

History of Physics Newsletter

Volume IV, Number 3

October 1990

DIVISION NEWS

APS MEETINGS

The Division of the History of Physics will sponsor invited papers sessions at the following APS meetings in 1991.

San Antonio, Texas, "Determinism and Causality." Tentatively Monday or Tuesday January 21 or 22, 1991. This is a joint meeting of the APS and AAPT. The session is being organized by James T. Cushing. The speakers include:

Max Dresden, "The Fluctuating Role of Determinism in Statistical Mechanics. Macroscopic and Microscopic Causality."

Nancy Cartwright, "Are There Quantum Causes?"

John Earman, "Aspects of Determinism in Relativistic Physics."

Cincinnati, Ohio, "The Discovery of High Tc Superconductors". March 18-22, 1991.

This session is being organized by Allen Hermann.

Washington, DC, "The Coming of Age of Nuclear Physics - the 1930's." April 22-25, 1991.

This session is being organized by Heinric Medicus. Invited speakers will include:

Hans Bethe, Richard Crane, Maurice Goldhaber, and Victor Weisskopf.

NOMINATIONS FOR OFFICERS

The Chairperson of the Nominating Committee for the 1991 Divisional election is Professor Martin J. Klein, Yale Station, Box 2036, New Haven, CT 06520. The Nominating Committee would appreciate receiving suggestions for nominees who are willing to serve as Vice-Chairperson (to become Chairperson in 1992) and/or members of the Executive Committee who serve for three years. This year the Division also needs nominees for a Secretary-Treasurer whose term is three years. Nominees must be members of the Division of History of Physics. Please send suggestion for nominees as soon as possible to Professor Klein.

NOMINATIONS FOR FELLOWS OF THE APS

Recommendations for members of the APS to be nominated to be Fellows are usually transmitted by a Fellowship Committee of one of the Divisions of the APS. The Chairperson of the Fellowship Committee of the Division of History of Physics is Max Dresden, SLAC, PO Box 4349, Bin 61, Stanford, CA 94309. If you know a member of the APS who has done outstanding research in the History of Phys-

ics and who is not yet a Fellow of the APS, the Division would appreciate being informed. It would be most helpful if you also cited the persons most outstanding works. Please send copies of your suggestions to the Chairperson of the Division, Professor Allan Franklin, Dept. of Physics, University of Colorado, Box 390, Boulder, CO 80309-0390 and a copy to Max Dresden. Members being considered for appointment to Fellow usually are not made aware of the recommendation.

ELECTION RESULTS

Martin J. Klein was elected vice-chairperson of the Division of History of Physics for 1990 and will serve as chairperson in 1991. He is Eugene Higgins Professor of History of Physics and Professor of Physics at Yale University. He was trained as a theoretical physicist, and his area of research was statistical mechanics. He was at Case Institute of Technology for eighteen years during which time his interests shifted to the history of science. His historical writings have concentrated on thermodynamics, statistical mechanics, and quantum mechanics. He is author of "Paul Ehrenfest: The Making of a Theoretical Physicist." He is a Fellow of the American Physical Society and a member of the National Academy of Science.

Albert Wattenberg was elected Divisional Councillor for a three-year term. He worked on the Manhattan Project and until 1950 at Argonne National Laboratory doing neutron experiments. At the University of Illinois since 1958 his experimental research has been mainly in particle physics. He was co-editor with Amaldi, Anderson, and Segrè of the "Collected Papers of Enrico Fermi". His historical articles have been on Fermi and/or the first nuclear chain reaction.

Elizabeth Garber was elected to serve on the Executive Committee till May 1993. She received her Ph D. in history from Case-Western Reserve. She was an Editorial Assistant to *Physical Review* 1967-1968. Since 1969, she has been in the History Department at SUNY at Stony Brook. Her research specialties have included 19th century European physics, especially the work of James Clerk Maxwell. Her current research is in the 18th century transformation of physics. She is a Fellow of the American Physical Society.

Stanley Goldberg is currently associated with the Smithsonian's National Museum of American History and he has been responsible for a number of their exhibits. Previously he had been at Antioch College, the University of Zambia, and from 1971 to 1983 at Hampshire College as a professor. His book "Understanding Relativity: Origins and Impacts of a Scientific Revolution" appeared in 1984. He is co-editor with Roger Stuewer of "American Science in the Age of Michel-

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 who wish to receive it should make a donation to the Division of History of Physics of \$10 per volume (\$5 additional for airmail). Each volume consists of 5 issues, Editor: Albert Wattenberg, Department of Physics, University of Illinois, Urbana, IL 61801. Associate Editors: Stephen G. Brush, Department of History and Institute for Physical Science and Technology, University of Maryland, College Park, MD 20742, and Elizabeth Garber, History Department, SUNY at Stony Brook, Stony Brook, NY 11794.

EXECUTIVE COMMITTEE

The Executive Committee held its annual meeting on April 16th, 1990, in Washington, DC. Highlights of the reports and discussions follow:

1. Report of Chairperson, Max Dresden: The joint AAPT/APS session in Atlanta organized by Cushing drew from 150 to 300 people, and the Division has been asked to co-sponsor with the AAPT a session at the San Antonio meeting in January 1991. A motion was passed that we co-sponsor a session in January on "Causality and Determinism in Physics." The sessions at the 1990 Washington meeting organized by L. Brown and D. Siegel had an attendance of about 90 people. The Division did not schedule a session at the March 1990 APS meeting. Dresden reported that Jim Cronin of the University of Chicago had discussed with him the participation of the Division at a December 1992 celebration of the 100th Anniversary of the founding of the U of C's Physics Department. It would also be close to the date of the 50th anniversary of the first nuclear chain reaction.

