Einstein when both were at Zurich. Some time between 1929 and 1930 the idea received further impetus when Pauli visited Jung as patient. I am particularly interested to discover if any student of Pauli's life can shed light upon the exact progress of Pauli's "breakdown" and cure. Also I would like to know the extent of the discussions and collaborations between Jung and Pauli which led to the publication of "The Structure and Dynamics of the Psyche" in 1952."

---F. David Peat, 90 Fentiman Ave.,Ottawa, Ontario K1S 0T8, Canada.

Cosmic Rays

"The study of highest-energy cosmic rays and their interactions by means of extensive air showers began rather recently, in 1938, with discoveries made by Pierre Auger and his collaborators at the Ecole Normale Superieure. Evidence hinting at the existence of these showers had been noted some years earlier. I have initiated an effort to collect and preserve records and personal recollections of this work. The earlier it is the more interesting, of course, and the more important that action be taken promptly to avoid loss. Anyone who participated in this kind of work prior to 1954, or is in contact with anyone who did, or knows of relevant letters, notebooks, etc., is requested to write or call me."

---John Linsley, Dept. of Physics and Astronomy, University of New Mexico, Albuquerque, NM 87131 (505/243-1924)

ANNOUNCEMENTS

Women Historians of Science

The Women's Committee of the History of Science Society is preparing a third Directory of Women in the History of Science, Medicine, and Technology. To compile data for the Directory the Committee wants to to distribute questionnaires to as wide an audience as possible in these fields. Women who wish to be included should contact Prof. Alice Stroup, Women's Roster, Department of History, Bard College, Annandale-on- Hudson, NY 12504.

Historians' Lobby

The National Coordinating Committee for the Promotion of History serves as a central advocacy office for the historical and archival professions. Since 1976 when the American Historical Association and the Organization of American Historians initiated the formation of the NCC it has been a clearinghouse of information and a focal point for the coordination of a state committee network.

Thirty-two constituent member organizations, twenty-nine state committees and thirty-one history departmental associates now support and participate in the work of the National Coordinating Committee. The NCC advocacy program focuses on those federal policies that have a direct impact on archival management and on historians' ability to do research, to teach, and to promote an understanding and appreciation of history in the public sphere. The NCC legislative program aims to facilate the exchange of information between government agencies, legislative aides, constituent and ad hoc coalitions, and professional historical and archival associations. This involves preparation of briefing sheets and legislative updates as well as testifying before congressional committees and providing executive directors of member organizations with advocacy related services.

If you wish to receive information on legistation please contact: Dr. Page Putnam Miller, Director, National Coordinating Committee for the Promotion of History, 400 A St. SE, Washington, D.C. 20003.

HISTORICAL PROJECTS AND PROGRAMS

Solid State Physics

The International Project in the History of Solid State Physics, now in its third year, with teams in Britain, Germany, the United States, and France, has conducted a large number of oral history interviews, surveyed unpublished papers, and written drafts on a wide variety of topics. Project members hope to fit all their draft papers together into a single unified book.

All the teams have submitted to AIP detailed information on interviews conducted and unpublished correspondence surveyed. From this information AIP has produced a preliminary draft of a Catalog of Sources for the History of Solid State Physics. Some results of the Project will be presented at the session devoted to solid state physics sponsored by the Division at the APS March meeting (see above). For further information on the Project contact Lillian Hoddeson, University of Illinois at Urbana-Champaign, Dept. of Physics, 1110 W. Green St., Urbana, Illinois 61801

Space Astronomy and Space Telescope

The National Air and Space Museum of the Smithsonian has two projects underway of interest to historians of physics and astronomy. The first is their "Space Astronomy Oral History Project" which in over two years of operation has conducted over 250 hours of interviews with more than 80 astronomers, engineers and administrators who have played a role in the origins of space science and astronomy dating from the V-2 era through the present. In addition, numerous historical artifacts and documents of value to understanding the history of space astronomy have been identified. Current research and interviews are trying to understand the 'insulated' character of early rocket research and how this relates to the resarchers' scientific achievements, as well as larger questions of the government's role in scientific research immediately after WWII. A descriptive catalog listing the interviews conducted through December 1983 should be available by the end of 1984.

The second project, a major documentation and analysis activity in cooperation with the Department of the History of Science at John Hopkins University, is a history of the Space Telescope. The "Space Telescope History Project" is collecting documentation, including oral histories, from individuals, governmental agencies and private corporations who have been involved in the inception and development of this astronomical satellite, which is scheduled for launch either in 1986 or 1987. Interviews with science and engineering managers of the Space Telescope reveal the character of organizational, managerial, and technical issues and problems that arose during the telescope's development.

Both of these projects have funding from NASA; the space astronomy project also has support from the Naval Research Laboratory. For further information on the space astronomy project contact David DeVorkin, National Air and Space Museum, Washington, D.C. 20560, and on the Space Telescope project, contact Paul Hanle, also at NASM, or Robert Kargon at John Hopkins University.

University of Sussex

The University of Sussex (England) is offering a degree in Physics with a minor in Science Studies. In addition to providing a sound training in physics, the program aims to enable students to recognize the choices, constraints, and policies within which scientific work proceeds, and to understand the central importance of science and technology in a modern industrial economy and in contemporary culture.

Mendelssohn Papers

The Contemporary Scientific Archives Centre at Oxford (England) has announced the completion of processing of the Kurt Alfred Georg Mendelssohn Collection, deposited in the Bodleian Library, Oxford (CSAC Catalogue no. 93/4/83, 118 pp.). Mendelssohn, whose primary contributions were in low temperature physics, was born in Berlin in 1906. He came to Oxford to work at the Clarendon Laboratory at the invitation of F.A. Lindemann in 1933, and with F.E. Simon, N. Kurti, and H. London he contributed to the establishment of the Clarendon as an important center of low temperature research. Mendelssohn was also the founder and editor of Cryogenics. All of his professional activities are represented in the collection.

For further information contact Contemporary Scientific Archives Centre, 16 Wellington Square, Oxford, OX1 2HY England.

PERSONALIA

Fowler - Nobel Prize

William A. Fowler (California Institute of Technology), a member of the History of Physics Division Executive Committee, was awarded the 1983 Nobel Prize in Physics for his theoretical and experimental studies of the nuclear reactions of importance in the formation of the chemical elements in the universe. He shared the award with **S. Chandrasekhar** (University of Chicago), who was recognized for his theoretical studies of the physical processes involved in the structure and evolution of stars. For a more detailed account of their work see "The 1983 Nobel Prize in Physics," Science, 1983, 222: 881-885.

Pais - Book Prize

Abraham Pais (Rockefeller University) is the 1983 winner of the AIP-U. S. Steel Foundation Science Writing Award to a scientist, for his book Subtle is the Lord: The Science and Life of Albert Einstein. For details see Physics Today, October 1983, 36, no. 10: 58.

Fries - NASA Historian

Sylvia Fries has been appointed director of the NASA History Office, beginning 3 October 1983. Formerly Associate Professor of History at the University of Maine, she has served on the NASA History Advisory Committee since 1977 and has chaired it since 1980. She has published studies in the history of science and technology policy and in particular on congressional technology policy since World War II.

Dr. Fries plans to reactivate the History Advisory Committee (which had ceased operating), with active participation by academic historians. She would also like to seek new topics in the history of the space effort, whose study NASA might support and publish. She welcomes inputs and proposals from researchers interested in the history of space exploration and technology. Her address is: Code LBH-14, NASA HQ, Washington, DC 20546.

OBITUARIES

Broda

Engelbert Broda, Professor Emeritus of Physical Chemistry at the University of Vienna, died in Vienna on 27 October 1983, at the age of 73. In addition to his work on the applications of radioactivity to chemistry and biology, Broda was well known for his historical his authoritative biography, Ludwig Boltzmann--Mensch, Physiker, Philosoph, recently published in English.