2. Report of the Divisional Councillor, Stephen Brush: The AIP has been discussing plans to move to the Washington, DC suburban area near the University of Maryland campus not far from the new Metro line station. The AIP's Center for the History of Physics also would move. It is to be noted that new National Archives Building, Archives II, is being built in the same area near the U. of Maryland. A motion was passed that the Division support the move of the AIP to the suburb of Washington. The APS Council voted in favor of the change to acid-free paper for its archival journals; it will be implemented probably in July 1990 at an added cost of over \$200,000 per year. The changes in governance of the APS, which were covered in previous issues of this Newsletter, were still under consideration by the council at the time of this Executive Committee meeting. (Subsequently, the new Constitution and By-Laws have been submitted to the APS membership for their approval or disapproval.)

3. Report of the Secretary/Treasurer, C. Stewart Gillmor: He reported on the results of the Divisional election, which are given in the preceding section. The Division's financial accounts are kept in the APS Controller's office on a fiscal year basis so that the statement provided to the Executive Committee by the treasurer is subject to major changes as of the end of the APS fiscal year. The bottom line is that the Division is not in debt. He attended a meeting at the APS headquarters in New York which was to acquaint new officers of the APS subunits with the procedures and methods of operations; he stated that the meeting was quite useful. Gillmor felt that the Newsletter Editor should attend the meetings of the Executive Committee. He moved that the Editor receive a mileage allowance and one day registration and hotel costs to allow attendance at the annual Executive Committee meeting, if the Editor did not have other sponsoring support. Dresden amended the motion to apply to support for possible future co-editors. The amended motion was passed.

4. Other Business:

There was no report from the Fellowship Committee. There was a discussion of whether to publish the Division Newsletter only once a year in order to reduce the effort and expenses involved. At the present time, the finances are not a problem. Several members said that two issues a year are desirable in order to have timely information. In regard to the editor's desire to reduce the time he spends on the Newsletter, attempts will be made to try to find a co-editor who could replace the present editor in the future.

APS & AIP NEWS

AIP and APS to move from New York to Washington - The AIP governing board has authorized the sale of the AIP headquarters in New York City and has voted to move its headquarters to the vicinity of Washington. The APS headquarters have been in the building that the AIP is selling. The APS Executive Committee and the APS Council approved a motion to relocate the APS headquarters with the AIP. A task force was appointed to negotiate with the AIP in regard to the relocation. A site near the University of Maryland campus in College Park, MD is under consideration.

W.W. Havens will be retiring from his position as Executive Secretary of the American Physical Society on December 31st, 1990. He has embodied the APS's historical and organizational wisdom for several decades. A banquet honoring Havens will be held on October 27th, 1990 in Urbana, Illinois in conjunction with the APS Council meeting. The APS Council approved the appointment of N. Richard Werthamer as Executive Secretary beginning in January 1991.

The Split in the APS Bulletin - About a year ago there were plans to try three test issues of a new monthly newsletter called "News of the American Physical Society" with plans to limit the *Bulletin* to Meeting Programs. It was decided to continue the split but not to continue with the format of a year ago. The two parts planned are referred to as *Bulletin* and *Transactions*. The Council approved the hiring of a Managing Editor to organize the newsletter and to carry out the editorial policies of the Editor. The Executive Secretary will continue to serve as Editor of the Bulletin.

News from the AIP Center for History of Physics - The April 1990 *History Newsletter* of the AIP has as one of its lead articles "Atomic Weapons in World War II: Materials in the National Archives" by Susan Karen of the National Archives. For researchers and/or writers who are trying to locate and read reports on nuclear developments during world war II, her opening paragraph epitomizes the problem. "Research in the National Archives of the United States requires time, patience, and a certain amount of creativity. The researcher faces both opportunities and challenges....Pertinent material is located in several record groups and various repositories." The author might have given as an example that you may find that you need security clearance to look at some of the declassified documents because they are located in a classified section of the National Archives. The article is useful in that it provides information as to whether certain reports are in the National Archives in Washington or in Regional Archives.

As well as other articles of interest to physics historians, the April issue contains its regular sections such as "Other News of Interest", "Recent Publications of Interest", and "Documentation Preserved: Report from the International Catalog of Sources for Physics and Allied Sciences." In this section, one item is that the papers of I.I. Rabi are unexpectedly in the Library of Congress, Manuscript Division, Washington, DC (contact Ronald S. Wilkinson). It is to be noted that there is comparatively little material from his 1930s Columbia laboratory where his chief contributions to physics were made. This is unfortunate because Rabi's articles in *Physical Review* from that period were very skimpy on details of some of the techniques that resulted in Rabi's measurements being more significant than those from other molecular beam laboratories.

This issue also contains an **Index to the AIP History Newsletter**. The AIP Newsletter has been published twice yearly since 1964, and the index lists articles (others than those regularly featured) that appeared in its pages from May 1964 to November 1989. The Newsletter is available on request without charge, but they welcome donations (tax-deductible) to the Friends of the Center for History of Physics. Write to Center for History of Physics, AIP, 335 East 45th Street, New York, NY 10017.

ANNOUNCEMENTS & REPORTS

Henri Poincaré Association for History and Philosophy of Modern Mathematics and Physics

The Association Henri Poincaré was created in Paris on September 30th, 1989. It is intended to foster relations between physicists, mathematicians, historians, and philosophers with an interest in the 19th and 20th century. It will be especially concerned with the role that history and philosophy of science may play in the undertaking and understanding of scientific activity. The Association is open to anyone who is interested; you are invited to send your name, address, academic affiliation, and an international money order for 100 francs for a subscription to the Association's Newsletter which will be published three times a year. Write to: Association Henri Poincaré, Institut Henri Poincaré, 11, rue Pierre et Marie Curie, 75005 Paris, France.

Dudley Observatory & Herbert C. Pollock Award

The Board of Trustees of the Dudley Observatory has announced that the seventh annual competition has been won by **James S. Lattis** of the University of Wisconsin for "A Study of Christopher Clavius." The Pollock Award is \$10,000. The winners of other Dudley awards are: **Mark Littman** of Loyola College (\$5,000 Dudley Award) for "Biography of Edwin Hubble", **Norris S. Hetherington** of the University of California (\$3,000 Dudley Award) for "Edwin Hubble's Cosmology", and **Frederic J. Baumgartner** of Virginia Polytechnic (\$2,000 Dudley Award for "The Origins of the Provençal School of Astronomy." **The Herbert C. Pollock Award** is for an innovative research project in the history of astronomy or astrophysics by a faculty member, research associate, or graduate student with an institutional association. Special consideration is given to proposals that involve the Dudley Collections. There are also lesser Dudley Awards as well as the Pollock Award. Interested applicants should let the Committee know whether they are otherwise supported; they should obtain more information from the Pollock Awards Committee, Dudley Observatory, Schenectady, NY 12308. In previous years the deadline for the applications has been December 15th.

Martin Kamen Honored

On November 13th, 1989, Kamen received the John Scott Award of the City of Philadelphia for his discovery of the Carbon-14 isotope and exploration of its potential. The Beckman Center for the History of Chemistry and the University of Pennsylvania took the opportunity to cohost a seminar, "Half a Century of C-14", at which Kamen described the isotope's use

in such diverse fields as cosmology, nuclear physics, organic reaction mechanisms, biochemistry, and the date of the shroud of Turin. Past recipients of the award, given for inventions contributing to comfort, welfare, and happiness of mankind, include: Marie Curie, Edwin Land, Irving Langmuir, and Glenn Seaborg.

Norberg Appointed to Chair at Minnesota

Arthur Norberg, Director of the Charles Babbage Institute (CBI) at the University of Minnesota, has been appointed to the Land Grant Chair for the History of Technology. The Chair is incorporated within the mission of CBI and the responsibilities include maintaining an active research program in the history of technology and related areas of history and participating in the instructional activities of the Program in the History of Science and Technology.

Office for History of Science at Uppsala University

The **Uppsala Newsletter** plans to have two issues a year concerning the history of science in Scandinavia. In the spring 1990 issue, among the articles of interest is a project in the History of Plasma Physics in Sweden. The Department of History of Science at the Royal Institute of Technology (KTH) has been collaborating with the Department of Plasma Physics in carrying out an inventory of interest to historians of science and technology. One possibility is to prepare an exhibition of the early history of plasma physics to be held at KTH. An important stage in the development of plasma physics (including electron physics, fusion research, and accelerator technology) began at KTH in 1940 when Hannes Alfvén was appointed Professor. His early interests included cosmic rays and the aurora borealis and some of the experiments of his group led to the design of commercially viable products. In 1970, Alfvén was awarded the Nobel Prize for Physics "for fundamental work and discoveries in magneto-hydrodynamics with fruitful applications in different parts of plasma physics." The Uppsala Newsletter will be sent without cost to anyone interested. Inquiries and information should be sent to the Editor, Tore Frängsmyr, Office for History of Science, Uppsala University, Box 256, S-751 05 Uppsala, Sweden.

Pascaline's 350th Anniversary

Blaise Pascal designed the first computing machines which were built in 1640. A few of these Pascalines still survive. An exhibition, "From Pascal's Machine to Electronic Automation, 350 Years of Computing", to honor the Pascaline was organized by the Musée

National des Techniques of Paris. The exhibition, which ended in September, included a display of the calculating methods used throughout history and the specifications of the various machines. A catalogue of the exhibition is available from the Musée.

Royal Society of London: Notes and Records

Beginning with the January 1990 issue, the contents of *Notes and Records* of the Royal Society has been widened in scope to include two new categories of shorter papers, with about 2,000 words as a norm. The first category provides reminiscences about past Fellows and the past operations of the Society, in the hope of bringing out interesting scientific events and information that otherwise might have remained unknown. The other category comprises first hand accounts of scientific discoveries. The journal will continue its previous tradition of devoting at least half of each issue to scholarly historical papers, generally of length less than 5,000 words; these papers will be refereed.

Roger H. Stuewer Honored by AAPT

Roger H. Stuewer of the University of Minnesota was recently awarded a Distinguished Service Citation by the American Association of Physics Teachers. He has been a member of the Executive Committee and Chairperson of this Division, Chairman of the AIP Committee on the History of Physics, and served the AAPT in a number of capacities.

Technoscience

The Newsletter of the Society for the Social Studies of Science has changed editors and location. The Executive Editor of *Technoscience* is Steve Fuller; the new address is Center for the Study of Science in Society, Virginia Polytechnic Institute, Blacksburg, VA 24061-0247

University of Bucharest Library: Donations

The 300,000 volume library collection of the University of Bucharest was destroyed in the revolution of December 1989. Those who wish to donate books and journals to help rebuild the University Library in Bucharest should send these materials to the Rumanian Library, 200 East 38th Street, New York, NY 10016. The Rumanian Foreign Ministry and Rumanian Embassy will arrange for their shipment to eastern Europe without additional charge. Please label shipments in bold letters, "FOR DONATION TO BUCHAREST LIBRARY." There is no time limit.