Schlegel

Richard Schlegel, professor of physics at Michigan State University, died on 30 May 1982 at the age of 68 while on leave at Cambridge, England.

Schlegel studied philosophy under Rudolf Carnap at the University of Chicago and Herbert Feigl at the University of Iowa before receiving his Ph.D. in physics at the University of Illinois in 1943. Throughout his career he was interested in and published on the influence of relativity and quantum physics on our concepts of time, causality, observation and the physical interpretation of mathematical theories For a more detailed obituary see Physics Today 36, no.8 (1983): 79-81

GRANTS AND FELLOWSHIPS

NEH Summer Seminars

The National Endowment for the Humanities is sponsoring several Summer Seminars for College Teachers in 1984. Those related to history of science include one on "Physicists in Historical Context" directed by **Martin J. Klein** (Yale), former chairman of the Division of History of Physics. The deadline for applications was March 1. Information about 1985 Seminars will probably be available in December 1984; write to the Division of Fellowships and Seminars, NEH, Washington, DC 20506.

NEH Research Awards

The Humanities, Science and Technology program at the National Endowment for the Humanities is inviting proposals for an important new kind of award. These new NEH Research Awards in Humanities, Science, and Technology will support research on a broad range of topics designed to improve the ability of the humanities to interpret, analyze and assess both the practices and the impact of science and technology. Appropriate foci for these new research projects might include, but need not be limited to: the form and content of scientific knowledge and technological knowledge, the interaction among science, technology and other elements of culture, and the conceptual and methodological foundations of humanities studies of science and technology. The program invites proposals which approach any of these foci from the perspectives of history, language and literature, philosophy, art history and criticism, comparative religion, jurisprudence, and those areas of the social sciences which emphasize historical and philosophical methods.

The first deadline was March 1, 1984 (applicants were urged to submit preproposals by January 1, 1984). For information on formal guidelines and other questions contact either David E. Wright or Eric T. Juengst, Humanities, Science & Technology Program, Division of Research Programs, NEH, 1100 Pennsylvania Ave., N.W., Washington, D.C. 20506.

Advice about NEH Grants

The following is extracted from an article "Insights into the Endowment: historians and the NEH" by Harold Cannon, director of the Division of research programs at the National Endowment for the Humanities, published in AHA Perspectives (March 1983), reprinted by permission of the American Historical Association.

"Faculty members often ask me if one must be a 'leading scholar' or 'established name' in a particular field to compete successfully for a grant in the research division. They would think me facetious if I pointed out that our application guidelines do not include that item among the criteria for judging applications; so, instead, I prefer to show them our annually published list of awards. My common experience is that they find few familiar names, even when the topic falls within their field of special interest. And when a name is recognized, the typical remark is, 'If she can get a grant, so can I!'

"At least two-thirds of the twelve hundred or so applications received annually by the division are denied funding. But every applicant can request copies of the review and panel comments of peers who are experts in relevant fields (usually 12 to 15 pages of critique), and this is not easily obtained elsewhere. We are always open to resubmission, and the success rate of these second-time-around applications is very high; obviously, projects are strengthened by criticisms in the earlier round. But a grant can never be guaranteed; all that can be guaranteed is careful consideration by experts here and abroad in a competitive context.

"Ideas for projects should be discussed with staff at the earliest possible time; a two- or three-page letter is usually the best way of initiating this discourse. Most of our telephone conversations end with a request for such a preliminary and informal document which we can share with our colleagues, particularly when there is some doubt about the appropriate category. If you have such a project in mind, please feel free to address your letter to me at: Mail Stop 350, National Endowment for the Humanities, Washington, DC 20506. The same address can be used to request a copy of the annual funding list to which I referred above."

NSF-HPS Panel

The current members of the NSF History and Philosophy of Science panel subcommittee include: **Edward Constant**, Carnegie-Mellon; **Clark Glymour**, Pittsburgh; **Joseph Hanna**, Michigan State; **Nancy Maull**, Harvard; **Mary Jo Nye**, Oklahoma (temporarily replaced by **F. Holmes**, Yale); **Michael Sokal**, Worcester Polytechnic (temporarily replaced by **J. Burchfield**, Northern Illinois); **Robert Kargon**, John Hopkins; and one to be named.

Deadlines for submitting proposals for fiscal year 1985 are 1 September 1984 and 1 February 1985. See HPN no. 1, p. 7 for details.

NSF-HPS FY 83 Grants

Grants awarded for studies in history and philosophy of science by the NSF for FY 1983 included:

Joan L. Bromberg (Laser Institute of America) "Lasers: A History of the Science, Engineering and Commercial Development, 1945-1968"
Samuel Devons (Barnard College) "Some Historical Aspects of Experimental Physics"
James E. Force (University of Kentucky) "William Whiston and the Newtonian Synthesis of Science and Religion"
Allan Franklin (University of Colorado at Boulder) "The Role of Experiment in Physics"
Michael Friedman (University of Illinois- Chicago Circle) "Quantum Logic and the Interpretation of Quantum Theory"
Robert M. Friedman (Norway) "The Influence of the Nobel Prizes on the Development of International Physics"
Stanley Goldberg (Hampshire College) "The Assimilation of Scientific Revolutions: The Case of Special Relativity in America"
Paul G. Horwich (MIT) "The Direction of Time"
Reese V. Jenkins (Rutgers University) "Thomas A. Edison Papers"
David C. Lindberg (University of Wisconsin-Madison) "Optics and the Development of Modern Science"
Enzo O. Macagno (University of Iowa) "Leonardo Da Vinci's Fluid Mechanics"
Russell McCormmach (Johns Hopkins University) "Scientific Biography of Henry Cavendish -- His Contributions to 18th Century Natural Philosophy"
Alan E. Shapiro (University of Minnesota) "An Edition of the Optical Papers of Isaac Newton"
John Stachel (Princeton University Press) "The Collected Papers and Correspondence of Albert Einstein"
Woodruff T. Sullivan (University of Washington) "A History of Radio Astronomy"
Paul R. Teller (University of Illinois- Chicago Circle) "Wave and Particle Concepts in the Interpretation of Quantum Field Theory"
William A. Wallace (Catholic University of America) "Foundations of Modern Science"
Spencer Weart and **Lillian Hoddeson** (American Institute of Physics) "A History of Solid-State Physics"

CONFERENCES

Historical Astronomy Division

The Historical Astronomy Division of the American Astronomical Society will hold sessions at the National Air and Space Museum in Washington, D.C. on June 9. These sessions will concentrate on the history of American astronomy. Historical sessions will continue at the AAS meeting in Baltimore on June 11, with papers on a variety of historical topics including archaeoastronomy. On June 12- 13 there will be a workshop entitled "A User's Guide to Astronomical Calculations for Historical Interests." For details contact David DeVorkin, National Air and Space Museum, Room 3560, Washington, D.C. 20560.

History of Science Society

The History of Science Society annual meeting for 1984 will be held in Chicago, 27-30 December 1984, at the Palmer House. This will be a joint meeting with the American Historical Association, and it is anticipated that all program sessions and job exchange facilities will be open to those registered for either meeting. The year 1984 marks the hundredth anniversary of the birth of George Sarton, the sixtieth anniversary of the founding of the History of Science Society, and the hundredth anniversary of the establishment of the American Historical Asociation.

Those wishing to organize or participate in sessions are invited to submit detailed proposals by 1 March 1984. Ordinary program sessions will be two or three hours in length, with individual papers scheduled for a maximum of 30 minutes. Proposals for 15-minute work-in-progress papers (including an abstract and brief vita) are due no later than 15 April 1984. Work-in-progress sessions will be one hour in length.