MEETINGS

British Society for the History of Science, BSHS

A symposium is being organized jointly with the Cambridge Physics History Group on "Writing the History of Physics." It will take place April 3-5, 1991 at St John's College, Cambridge. It will be comprised of a series of workshops sessions and discussions initiated by precirculated papers. The papers should fall within the period 1870-1945 and should focus broadly upon one or more of the issues listed in an announcement by BSHS. The issues fall in the following categories:

Experiment and the Laboratory,
Theoretical Practice,
Establishment of an International Community of Physics,
Physics Industry and Technology,
If you would like to offer a paper or participate in the discussion, please write to Dr. Andrew Warwick, St. John's College, Cambridge, CB2 1TP, Great Britain and give a brief outline of the contribution that you would like to make.

BSHS

A meeting on "Science and Technology in the Nineteenth Century" will be held at St. John's College, Cambridge on July 5-7, 1991. Plans for the meeting are in the early stages. The topics will concentrate on celebrating various anniversaries in 1991. Anyone interested in participating in the BSHS meeting is invited to contact Wing Commander G. Bennett, Executive Secretary, 31 High Street Stanford in the Vale, Faringdon, Oxfordshire, SN7 8LH Great Britain.

Carnegie - Geoscience Symposium

Ideas for sessions, papers, and participants are being solicited for a two- or three-day symposium on the theme: "The Earth and the Carnegie Institution of Washington: Historical Perspectives after 90 Years." The symposium is planned for the winter of 1991-1992 and will include presentations by historians, philosophers, research scientists, and others; the goal is to give perspective to the role of CIW in the geosciences. For further information, contact Gregory A. Good, Carnegie-Geoscience Symposium, History Department, Woodburn Hall, West Virginia University, Morgantown, WV 26506.

History of Science Society

The 1991 Annual Meeting will be held in Madison, Wisconsin from October 31st thru November 3rd in conjunction with the Society for the History of Technology's annual meeting. As well as regular sessions there will be a joint conference on "Critical Problems and Research Frontiers in the History of Science and Technology." Please direct enquiries to Albert E. Moyer or Richards Hirsh, Program Chairs, Department of History, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0117.

The 1992 Annual Meeting will be held on December 27-30, 1992, in Washington, DC. HSS normally meets with AHA (the American Historical Association) in years that are multiple of fours; there is a desire by the board of AHA to move the meetings from December to January. If the change in month does not occur in 1992, the subsequent joint meeting will be in January 1997.

IEE - The Bicentennial Conference on Computing

An event is scheduled for July 1-3, 1991 in London to commemorate the 200th anniversary of the birth of Charles Babbage. It is a collaboration of IEE and the National Science Museum in association with nine other science and history organizations including the History of Science Society. For further information and a registration form, send name, address, phone and fax numbers to: The Bicentennial Conference on Computing, IEE Conference Services, Savoy Place, London WC2R 0BL, United Kingdom.

History and Philosophy of General Relativity

The third International Conference on this topic will be held on June 27-30, 1991 at the University of Pittsburgh (Johnstown Campus). The organizers invite proposals for papers in all areas of history and philosophy of general relativity. Some of the topics included are:

The historical development of general relativity prior to 1915, its precursors, competitors, and related developments;

The later developments of the theory including the emergence of cosmologies, general field theories, black holes, experimental testing, etc.;

General relativity in context including its reception and the anti-relativity movement;

Philosophical problems and aspects of general relativity.

For further information write to: John Norton, Conference in HPGR, Dept. of HPS, 101CL, University of Pittsburgh, Pittsburgh, PA 15260. If you would like to propose a paper for the conference, send a title and abstract of the proposed paper to this address as soon as possible.

International Association for Geomagnetism and Aeronomy

Meetings are scheduled in Vienna during August of 1991; the title of one of the meetings is "Pioneers in Geophysical Research", and the topics will include the problem of leading scientific ideas in the development of the geophysical sciences, the pioneers of geophysics, and the role of institutions. The other meeting is "Historic Data: Long-Short Variability of Solar and Geomagnetic Activity." For more information concerning the meetings, write to Wilfried Schröder, Hechelstrasse 8, D-2820 Bremen-Ronnebeck, West Germany.

The Latin American Society for the History of Science and Technology and Mexican Society for the History of Science and Technology

These societies are sponsoring **The Third Latin American Congress for the History of Science and Technology** in Mexico City on January 12-16, 1992. The general theme will be "America in the Formation of a New World: Five Hundred Years of Scientific Changes." Proposals for sessions should include the theme of a session, an abstract of each paper, and a vita for each participant, including the chairperson of the session. Send to Comite Organizador III, CLAHCT, Apartado Postale 21-873, 04000 Mexico D.F. Mexico. Contact the same address to receive the second announcement which will be available in October 1990.

Madrid Quincentennial Conference on Science and Discovery

This conference is being jointly sponsored by the HSS and the Spanish and the Latin American Societies for the History of Science and Technology to be held June 25-28, 1991 in Madrid. For information on the themes and special topics that are being recommended for contributed papers or sessions, write to Prof. Michael R. McVaugh, Department of History, University of North Carolina, Chapel Hill, NC 27514.

The Missouri Valley History Conference

will be held in Omaha, Nebraska on March 14-16, 1991. Proposals for papers should be sent by November 1st, with abstracts and vitae, to William C. Pratt, Program Coordinator, MVHC, University of Nebraska, Omaha, NE 68182.

Pacific Science Congress

The Seventeenth Congress will be held in Honolulu from May 27th till June 2nd, 1991. This will include a symposium on "Science and Culture." For further details write to Phillip Rehbock, Department of History, University of Hawaii, Honolulu, HI 96822 USA.

SHOT in Sweden 1992

The 1992 annual meeting of the Society for History of Technology will take place August 16-21, 1992 at Uppsala, Sweden; it is being hosted by the National Museum of Science and Technology of Sweden. Those interested in proposing a theme for a session or in contributing a paper are requested to send their suggestion and an abstract of about 25 lines, in five copies to the SHOT program committee at the following address: Prof. Håkon With Anderson, Center for Technology and Society, University of Trondheim at Laird, N-7055 Dragvoll, Norway

Turkey's History of Science Society Symposium on Science Institutions in Islamic Civilization

will take place in Istanbul, April 22-24, 1991. It is being run in cooperation with the International Union of History and Philosophy of Science and the Research Center for History, Art, and Culture. For more information, contact the Symposium Secretariat, P.O. Box 24, 80692, Besitkas, Istanbul, Turkey.

RECENT & FUTURE ARTICLES

American Scientist

May-June 1990:

"Three Women of American Astronomy" by *Peggy Aldrich Kidwell*. Determined to study the heavens, Maria Mitchell, Annie Jump Cannon, and Cecelia Payne-Gaposchkin all achieved distinction in a male dominated science.

Annals of Science

January 1990:

"Newton's Unpublished Dynamical Principles: A Study in Simplicity" by *J. Bruce Brackenridge*.

March 1990:

"From Dust Figures to the Kinetic Theory of Gases: August Kundt and the Changing Nature of Experimental Physics in the 1860s and 1870s" by *David Cahan*.

May 1990:

"The Development of Saxon Scientific Instrument-Making Skills from the Sixteenth Century to the Thirty Years War" by *Klaus Schillinger*. "Itinéraire de Louis Néel des Aimants aux Grenats Ferrimagnétiques" by *Pierre Quédec*. Louis Néel was heir to Pierre Weiss who in 1907 developed a classical theory of ferromagnetism using the concept of the molecular field.

July 1990:

"Japan's Secret War? 'Instant' Scientific Manpower and Japan's World War II Atomic Bomb Project" by *Morris Fraser Low*.

The British Journal for the Philosophy of Science

June 1990:

"Scientific Instruments, Scientific Progress, and the Cyclotron" by *David Baird* and *Thomas Faust*. The article contains a history of the development of the concepts and details of the cyclotron. There is an interesting discussion of the roles of experiment and theory and the significant difference between experiments that are trying to develop instrumentation and those that are taking data to check a theory.

European Journal of Physics

July 1990:

"Origins and Early Days of the Bristol School of Cosmic-Ray Physics" by *W.O. Lock*. This is part of E.J.P.'s series on Grand Schools of Physics. C.F. Powell built up one of the first post-war international research centers at which were discovered pi-mesons and "strange particles." The article covers his early life, his developing the emulsion technique, his being awarded the Nobel Prize and the happy creative atmosphere of his laboratory.

HSPS - Historical Studies in the Physical and Biological Sciences

Volume 20, Part 2 includes:

"The Reaction of British Physicists and Chemists to Van der Waals' Early Work and to the Law of Corresponding States" by *Kostas Gavroglu*. "Cold War and Hot Physics: Science and the American State, 1945-1956" by *Dan Kevles*. "Useful in Many Capacities. An Early Career in American Physical Oceanography" by *Eric L. Mills*. The article is about America's first professional physical oceanographer, George Francis McEwen at the Scripps Institution for Oceanography at La Jolla. By 1912, he was transforming himself into a mathematical physical oceanographer following the ideas of the European pioneers. "The Young John Clarke Slater and the Development of Quantum Chemistry" by *S.S. Schweber*. Slater was one of the very few American-trained physicist who contributed significantly in the early days of the quantum revolution in physics.

History of Science

March 1990:

"Galileo's System of Patronage" by *Mario Baglioli*. The author discusses a comparison of support for a scientist by a prince or court to the modern support of scientists by governments or institutions.

June 1990:

"Polyphonic Music and Classical Physics - The Origin of Newtonian Time" by *Geza Szamosi*. Days and years are based on the motion of astronomical bodies; metric time is assumed to be an independent dimension that cannot be derived from anything else such as the motion of bodies. The article addresses the problem of the concept and history of the concept of absolute and metric time. It is interesting that Kepler, Descartes, Galileo and Huygens all were accomplished and active musical theorists.

Isis

March 1990:

"Gregory of Tours, Monastic Timekeeping, and Early Christian Attitudes to Astronomy" by *Steven McCluskey*. Rudimentary astronomy was carried on in the dark ages for monastic timekeeping. However in the sixth century, the "De Cursu Stellarum" goes beyond the application to just timekeeping. "The Relativization of Centrifugal Force in the Eighteenth Century" by *Domenico Bertolini Meli*. The article deals with the ideas and views of Huygens, Newton, and Bernoulli on centrifugal force. Newton's point of view was debated very much. "Sunspots, Galileo, and the Orbit of the Earth" by *Keith Hutchison*. This note deals with Galileo's observational attempts to justify his belief in the earth's orbit and the criticism of some historians.