Proposals should be sent to the History of Science Society program co-chairs, Professors David B. Kitts or Mary Jo Nye, Department of the History of Science, 601 Elm Street, Room 621, The University of Oklahoma, Norman, OK 73019 (405/325-6908). The program co-chairs welcome diversity among proposals so that the program represents the many different subjects and chronological periods constituting the domain of the history of science.

British Society for the History of Science

The schedule of BSHS meetings for 1984 includes the following:

"Cambridge Mathematical Physics in the 19th century," Grasmere, Cumbria, 23-26 March; details from Dr. Peter Harman, Dept. of History, University of Lancaster, Lancaster LA1 4YG, England. The program will include: **D. B. Wilson**, "Educating Cambridge's Mathematical Physicists"; **I. Grattan-Guinness**, "Mathematical Physics at Cambridge 1830- 50: On the French Influences"; **J. Cross**, "Integral Theorems in Cambridge Mathematical Physics, 1830-52"; **O. Knudsen**, "Mathematics and Physical Reality in Maxwell's Electromagnetic Theory"; **P. M. Harman**, "Edinburgh Philosophy and Cambridge Physics: The Natural Philosophy of James Clerk Maxwell"; **J. Z. Buchwald**, "The Maxwellians the the 'golden idol': Hamilton's Principle and Electromagnetism"; **J. L. Heilbron**, "Rise of the Cavendish and Fall of the Wrangler"; **C. W. Smith**, "Geologists and Mathematicians: The Rise of Geophysics."

"New Perspectives in 19th Century Science," Canterbury, 12-14 April; details from Dr. C. W. Smith, Unit for History of Science, Physics Bldg., University of Kent, Canterbury, Kent CT2 7NR, England.

"Science, Technical Change and Work," Manchester, 12 May.

For information contact The Administrator, BSHS, Halfpenny Furze, Mill Lane, Chalfont St. Giles, Buckinghamshire HP8 4NR, England, UK.

West Coast History of Science Society

The spring meeting of the West Coast History of Science Society will be held at the University of California, Santa Barbara, the weekend of 17 March 1984. Papers will deal with the topics of science, war, and peace, and works in progress. To receive mailings from the society, send $3 per year to the secretary-treasurer, Dr. Bruce R. Wheaton, Office for History of Science and Technology, 470 Stephens Hall, University of California, Berkeley, CA 94720.

Faraday

A Symposium, "Faraday Rediscovered," is being organized by the Royal Institution Centre for the History of Science and Technology by Frank James and David Gooding. It will be held at the Royal Institution in London, 19-21 April 1984. For information write to Dr. Frank James, Faraday Symposium, RICHST, The Royal Institution, 21 Albemarle St., London, W1X 4BS, England.

Electro-culture

The IEEE Society on Social Implications of Technology and SPIE--The International Society for Optical Engineering will cosponsor a symposium entitled "Electro-culture" in Arlington, Virginia on 1-2 May 1984. The call for papers requires that presentations highlight the social implications of electrotechnology, demonstrating knowledge and appreciation of relevant engineering as well as social issues. This may include the history of the societal aspects of electrotechnology.

Prospective contributors and those interested in further information should contact Professor Stephen H. Unger, Dept. of Computer Science, Columbia University, New York, NY 10027 (212/280-8187)

Energy

The International Committee for the History of Technology is planning a meeting on "Energy in History: The Topicality of the History of Technology," at Lerbach, West Germany, 2-7 September 1984. Contact Dr. R. A. Buchanan, The Newcomen Society, c/o The Science Museum, Exhibition Road, London SW7 2DD.

Mathematics

In conjunction with the Open University, the Society is organizing a meeting on "Renaissance Mathematics" to be held at Keble College, Oxford on 26-30 September, 1984. Themes will include national traditions in mathematics, the vernacular tradition, pedagogic aspects of mathematics, the work of Nicholas Chuquet, mathematics and other sciences, and mathematics and society.

Details can be obtained from Dr. Cynthia Hay, Faculty of Mathematics, The Open University, Walton Hall, Milton Keynes MK7 6AA, England.

REPORTS

APS Fall Meeting

The 1983 fall meeting of the Southeastern Section of the APS was held at Columbia, South Carolina, on 3-5 November. There was a session on the history of physics, at which the following papers were presented:

"Joseph LeConte's Studies in Physiological Optics, 1866-1897" - **Lester D. Stephens**, University of Georgia.

"Women in Physics, Past, Present and Future" - **Lucille B. Garmon**, West Georgia College, and **Katherine R. Sopka**, Fort Lewis College, Colorado.

"The Impact of Technology on Science" - **J.P. Kelvey**, Clemson University.

"Making a Movie About the History of Science" - **Hans C. Von Baeyer**, William and Mary.

APS-AAPT Annual Meeting

A session on the history and philosophy of physics was held at the San Antonio meeting of APS & AAPT, 1 February 1984. The following papers were presented:

"Educational use of recorded voices of physicists" - **Arthur Eisenkraft**, Briarcliff H.S., Briarcliff Manor, NY

"Lise Meitner: The Early Exile Period" - **Sallie A. Watkins**, University of Southern Colorado

"Observation, Theory and Cultural Relativity" - **Douglas R. Martin**, Deep Springs College

"Kepler, Physical Cause, and Astrology" - **J. B. Brackenridge**, Lawrence University

"Newton's Principia and the external gravitational field of a spherically symmetric mass distribution" - **Robert Weinstock**, Oberlin College

"The Acoustical Apparatus of Rudolph Koenig" - **Thomas B. Greenslade, Jr.**, Kenyon College

"John Smeaton, Eighteenth-Century Physicist and Engineer" - **Reuben Alley**, U. S. Naval Academy

"The Rationality of the Copernican Revolution" - **Douglas R. Martin**, Deep Springs College

Paul Smith presided at the session.

AGU Fall Meeting

Two papers on historical topics were presented at the 1983 fall meeting of the American Geophysical Union in San Francisco. **L.R. Owen Storey** (Stanford), "The Early History of Whistler Research," traced the theoretical interest in whistlers, which began in earnest after WWII. **W. Glen** (University of California, Berkeley), "Keys to the Revolution in Earth Science," discussed the role of three lines of research crucial to the confirmation of the Vine-Matthews-Morley hypothesis: potassium-argon dating of young rocks with the Reynolds mass spectrometer; the use of that dating capability in formulating a time scale of reversals of the earth's magnetic field; and the application of that scale in deciphering magnetic data from the sea floor.

West Coast History of Science Society

The West Coast History of Science Society held its 1983 autumn meeting at Oregon State University on 12 November. The meeting was arranged in conjunction with a celebration entitled "German Culture and Its Legacy in the United States: A Tricentennial Commemoration of the First German Immigrants to America," and featured two sessions on German and U.S. scientific interaction.

At the first session, chaired by **Robert Frank**, the following papers were presented: **John Greenberg** and **Judith Goodstein**, "Theodore von Karman and the Arrival of Applied Mathematics in the U.S., 1930-1940"; **Charles Burdick**, "Werner Heisenberg: A Physicist and Politics"; **Robert Hall**, "Two Eras of Strong Influence on American Astronomy by German Astronomers"; **E.T. Florance**, "Discharge Tubes and Heaviside Layers: German and American Plasma Science in the 1930s."

The second session, chaired by **Brookes Spencer**, included the following papers: **Michael Kinch**, "The Science of German-Americans, 1760-1860"; **Paul Hoch**, "The Role of Central European Emigres in the Rise of New Interdisciplinary Scientific Specialties after 1933."