June 1990:

"Galileo the Emblem Maker" by *Mario Baglioli*. This article deals with Galileo's successes at the Medici court and why he was so well paid. *Ronald L. Numbers*, the editor of *Isis* has arranged a very interesting and useful "Reviews of Journals and Serials" in this issue. The motivation for the review was to assist readers with regard to the time consuming task of trying to keep track of the burgeoning periodical literature in the history of science. Numbers solicited reviews of over two dozen general English-language journals. Some of them are devoted to the history of a particular scientific discipline.

Journal for the History of Astronomy

February 1990:

A collection of papers celebrating the sesquicentennial of Harvard College Observatory and the centennial of the Smithsonian Astrophysical Observatory. The papers were originally presented on June 7th, 1989 at a symposium sponsored by the Harvard-Smithsonian Center for Astrophysics and the Historical Astronomy Division of the American Astronomical Society. There are introductory articles by *Owen Gingerich* and *Clark A. Elliott*; the contributed papers are divided into three historical periods: the Early Years, Harvard College Observatory, and the Pickering Years, and Smithsonian Astrophysical Observatory Centennial.

May 1990:

"Quantum Physics and the Stars (III): Henry Norris Russell and the Search for a Rational Theory of Stellar Spectra" by *Ralph Kenat* and *David H. DeVorkin*.

August 1990:

"The Vicissitudes of a Scientific Institution: A Decade of Change at the Paris Observatory" by *Seymour L. Chapin*. The decade is during the French revolution. "Notes on the Compilation of Ptolemy's Catalogue of Stars" by *Jaroslav Włodarczyk*.

Nuclear Physics

A507 1990:

"Why the Shell-Model Came as a Surprise" - A memorandum to J. Hans D. Jensen - by *Hans A. Weidenmüller*. This contains a brief history of the early attempts and difficulties encountered by those trying to understand whether there were shells in nuclei.

Physics Today

March 1990:

"Gender and Science: Women in American Astronomy, 1859-1940" by *John Lankford* and *Rickey L. Slavings*. Historically, the division of labor within American Astronomy was by gender; women measured plates and reduced data in the observatories and remained in a second class status while American astronomy rose to world class status.

April 1990:

"Edwin P. Hubble and the Transformation of Cosmology" by *Robert W. Smith*. The article is a history of the development of cosmology in this century, and it concentrates on Hubble's major scientific achievements that led to the profound new view of the universe. Hubble provided the first widely convincing evidence of the existence of galaxies external to our own.

August 1990:

This is a special issue devoted to Andrei Sakharov. The articles include: "Andrei Dmitriev Sakharov" by *Sidney Drell* and *Lev Okun*. This article is a historical review of his technical work. It starts with his early life, and then it covers his contributions to plasma physics, cosmology and baryon asymmetry, the quark model, the nuclear bomb, etc. It also covers his work for arms control and human rights. "Precursors of Perestroika" by *Vladimir Ya. Fainberg*. This article covers the period when Sakharov was at the Lebedev Physical institute where they both were students of Tamn and continues with his work at other institutions. Sakharov's political turning point was in 1968 with the publication of his memorandum "Reflections on Progress, Peaceful Coexistence and Intellectual Freedom." Eleven years later he was exiled to Gorky. "Scientist, Thinker, Humanist" by *Vitalii I. Goldanski*. This is an excerpt and translation of an article that appeared in a Soviet journal. "Sakharov in His Own Words" by *Susan Eisenhower* and *Raold Z. Sagdeev*. This is a review of Sakharov's newly published life story *Memoirs*; the epilogue was written the day before Sakharov died.

September 1990: "The Physics of J. Willard Gibbs in his Time" by *Martin J. Klein*. The author describes Gibbs from the vantage of his contemporaries and puts Gibbs' works and motives in the context of his time.

November 1990:

There will be a special issue on "Communicating Physics to the Public." The issue will feature many short articles by those who have made distinguished contributions to science writing.

Reviews of Modern Physics

July 1990:

This issue contains the three Nobel Prize lectures given in Stockholm in 1989. "Experiments with an Isolated Subatomic Particle at Rest" by *Hans Dehmelt*. The lecture is mainly about "Geonium Spectroscopy." "Geonium" is an electron in an ultrahigh vacuum Penning trap at 4 K. "Electromagnetic Traps for Charged and Neutral Particles" by *Wolfgang Paul*. The article is mainly concerned with a description of the techniques that Paul tried over the years in his quest for longtime stability for "bottling" a neutral particle. "Experiments with Separated Oscillatory Fields and Hydrogen Masers" by *Norman Ramsey*. This is a history of the development of the method of successive oscillatory fields starting in the laboratory of I.I. Rabi where Ramsey worked before 1942. He also covers atomic hydrogen masers and atomic clocks.

Science Citation Index - Current Contents

May 14, 1990:

"The Most-Cited Physical-Sciences Publications in the 1945-1954 Science Citation Index" by *Stephen G. Brush*. Virtually all of the 52 most cited physical-science publications in the Bibliography are in physics and chemistry. Comparisons are made between the citation frequency and other measures of importance.

Scientific American

August 1989:

"The Age-of-the-Earth Debate" by *Lawrence Badash*. Lord Kelvin's calculation of tens to hundreds of millions of years for the age of the earth based on cooling was very upsetting to geologists and paleontologists. A great deal of debate took place. The discovery of radioactivity and the work of Rutherford and other physicists led to the earth-aging by 4.5 billion years during this century.

June 1990:

"Oliver Heaviside" by *Paul J. Nahin*. Heaviside was an eminent Victorian mathematical physicist, who despised mathematical rigor. He clarified Maxwell's electromagnetic theory and became the first to use vectors for forces. He invented a device that makes long distance telephone possible.

GRANTS & FELLOWSHIPS**The AIP Center for History of Physics**

The Center is continuing its program of **Grants in Aid** for research in the history of modern physics and allied sciences (such as astronomy, geophysics, and optics) and their social interactions. Grants can be up to \$2,000 each, although most are smaller. They can be used only to reimburse direct expenses connected with the work. Preference will be given to those who need part of the funds for travel and subsistence to use the Center's Niels Bohr Library in New York City, or to microfilm papers or to record oral history

interviews with a copy deposited in the Library. Applicants should either be working toward a graduate degree in the history of science, or show a record of publication in the field. To apply, send a vita plus a letter of two pages describing your research project, and a brief budget showing expenses for which support is requested. Send to Spencer Weart, Center for History of Physics, American Institute of Physics, 335 East 45th Street, New York, NY 10017. Deadlines are June 30th and December 31st for each year

American Council of Learned Societies Grants-in-Aid

for 1991/92 will again be awarded by the ACLS. All ACLS awards and fellowships require U.S. citizenship or permanent legal residence. These awards are designed to help scholars with the expenses of specific programs of research in progress. These expenses may include personal travel and maintenance away from home necessary to gain access to materials, research or clerical assistance, and reproduction of materials. Requests for application forms must indicate citizenship or legal residence, highest academic degree held and date received, academic or other position, field of specialization, proposed subject of research or study, period of time for which support is requested, and the specific program under which application is contemplated. The application deadline for Grants-in-Aid is December 14th, 1990. The amount is \$3,000 maximum, the tenure is May 1, 1991 to May 1, 1992. For further information and application forms, contact the Office for Fellowships and Grants, American Council of Learned Societies, 228 East 45th Street, New York, NY 10017-3398

The Council for the International Exchange of Scholars

This Council administers over one thousand **Fulbright Awards** annually. Copies of its brochure "The 1991-92 Fulbright Scholar Program: Grants for Faculty and Professionals", are available from the Council, 3400 International Drive, Suite M-500, Washington, DC 20008-3097.

The Institute for Advanced Study School of Historical Studies

The Institute at Princeton offers research fellowships and temporary membership for periods ranging from three months to two years. The program is mainly for promising young assistant professors and in the past the deadlines have been in the early fall. One should obtain detailed information and applications many months before the deadline by writing to the Administrative Officer, School of Historical Studies, Institute for Advanced Study, Princeton, NJ 08540.

National Endowment for the Humanities

The current NEH "Overview" of Endowment Programs is dated July 1990. We again urge you to get a copy by writing or calling: NEH "Overview", room 406, National Endowment for the Humanities, 1100 Pennsylvania Avenue, N.W., Washington, DC 20506; telephone (202) 786-0438. The first section of the booklet provides information about the Endowment to help individuals and organizations determine whether proposed projects and activities may be eligible for Endowment support. The second section of the booklet provides information on the Endowment's grant-making programs, as well as a current schedule of application deadlines for these programs. The booklet also contains a directory of Endowment telephone numbers. The Endowment program's are under five different Divisions and two Offices. A copy of the "Overview" helps the potential applicant to identify the correct Division or Office. A brief summary of the situation was given on page 25 of the previous issue of this Newsletter, February 1990.

Higher Education in the Humanities grants are supported within the **Division of Education Programs**. Grants support a variety of activities, including institutes for college and university faculty; national conferences; curriculum development efforts; and various types of faculty study programs within individual institutions. Because the higher education program seeks principally to serve undergraduate education, projects that aim to improve the teaching of core humanities courses or that propose to widen the audiences for such courses are particularly encouraged. Eligible applicants include: colleges, universities, academic associations, and cultural institutions. The next deadline is April 1st, 1991. For assistance with preparing proposals write to the NEH room 302 or telephone (202) 786-0380.

The Division of Fellowships and Seminars - NEH fellowships afford individual scholars, teachers, and other interpreters of the humanities opportunities to undertake study, research, or independent work for periods ranging from several weeks to one year. There are **Fellowships for University Teachers and Fellowships for College Teachers and Independent Scholars**. The latter also allows individuals employed by schools, museums, libraries, independent scholars and writers to undertake full-time independent study and research in the humanities. Eligible applicants are individuals; the deadline for receipt of applications is June 1st, 1991. Write to NEH room 316 or telephone (202) 786-0466.

Travel to Collections NEH grants enable individual scholars to travel to use the research collections of humanities materials in libraries, archives, museums, or other repositories. Eligible applicants are individuals; the deadline is January 15th, 1991. Write to NEH room 316 or telephone (202) 786-0463.

NEH College Teachers Summer Seminars

If you are interested in the possibility of attending NEH 1991 Summer Institutes or Seminars or in Directing a 1992 Summer Seminar for College Teachers, you should telephone (202) 786-0463 or write to NEH 1991 Summer Institutes and Seminars, room 316, 1100 Pennsylvania Avenue, N.W., Washington, DC 20506. The deadline for applications is March 1st, 1991. Printed material will be available in early December in plenty of time to submit applications.

The **Division of General Programs** fosters public understanding by supporting projects for general audiences through interpretive exhibitions, radio and television programs, lectures symposia, etc. Grants under the **Humanities Projects in Media** support the planning, writing, or production of television and radio programs in the humanities intended for general audiences. The collaboration of scholars in the humanities with experienced producers, writers and directors is required. The Endowment is particularly interested in applications for television and radio projects on the lives of historically significant Americans. Eligible applicants are nonprofit institutions, organizations, and groups including public television radio stations. The application deadline is March 15th, 1991. Write to NEH room 420 or telephone (202) 786-0278.