American Vacuum Society

The American Vacuum Society, celebrating its 30th anniversary, held its annual meeting in Boston on 1-4 November 1983. Commemorating the anniversary, the Fusion Technology Division presented historical reviews of the tokamak and mirror approaches to controlled fusion in a session entitled "History of Fusion." Invited speakers were: **C.C. Damm**, "Evolution of the Mirror Machine"; and **M.B. Gottlieb**, "Controlled Fusion."

BSHS

The British Society for the History of Science and the Royal Institution Centre for the History of Science and Technology held a meeting on "Work in Progress in the History of Science and Technology" in London on 31 October 1983. The meeting included several papers relating to the history of physics: **E. Crawford**, "The Discovery of the Faraday Effect and the Magnetic Lines of Force"; **C. Murphy**, "Radium Bombs. An Early Form of High Energy Beam Therapy"; and **S. Saunders**, "Early History of the Schroedinger Wave Equations."

William and Lawrence Bragg

The Royal Institution Centre for the History of Science and Technology held a conference on "The Lives and Works of William and Lawrence Bragg" in London on 13 January 1984. Father and son jointly received the 1915 Nobel physics prize for their work on x-ray crystallography. William Bragg was one of the founders of Australian science. Both Braggs helped to develop equipment which enabled the two world wars to be waged more effectively by the allies. Both Braggs were Distinguished Professors at the Royal Institution, Lawrence founding the successful Schools lectures.

The papers at the meeting covered these aspects and others; the papers included: **J. Jenkin**, "Not a Chair but a Sofa; W.H. Bragg's Early Years in Adelaide"; **R.W. Home**, "W.H. Bragg's Place in the Australian Scientific Community, 1886-1909"; **B. Coates**, "Demonstrations from the Repertoire of Sir Lawrence Bragg"; **M. Gray**, "The Archives of William and Lawrence Bragg"; and **H. Kamminga** and **A. Mackay**, "Lawrence Bragg and Generalised Optics."

Peoples Republic of China

A summer school on the History of Physics was held in the city of Chengdei, Hobei Province, 1-12 August 1983, sponsored by the journal Physics Bulletin and the Hobei Branch of the Chinese Physical Society. More than 340 persons from 28 provinces and cities participated in this meeting. Eight professors and specialists were invited to give lectures, which covered the following topics: the achievements of ancient physiscs in China and their world-wide influence on civilization; historical developments of basic mechchanical concepts; the establishment of electromagnetic theory; the landmark discoveries in physics experiments at the turn of the nineteenth century; the rise of quantum physics and the Copenhagen School; Einstein's thinking and methods on creating theories of relativity; as well as problems of physics education using the history of physics.

For information contact Dr. I-Ling Kuo, Science Building, Tsinghua University, Beijing, Peoples Republic of China.

Denmark

The Danish division of the International Union of the History and Philosophy of Science held its annual meeting at Odense University, 28-29 October 1983. Two of the lectures were of interest to historians of physics: **P. Lervig** (Arhus University), "Carnot and the Steam Engine"; and **K.M. Pedersen** (Aarhus University), "Picard's Travel to Uranienborg." Further information about the meeting can be obtained from Prof. David Favrholdt, Odense University, Institute of Philosophy, Campusvej 55, 5230 Odense, Denmark.

EINSTEINIANA

From Minsk to Pinsk...?

"Workers repairing an old building in Minsk (USSR) have discovered 73 photographs of George Bernard Shaw, Tass, the official Soviet Press Agency reported today. Tass said some of the photographs showed Shaw listening to a report by Albert Einstein and chatting with Charlie Chaplin ..." -- AP dispatch published in New York Times, 21 February 1984.

BOOK SERIES

History of Modern Physics

Tomash Publishers has announced the publication of volumes three and four in its "History of Modern Physics, 1800- 1950" series. (For a description of the series see HPN, no. 1, p. 5; for volumes one and two see no. 2, p. 25.)

Volume three is American Physics in Transition: Conceptual Changes in the Late Nineteenth Century by Albert Moyer. Beginning with a discussion of Stallo's Critique of Physics (1880), and culminating with an assessment of the impact of the St. Louis Congress of 1904, the author examines the scientific outlooks of a number of American physicists active in the late nineteenth century.

Volume four in the series is The Question of the Atom: From the Karlsruhe Congress to the First Solvay Conference, 1860-1911, edited by Mary Jo Nye. The twenty selections in this anthology, compiled for the first time in one edition and written by such eminent scientists as Einstein, Perrin, Rutherford, Duhem, Kelvin, and Berthelot, address the question of the reality of the atom.

Information can be obtained from Adele Clark, Tomash Publishers, P.O. Box 49613, Los Angeles, CA 90049

Classics in Philosophy and Science

The Ox Bow Press is publishing a series of reprints of classics in philosophy and science. Titles include: Ludwig Boltzmann, by E. Broda; Foundations of Physics, by R. Bruce Lindsay and Henry Margenau; The Nature of Physical Reality, by Henry Margenau; Elementary Principles in Statistical Mechanics, by J. Willard Gibbs; Philosophical Problems of Quantum Physics, by Werner Heisenberg; Symmetries and Reflections, by Eugene Wigner; Where is Science Going, by Max Planck; Science and First Principles, by F. S. C. Northrop.

Information can be obtained from Ox Bow Press, P.O. Box 4045, Woodbridge, CT 06525

Euler

The year 1983 marked the 200th anniversary of the death of Leonhard Euler (1707-1783). The occasion prompted Basel, "The City of Euler," to issue an official memorial volume, richly illustrated, with thirty contributions from thirty-three scholars representing ten different countries.

Euler's Opera omnia, second series, nears completion with the publication of volume 16, Leonhardi Euleri commentationes mechanicae ad theoriam machinarum pertinentes volumen posterius (Bern, 1979), and volume 21, Leonhardi Euleri commentationes mechanicae et astronomicae ad scientiam navalem pertinentes volumen posterius (Bern, 1978). Volumes 16 and 21 share a common theme: the mechanics of fluids and its applications. They are thus closely linked with other volumes in the same series, especially volumes 18 and 19 in which Euler's massive Scientia navalis seu tractatus de construendis ac dirigendis navibus is reprinted. The latter two volumes, edited by C. Truesdell, contain no scholarly introduction. The introduction is instsead supplied in a 190 page essay by Walter Habicht at the beginning of volume 21. There Professor Habicht provides detailed analyses of both volumes of Scientia navalis and situates the work in the context of mid-18th century fluid mechanics. He also makes ample reference to other relevant literature published both in the Opera omnia series and elsewhere. (See review in Historia Mathematica 10 (1983): 476-7)

Ethics and Engineering

Volume One of the Working Papers, published by the Center for the Study of Science in Society, is now available. Volume One contains the papers of Langdon Winner, Vivien Weil, Spencer Weart, and Robert Livingston presented in an "Ethics and Engineering" Series at Virginia Tech in the spring of 1981. Please send your check ($2.50 per copy) made out to the Center for the Study of Science in Society, Price House, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

SUMMARIES

Authors of books and articles on the history of physics are invited to send summaries for publication in this section. Maximum lengths: 75 words for articles, 150 words for books. (Longer summaries may be published of papers presented at Division symposia.) In addition, for articles please give author's mailing address and indicate whether reprints are available; for books published outside the U.S., indicate the U. S. distributor (if any) or complete mailing address of publisher, and give the price in U. S. dollars, including cost of mailing (if applicable). We can also publish summaries of papers presented at meetings if the author is willing to distribute preprints; otherwise, if copies are not available but the author is willing to correspond with others about the research, a summary may be submitted for the "Work in Progress" section. Publication will be expedited if each summary is typed, on a separate sheet, in the format of the examples below.

HARRIOT'S ATOMISM

HENRY, JOHN. Thomas Harriot and atomism: a reappraisal. History of Science, 1982, 20: 267-296.

Harriot (1560-1621) has been regarded as the earliest Englishman to embrace the atomist revival and develop a new corpuscular philosophy. This paper argues that he never succeeded in finding a philosophically coherent atomism. His mathematical approach led him to adopt infinitely small atoms which, though compatible with geometry, were incompatible with a physics which required atoms to have size and shape. A parallel is drawn with Galileo's attempts to revive atomism which were similarly thwarted.

Author's address: John Henry, School of Humanities, The Hatfield Polytechnic, College Lane, Hatfield, Herts. AL10 9AB, England, UK.

ALHAZEN'S OPTICS

SABRA, A. I. (ed.) The Optics of Ibn al-Haytham (Alhazen), Books I-II-III. 798 pp. Safat, Kuwait: National Council for Culture, Arts, and Letters, State of Kuwait, 1983. $50 (ind. airmail postage).

This is the first of four volumes that will comprise the text and English translation of Ibn al-Haytham's Kitāb al-Manāzir, known in the West in a medieval Latin translation as Perspectiva or De aspectibus. The volume just published includes Arabic-Latin glossaries and concordance tables for comparing the Arabic text with the Latin translation published by F. Risner in Opticae thesaurus, Basel, 1572.

LEIBNIZ

WILSON, CATHERINE. Leibniz and Atomism. Studies in the History and Philosophy of Science, 1982, 13: 175-179.

Why did Leibniz reject the popular late seventeenth-century doctrine that the ultimate constituents of matter were solid corpuscles possessing only size, shape, and motion intrinsically? The question is especially perplexing, because Leibniz was a determined mechanist who protested vigorously throughout his life against "animistic" modes of explanation. The paper discusses the physical and metaphysical considerations which convinced Leibniz that the physical world was a mere phenomenon by contrast with the underlying order of immaterial monads.

Author's address: Catherine Wilson, Department of Philosophy, University of Oregon, Eugene, Oregon 97403.

GALILEO

DRAKE, STILLMAN. Telescopes, Tides, and Tactics. A Galilean Dialogue about the Starry Messenger and Systems of the World. xix + 236 pp. Chicago: University of Chicago Press, 1983. $22.50.

This book presents Galileo's Starry Messenger of 1610 in the context of an imagined dialogue among three of his friends late in 1613. It is an astronomical companion to my Cause, Experiment, and Science, in which Galileo's first book in physics was similarly presented. Emphasis here is on Galileo as a working astronomer during the early days of the telescope. In that respect this book supplements Galileo at work with new information drawn from letters and notebooks.

ATOMISM

HENRY, JOHN. Atomism and eschatology: Catholicism and natural philosophy in the Interregnum. British Journal for the History of Science, 1982, 15: 211-239.

The earliest complete system of mechanical philosophy to be published by an English writer, the Two Treatises (1644) of Sir Kenelm Digby (1603-1665), is shown to have been part of a counter-reforming enterprise undertaken by a little remembered group of heterodox English Catholics known as the Blackloists. The reactions of contemporaries to the science and the theology are considered as are the implications of this for the Puritanism-amd-science thesis upheld by many modern historians.

Author's address: School of Humanities, The Hatfield Polytechnic, College Lane, Hatfield, Herts. AL10 9AB, England UK.

HUYGENS

BURCH, CHRISTOPHER. Christiaan Huygens: The Development of a Scientific Research Program in the Foundations of Mechanics. xv + 409 pp. Ann Arbor: University Microfilms, 1982. &20.00 (pb), $10.00 microfilm or microfiche.

Huygens' mechanical foundations are set out most clearly in De Motu Corporum ex Percussione. Careful comparison is made with Descartes' impact theory, illustrating Huygens' subtle but conscious opposition. Huygens' own concepts of matter, motion and impact are elucidated. Versions of this impact theory allow exploration of Huygens' modes of theory change and development. Huygens' impact theory provides demonstrated propositions as hypotheses for secondary theories, such as his light and gravitation theories. This stratification of theories is explored in detail. Huygens' impact theory relies on the property of hardness rather than elasticity; his light theory is founded on pulses rather than waves. Huygens' modernity arises not so much from his scientific beliefs, his theoretical commitments, or in the structure and predictions of his theories as in his method of theory development and advancement. While regarded as a kinematic theorist, Huygens has an unusual conception of causality, which is explored.

GLOBAL MOBILISM

CAROZZI, ALBERT V. Heinrich Wettstein (1880), A Swiss Forerunner of Global Mobilism. Earth Sciences History, 1983, 2: 41-47.

Heinrich Wettstein (1831-1895) from Switzerland should be considered a forerunner of global mobilism. His 1880 book "Die Strömungen des Festen, Flüssigen und Gasförmigen und ihre Bedeutung für Geologie, Astronomie, Klimatologie und Meteorologie" presented the hypothesis of westward displacement and deformation of continents under the effect of the sun's gravitational pull. According to Wettstein, mountain ranges are formed when westward creeping sedimentary sequences encounter and override obstacles on the upper surface of a rigid substratum. However, formation of mountains with related earthquakes and volcanism is only a temporary and secondary effect of a larger generalized westward creeping of the continents themselves over a similar rigid substratum. Such large-scale displacements, deformations, temporary separations, and junctions of continents across fixed climatic belts are demonstrated, said Wettstein, by variations of superposed fossil faunas and floras and by their dispersal patterns. Although the force assumed by Wettstein was subsequently demonstrated to be negligible, he broke the strait jacket of the contraction theory with a grandiose and early vision of global mobilism.

Author's address: Albert V. Carozzi, Department of Geology, University of Illinois, 1301 West Green Street, Urbana, IL 61801

CP VIOLATION

ABASHIAN, ALEXANDER. History of CP violation. Physics Today, Feb. 1983, 36(2): 101-102.

The article by James Cronin (July 1982) disregards "the important contributions made by me and by my colleagues at the University of Illinois." The author offers to send a copy of his paper "CP violation, the Other View" to anyone interested in the history of the subject.

Author's address: Alexander Abashian, Virginia Polytechnic Institute and State University, Blacksburg, VA.

JUPITER RADIO

FRANKLIN, K. L. The Discovery of Jupiter as a Radio Source. Presented at the meeting of the American Geophysical Union, May 1983. [From EOS, 1982, 63:412]

A personal account will be given of the entirely serendipitous discovery that Jupiter emitted radio frequency radiation. This 1955 event alerted astronomers to the possibility that the sun's planetary system was astrophysically interesting, several years before the space age began.

Author's address: K.L. Franklin American Museum-Hayden Planetarium New York, NY 10024

LIGHT QUANTUM

WHEATON, BRUCE R. Renaissance of the Lightquantum. Presented at the Symposium of the Division of History of Physics, American Physical Society meeting, San Francisco, 20-23 November 1983.

Einstein's proposal of the lightquantum in 1905 was neither the only nor the first suggestion that radiation fails to distribute its energy uniformly in interaction with matter. Nonetheless for a variety of historical reasons Einstein's hypothesis was not taken seriously by physicists for fifteen years. Robert Millikan's unambiguous corroboration of the linear law of the photoeffect did not sway opinion--even Millikan's--in favor of this truly revolutionary reformulation of classical ideas about light.

The evidence that finally began to convince others came from the x-ray and γ-ray regions of the electromagnetic spectrum, and not before knowledge of x-ray spectroscopy, the Bohr theory of the atom, x-ray absorption features, and β-ray velocity spectroscopy were sufficiently developed. This constellation of events occurred first in Maurice de Broglie's private laboratory in Paris in 1921. Subsequently, and more a result than a cause of increasing acceptance of the lightquantum hypothesis, Arthur Compton reinterpreted x-ray scattering data in a way that gave further impetus to the quantization of free electromagnetic radiation.

The final conceptual contribution linking this developing strain of thought with the new wave mechanics of Erwin Schrödinger came from Louis de Broglie, heavily influenced by his elder brother's empirical research. The younger de Broglie provided the decidedly unorthodox, but under the strained circumstances of 1923, provisionally acceptable hypothesis that completed the symmetrical interpretation of matter and light originally sought by Einstein: If wave radiation demonstrates particulate properties, parriculate matter should exhibit wave-like characteristics. The renaissance of the lightquantum brought with it what we now call "wave-particle dualism" and final renunciation of determinism in physical theory.

Author's address: Office for History of Science and Technology, University of California, Berkeley, CA 94720

CP VIOLATION

FRANKLIN, ALLAN. The Discovery and Acceptance of CP Violation, Historical Studies in the Physical Sciences, 1983, 13(2): 207-238.

This paper examines the role of the experiment of Christenson, Cronin, Fitch, and Turlay in establishing the violation of CP invariance. The background of the experiment, the experiment itself, and the reaction of the physics community to it are discussed. I argue that the experiment is an exemplar of what might call a "convincing" experiment. The entire episode demonstrates the fruitful interaction of theory and experiment.

For reprint write to Allan Franklin, Department of Physics, Campus Box 390, University of Colorado, Boulder, CO 80309.

LOW TEMPERATURE PHYSICS

KURTI, N. Liquid helium at the Clarendon Laboratory. Nature, 1983, 302: 210.

Report of a celebration of the half-centenary of Oxford research in low temperature physics, including recollections by David Shoenberg.

STORY OF PHYSICS

BEVILACQUA, FABIO (ed.) Storia della Fisica: Un Contributo per l' insegnamento della fisica. 261 pp. Milan, Italy: Franco Angeli Editore, 1983. Price, L. 16,000.

Contents: F. Bevilacqua, "Storia della fisica e didattica"; J. Teichmann, "L'esperimento storico nell'insegnamento della fisica"; G. Arcidiaco, G. Bruni, V. Cinquini, M.T. De Luca, "Il principio di inerzia nella meccanica classica"; G. Fenaroli, M.A. Penco, "Origini del concetto di probabilità nel Seicento"; M. La Forgia, "Michael Faraday e la scoperta dell'induzione elettromagnetica"; G.P. Guidetti, "La scoperta dell'elettrone"; C. Tarsitani, "L'effetto fotoelettrico e la natura <<duale>> della radiazione: aspetti storici, metodologici e didattici"; E. Giordano, "I raggi X"; P. Tucci, "Il rapporto ipotesi-esperimento nell'individuazione dei fenomeni radioattivi"; G. Tagliaferri, "Introduzione alla storia della fisica quantistica"; L. Belloni e O. Rossi, "Un contributo bibliografico di storia della fisica".

CP VIOLATION

FRANKLIN, ALLAN. The Discovery and Acceptance of CP Violation. Presented at a symposium of the Division of History Physics, American Physical Society meeting, San Francisco, CA, November, 1983.

One of the interesting problems in the history and philosophy of science is the role that experiment plays in the choice between competing hypotheses or theories. In this paper I examine the role of the experiment of Christenson, Cronin, Fitch, and Turlay (1964) in establishing the violation of CP (combined space inversion and particle-antiparticle interchange) invariance. I will discuss the background of the experiment, the experiment is an exemplar of what one might call a "convincing" experiment. In addition, the history of the alternative explanations of the experiment and of the experimental tests of these alternatives shows the physics community solving, in a pragmatic way, the problem of theory choice posed by Duhem and Quine. The entire episode also demonstrates the fruitful interaction of theory and experiment.

Author's address: Allan Franklin, Physics Department, University of Colorado, Boulder, CO 80309.

GENERAL COVARIANCE

NORTON, JOHN. Einstein's Early Problems with General Covariance. Presented at the Joint Atlantic Seminar in the History of the Physical Sciences, Washington, D.C., 8-9 April 1983.

By mid 1913, Einstein and his collaborator Marcel Grossmann had published an outline of virtually all the major features of the general theory of relativity. However they were unable to find generally covariant field equations which they believed would reduce to the correct Newtonian limit. It has generally been assumed that this episode resulted from an ignorance of their freedom to apply coordinate conditions to generally covariant field equations, and, further, that this same ignorance continued to trouble Einstein, as he wrestled with the problem of field equations of limited covariance, up to his triumphant return to general covariance in November 1915.

On the basis of one of Einstein's notebooks from the 1912/1913 period, I argue that Einstein was fully aware of his freedom to use coordinate conditions and that he even knew then of two different coordinate conditions which could be used to reduce the Ricci tensor to a Newtonian form. Finally, I speculate briefly about an alternative explanation for Einstein and Grossmann's rejection of general covariance and allude to the new account of the three year struggle with the field equations which follows from it.

Author's address: John Norton Einstein Project, Princeton University Press, Princeton, N.J.

ATOMIC PHYSICS

MACKINNON, EDWARD M. Scientific Explanation and Atomic Physics, x + 450. Chicago: University of Chicago Press, 1982, $27.50.

This is a history of atomic physics with a focus on the scientific explanations that were introduced, developed, and modified in the course of this development. The first three chapters treat atomism in classical physics. The bulk of the book is given over to a detailed and quite selective analysis of the work of those who developed and shaped the interpretation of quantum mechanics. Here the emphasis is on getting behind the textbook accounts and showing how the decisive breakthroughs actually happened. The book concludes with a detailed historical analysis of the Bohr-Einstein debates. The disagreements, it is argued, rest on differing ideas on scientific explanation. The development of each man's view is presented both historically and systematically.

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HENRY PAPERS

REINGOLD, NATHAN; ARTHUR P. MOLELLA; MARC ROTHENBERG; KATHLEEN WALDENFELS; JOAN F. STEINER (eds.). The Papers of Joseph Henry. Volume 4: January 1838-December 1840: The Princeton Years. xxxiv + 475 pp. Washington, D.C.: Smithsonian Institute Press, 1981. $30.00.

This volume documents the years immediately following Henry's first tour of Europe. Gratified by his acceptance by the European scientific community, Henry returned to the United States with renewed concern for the institutional and intellectual development of American science, especially the need to protect the scientific community from charlatanism. This period was also noteworthy for the laboratory research conducted by Henry. During these years he increased his understanding of electromagnetic induction, concentrating on the phenomena of induction of higher order currents, shielding (where he differed considerably with Faraday's conclusions), and induction over long distances. The published fruits of these experiments were Parts III and IV of his series "Contributions to Electricity and Magnetism."

Editor's address: Joseph Henry Papers, Smithsonian Institute, Washington, D.C. 20560

PARTICLE PHYSICS

BROWN, LAURIE M.; LILLIAN HODDESON (eds.) The Birth of Particle Physics. XXII + 412 pp. New York: Cambridge University Press, 1983. $44.00.

Based upon the presentations and discussion at the May 1980 International Symposium on the History of Particle Physics, held at Fermilab in Batavia, Illinois, this collection focusses primarily on the development of cosmic ray physics and quantum field theory in the 1930's and 1940's, before the advent of the great accelerators, and draws on research conducted in the U.S.A., Italy, Japan, U.K., Germany, France, and the U.S.S.R. Besides an introductory essay by the editors, there are 22 chapters including contributions by C.D. Anderson, G. Bernardini, P.A.M. Dirac, S. Hayakawa, W.E. Lamb, Jr., R.E. Marshak, B.B. Rossi, R. Serber, J. Schwinger, and V.F. Weisskopf. Social, personal, and political aspects of particle physics history are discussed, as well as the purely scientific development.

EINSTEIN

BYRNE, PATRICK H. The Origins of Einstein's Use of Formal Asymmetries. Annals of Science, 1981, 38: 191-206.

Several authors have used the expression 'formal asymmetry' to characterize Einstein's method of introducing conceptual innovations such as the principle of relativity and quanta of radiation prior to his use of formal asymmetries. However, Einstein relied upon analogies to introduce new concepts, but without satisfactory results. This article traces Einstein's modification of the methods employed in his earliest papers into the method of formal asymmetries which would guide the reflections for the remainder of his scientific career.

Limited number of free reprints available from Prof. Patrick H. Byrne, Dept. of Philosphy, Boston College, Chestnut Hill, MA 02167.

RELATIVITY

BYRNE, PATRICK H. Relativity and Indeterminism. Foundations of Physics, 1981, 11(11/12): 913-932.

Despite the fact that Einstein strictly adhered to a deterministic world view throughout his career, the author has discovered that his theories of relativity are incompatible with such a world view. This article sets forth a proof of that incompatibility. Two different formulations of determinism are first considered -- classical Laplacian determinism and a determinism of isolated systems as formulated by Einstein himself. Through careful consideration of what is concretely involved in predicting future states of the universe, it is shown that the demands of the theories of relativity make these deterministic positions untenable. Finally, more generic notions of determinism are also shown to be untenable.

Free reprints available from Prof. Patrick H. Byrne, Department of Philosophy, Boston College, Chetnut Hill, Ma 02167.

REVOLUTIONARY CHANGES

NOVY, LUBOS; IURI I. SOLOV'EV, eds. Revolutionary Changes in Science and Technology at the Turn of the 19th and 20th Centuries. 477 pp. Prague: Institute of Czechoslovak and General History of the Czechoslovak Academy of Sciences, 1981.

Reviewed by P.R. Josephson in Annals of Science, 1982, 39: 511-12. Includes: V.P. Kartsev and V.M. Rodionov "Maxwell's Electrodynamics and the Emergence of New Technical Disciplines"; Joseph Illy, "Lenin, the Electromagnetic World View and the Theory of Relativity."

QUANTUM REVOLUTION

AGASSI, JOSEPH. The Structure of the Quantum Revolution. Philosophy of The Social Sciences, 1983, 13: 367-81.

Essay review of T.S. Kuhn, Black-Body Theory and the Quantum Discontinuity, 1894-1912.

Author's address: York University, 4700 Keele Street, Toronto, Ontario, Canada.

AURORA RESEARCH

SCHRÖDER, WILFRIED, Hermann Fritz, a pioneer of Aurora Research. Vischer. naturf. Ges. Zürich 1981, 126: 199-204.

The endeavours of Hermann Fritz (1830-1893) relating to aurora and solar-terrestrial physics are presented here as to give an idea of his contributions to this subject made during the years 1860-1893.

Author's address: W. Schröder, Hechelstrasse 8 D-2820 Bremen-Roennebeck, Germany.

AMPÈRE

HOFFMAN, JAMES R. Why was Ampère unimpressed by his 'discovery' of electrodynamic induction? Presented at the twenty-sixth annual meeting of the Midwest Junto for the History of Science, Ann Arbor, Michigan, April 15,1983.

Although Faraday is correctly credited with the discovery of electromagnetic induction in 1831, Ampère had already observed this phenomenon nine years earlier. On the same day, however, Ampère had also performed another experiment which confirmed a suprising prediction he had made several months earlier. Ampère's desire to defend his theory of electrodynamics by publicizing his successful prediction contributed to his overlooking the significance of the induction effect.

For free copies write to: James R. Hoffman, Dept. of History and Philosophy of Science, 1007 CL, University of Pittsburgh, Pittsburgh, PA 15260.

AMERICAN SCIENCE

REINGOLD, NATHAN; IDA H. REINGOLD (eds.) Science in America: A Documentary History, 1900-1939. xii + 490 pp. Chicago: University of Chicago Press, 1981. $37.50.

The documents are organized thematically within a general chronological framework. There are separate chapters on pre-World War I astrophysics and physics, the physical sciences between the World Wars, and such significant institutions as the Carnegie Institution of Washington and the Institute for Advanced Study. The book includes analytical introductions to each chapter and annotations to the documents. The editors have appended a guide to manuscript collections.

Author's address: Joseph Henry Papers, Smithsonian Institution, Washington, D.C. 20560.

SEMICONDUCTORS

SCHOPMAN, JOOP. The Dutch Contribution to barrier-layer semiconductors in the pre-germanium era. Janus, 1982, 69: 1-28.

Before 1950 all Dutch research on semiconductors has been performed in the Physical Laboratories of Philips' Gloeilampenfabrieken N.V. The research started about 1930 and after an exploration of the field concentrated on selenium. Although some useful devices could be produced, the work on selenium remained a trial and error type. Its research was abandoned in 1952, its production in 1957/8 for the new technology: germanium and silicon.

Author's address: J. Schopman, Dept. of Philosophy of Science, Heidelberglaan 2, 3508 TC Utrecht, The Netherlands.

AMPÈRE

HOFFMAN, JAMES R. Ampère's Hesitant Transition from Synthesis to Analysis: Methodical Strategy in Electrodynamics. Presented at the tenth annual meeting of the Joint Atlantic Seminar in the History of the Physical Sciences, Washington, D.C., April, 1983.

Early in 1822 Ampère recognized the full significance of his new experimental technique of "null experiments." Although he was eager to cite this method as greatly superior to the hypothetico-deductive methodology being employed by his rivals, Ampere hesitated due to the fact that he was not able to design a full set of null experiments suitable for a complete derivation of his electrodynamic force law until 1825. An unpublished 1823 manuscript draft fully reveals Ampère's hesitant state of mind.

Free copies are available by writing to: James R. Hoffman, Dept. of History and Philosophy of Science, 1017 CL University of Pittsburgh, Pittsburgh, PA 15260.

SPACE PHYSICS

EGELAND, A.; BREKKE, A. Kristian Birkeland (1867-1917): Pioneer of Space Physics. Presented at the meeting of the American Geophysical Union, May 1983. [From EOS, 1982, 63: 412]

Kristian Birkeland is remembered as a dynamic and enthusiastic physicist and inventor. During the period 1983-1913 he contributed greatly to the study of the polar aurora and of the Earth's magnetosphere and introduced many ideas which still remain central to this area--particle motion in a dipole field, magnetic substorms and the idea of large electric currents flowing into the upper atmosphere and out of it, now known in his honor as Birkeland currents. Though much of this remained unrecognized for many years, this was truly the foundation of modern magnetospheric physics.

Author's address: A. Egeland. Goddard Space Flight Center, Greenbelt, MD 20771

A. Brekke. Department of Physics, University of Tromsø, N-9001 Tromsø, Norway)

EXCLUSION PRINCIPLE

HEILBRON, J.L. The origins of the exclusion principle. Historical Studies in the Physical Sciences, 1983, 13: 261-310.

A detailed account of the early careers and contributions to the exclusion principle of Edmund Stoner and Wolfgang Pauli. The paper may have some interest from a psychological as well as from a scientific-historical point of view.

Author's address: Office for History of Science, University of California, 470 Stephens Hall, Berkeley, CA 94720

SEMICONDUCTORS

SCHOPMAN, J. Wetenschap in bedrijf: ontwikkeling en organisatie van het halfgeleiderondersoek binnen de N.V. Philips Gloeilampenfabrieken (1930-1955). Tijdschrift voor de geschiedenis der geneeskunde, natuurwetenschappen, wiskunde en techniek, 1982 , 5: 158-185.

A study has been made of semiconductor research in the Netherlands during the period 1930-1955. Research was only performed by the N.V. Philips Gloeilampenfabrieken at Eindhoven, especially within its Natuurkundig Laboratorium (Physical Laboratory). From 1914 Philips spent much attention to scientific research. This is due to its type of products. In the case of semiconductors the laboratory first studied barrier layer semiconductors, in particular selenium. During the second world war new types of resistors were developed as a result of the work on spinels and controlled valency. After the war the germanium technology appeared to have been developed so far that germanium formed the ideal semiconductor material; later it was superseded by silicon.

For reprints write to J. Schopman, Centrale Interfaculteit, Rijksuniversiteit Utrecht, Transitorium 2, Heidelberglaan 2, Utrecht, The Netherlands.

SOLAR WIND

HUNDHAUSEN, A. J. M Regions Revisited. Presented at the meeting of the American Geophysical Union, May 1983. [From EOS, 1982, 63:412]

Coronal holes are now widely regarded as the sources of long-lived, high-speed solar wind streams. This association of solar and interplanetary features has resolved one of the oldest problems in solar-terrestrial physics--the identification of solar M regions, hypothesized in the 1930s as the sources of recurrent geomagnetic activity. Early attempts to solve this problem by correlating such observed solar features as sunspots, plages and active regions with recurrent geomagnetic disturbances led to widely divergent conclusions. By the 1960s different schools of thought regarded active regions as either the origin or a serious inhibitor of the emmission of solar particles responsible for geomagnetic activity. The problem was solved in the 1970s by combining observational evidence about the solar wind with new insights about coronal structure, stimulated by the striking appearance of coronal holes on X-ray images of the sun. In retrospect, many of the apparent contradictions among earlier studies are now seen to be easily accomodated by a simple coherent view of coronal and interplanetary structure. The pitfalls encountered in achieving this synthesis provide an interesting lesson about the application of statistical inference to complicated geophysical systems.

Author's address: A.J. Hundhausen High Altitude Observatory, National Center for Atmospheric Research, Boulder, CO 80307

HUBBLE'S UNIVERSE

HETHERINGTON, NORRISS S. Philosophical values and observation in Edwin Hubble's choice of a model of the universe. Historical Studies in the Physical Sciences, 1982, 13: 41-67.

Three new cosmological models were proposed in the 1930s: Georges Lemaitre's relativistic, expanding universe; E.A. Milne's kinematic model, and Fritz Zwicky's static model. Edwin Hubble, with the help of Richard Tolman, set out to compare the rival theories with observation. This analysis of Hubble's published and unpublished papers demonstrates that in choosing between competing cosmological models Hubble rejected the model of the universe that best fit his data because philosophical values dictated allegiance to another model.

Reprints available: N. Hetherington, 1742 Spruce #201, Berkeley, CA 94709.

INTELLECTUAL LEAPFROG

FEINBERG, GERALD. Progress in Physics: The Game of Intellectual Leapfrog. Chapter 7 in Progress and its Discontents ed. Gabriel Almond et al., xiv + 565 pp. Berkeley: University of California Press, 1982.

This article discusses several aspects of the development of physics over the past century. It concentrates on the relation between theory and experiment in the development of physics, and on the changing nature of what physicists think needs explaining, and on what is acceptable as an explanation.

Author's address: Gerald Feinberg, Department of Physics, Columbia University 538 West 120th Street, New York, NY 10027

DIODES

SCHOPMAN, JOOP. Philips' Antwort auf die neue Halbleiterära Germanium und Silicium (Philips' response to the new semiconductor era: Germanium and Silicon) (1947-1957). Technikgeschichte 1983, 50: 146-162.

After the second world war Philips was behind. In 1948 it succeeded in producing diodes, but could not master the transistor technology until after the Bell symposium (1952). It did not use the methods demonstrated, but prefered the RCA alloy method. For a long time Philips' research was dictated by US competitors. Slowly it was able to make its own contribution; initially technical; later a real breakthrough with the POB transistor (1957).

Reprints - also copies of the original English text - are available from the author: Department of Philosophy of Science, Heidelberglaan 2 3508 TC Utrecht, The Netherlands.

PARTICLES

ROSNER, JONATHAN L. New Particles. Stony Brook, N.Y.: American Association of Physics Teachers, 1981. Hardcover $4.00, $4.50 outside the U.S.

The period 1974-1979 witnesses a spectacular growth in the number of "elementary" particles. The discovery of the J/ψ in November of 1974 heralded the fourth ("charmed") quark, and shortly thereafter a new lepton (τ) and evidence for a fifth quark were also found. This period is traced via original journal articles, starting with the theoretical underpinnings of charm, and via a brief summary of the relevant literature up to early 1979.

For reprints: Publications Department, American Association of Physics Teachers, Graduate Physics Building, SUNY at Stony Brook, New York 11794

KANT'S GEOLOGY

REINHARDT, O; D. R. OLDROYD. Kant's theory of earthquakes and volcanic action. Annals of Science, 1983, 40: 247-72.

In response to the Lisbon earthquake of 1 November 1755, and the subsequent seismic activity in Europe, Kant wrote several articles on earthquakes and volcanic phenomena. Full translations of the most important parts of these articles are presented, and summaries for the remainder. Kant developed a carefully worked out theory to account for seismic activity, based on his reading of the scientific literature, the reports received in Königsberg of the Lisbon earthquake and associated events, and his general theory of the origin of the Earth's crust, as presented in his Allgemeine Naturgeschichte of 1755. Following Lemery, Kant supposed that volcanic action was due to the subterranean combination of sulphur and iron, and he rejected the suggestion that earthquakes might be due to the gravitational pull of heavenly bodies. Kant's theory was naturalistic, but his account was not wholly divorced from physicotheological considerations.

Author's address: University of New South Wales, Kensington, N.S.W., 2033, Australia

BOLTZMANN

SEXL, ROMAN; JOHN BLACKMORE, eds. Ludwig Boltzmann, International Tagung anlässlich des 75. Jahrestages seines Todes, 5.- 8. September 1981, Ausgewählte Abhandlungen. (Ludwig Boltzmann Gesamtausgabe, Band 8). ix + 368 pp. Graz, Austria: Akademische Druck-u. Verlagsanstalt, 1982.

John Blackmore, "Introduction," 1-9; Dieter Flamm, "Die Persönlichkeit Ludwig Boltzmanns," 11-19; Dieter Flamm, "Aus dem Leben Ludwig Boltzmanns," 21-56; Paul Urban, "Ludwig Boltzmann in Graz," 57-71; Anne Kox, "The Correspondence Between Boltzmann and H.A. Lorentz," 73-86; Gerhard Fasol, "Comments on Some Manuscripts by Ludwig Boltzmann," 87-95; Karl von Meyenn: Boltzmann als Kritiker und Rezensent," 97-127; Engelbert Broda, "Boltzmann and Darwin," 129-142; Friedrich Wallner, "Boltzmann, Hertz und Wittgenstein," 143-153; John Blackmore: Boltzmann's Concessions to Mach's Philosophy of Science," 155-190; Herbert Hörz, "Helmholtz und Boltzmann," 191-205; Walter Kaiser, "Boltzmanns mechanische Darstellung von Thermodynamik und Elektrodynamik," 207-230; Arthur I. Miller, "On the Origins, Methods, and Legacy of Ludwig Boltzmann's Mechanics," 231-261; Martin Curd, "Popper on Boltzmann's Theory of the Direction of Time," 263-303; Stephen G. Brush, "Changes in the Concept of Time During the Second Scientific Revolution," 305-328; Alfred Wehrl, "Entropie seit Boltzmann," 329-339; Siegfried Wagner, "Ludwig Boltzmann and the Special Theory of Relativity," 341-354; Hans Motz, "Did the Germ of General Relativity Come from Boltzmann?"

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