University of Oklahoma

Junior and senior **Rockefeller Foundation Fellowships** in the history of science are open to candidates with doctorates in history, the history of science, or related fields. The program for the 1991-1992 academic year focuses on the transmission of science from its classical origins and its pre-modern adaptation and transformation. Proposals should address the theme in Western Christian, Islamic, Byzantine, or related cultural contexts. Fellows will also participate in the activities of a multi-disciplinary Medieval and Renaissance faculty colloquium. Applications are due January 18th, 1991. For more details, contact: Steven J. Livesey, Department of the History of Science, The University of Oklahoma, 601 Elm, Room 622, Norman, Oklahoma 73019.

BOOK PUBLISHERS

Academic Press

Edited by *David Rowe* and *John McCleary* - **The History of Modern Mathematics Volume 2** The authors feel that the vast amount of new work in the 19th and 20th centuries has not received sufficient attention in the historical literature, and they have brought together in two volumes 24 leading authorities in mathematics from eight countries. In Volume 2 the emphasis is on ideas that lie at the intersection of mathematics and physics - for example, crystallography and group structures, potential theory and electrodynamics, differential geome-

try, and classical and relativistic mechanics. Write to: Academic Press, Order Processing Department, 465 South Lincoln Drive, Troy, MO 63379.

American Institute of Physics

E.L. Andronikashvili with an introduction by *Russell J. Donnelly* translated by *Robert Berman* - **Reflections on Liquid Helium** On the basis of his own work and that of other leading scientists such as Kapitza, Landau, Feynman, and Bardeen, the author recounts the establishment and development of the superfluidity of liquid helium.

Edited by *J. Roche* - **Physicists Look Back, Studies in the History of Physics** It is a set of contributions from outstanding theoretical physicist who provide insights into ways physics history can clarify difficult concepts and possibly point the way toward resources and methods. Topics range from the history of sun-spots, ozone, plasma physics, the Josephson effect, and more.

Michael Eckert and *Helmut Schubert* translated by *Thomas E. Hughes* - **Crystals, Electrons, Transistors, From Scholar's Study to Industrial Research** The translation from the German presents a history of solid state physics and technology. It ranges from the early 1900s till today.

Edited and introduced by *David Gooding* and *Franck A.J.L. James* - **Faraday Rediscovered: Essays on the Life and Work of Michael J. Faraday** This is a collection of original essays by eleven leading Faraday scholars who chronicle the life and works of Faraday. They show his wide range of interest and influence including his major contributions to electricity and magnetism, optics, chemistry and metallurgy. For all of the above send orders to: American Institute of Physics c/o AIDC, 64 Depot Road, Colchester, VT 05446 or call toll free (800) 445-6638.

Cambridge University Press

Bernard d'Espagnat - **Reality and the Physicist: Knowledge, Duration, and the Quantum World** Contemporary physics, especially quantum theory, has raised questions about the relationship between the methods of science and the reality these methods seek to evaluate. D'Espagnat, who is a physicist, examines these questions as well as how we should answer them. Part I examines the practices of contemporary physicists and addresses the criticisms that philosophers of science have made of these practices. Part II covers the doctrine of physical reality adopted by most physicists, and part III concludes by outlining the position contemporary physics indicates we should take.

Walter J. Moore - **Schrödinger: Life and Work** The publication of this book was announced in the October 1989 issue of this Newsletter on page 7. Subse-

quently it has received The Most Outstanding Book Award in the Chemistry, Physics, Mathematics, and Astronomy category of the Professional and Scholarly Division of the American Association of Publishers.

Abdus Salam - Unification and the Fundamentals of Quantum Physics This is an expanded version of the 1988 Dirac Memorial Lectures given by the Nobel Laureate Abdus Salam. The lecture gives an overview of the developments in modern physics from the turn of the century to the present theories trying to unify all the fundamental forces. In addition, two previously unpublished lectures by Paul Dirac and by Werner Heisenberg are included. The lectures provide an insight into their approach to research and the developments in particle physics at the time. For more information on Cambridge University Press books, write to Cambridge University Press, 32 East 57th Street, New York, NY 10022.

Editions Frontieres

Edited by *J. Tran Thanh Van* - **CP Violation in Particle Physics and Astrophysics: XXVth Anniversary of CP Violation Discovery** These are the papers from the conference to commemorate the observation of CP Violation in 1964. All four participants in the discovery spoke, but no one was asked to describe or discuss the excellent experiment for which Cronin and Fitch were awarded the Nobel prize. The omission is partly compensated in Adair's contribution to the proceedings and in the theoretical prelude described by Pais. The address for Editions Frontieres is B.P. 33, 91192 Gif-sur-Yvette Cedex - France.

Garland Publishing

Marc Rothenberg - The History of Science and Technology in the United States, Volume II: A Critical and Selective Bibliography This work covers books, articles, and dissertations in the history of American science and technology published between 1980 and 1987. It supplements Rothenberg's 1982 bibliography that listed literature published through 1980. The book includes an evaluation of guides and archives and the ease of doing research at various repositories. An appendix discusses some of the mechanics of doing historical research. Garland Publishing has a series of bibliographies on the history of science of which this is volume 17.

Rachel Laudan - Histories of Science and Mathematics, 1700-1912: An Annotated Bibliography This bibliography presents a representative sample of histories of science published prior to 1912. It includes monographs, journal articles, encyclopedias, and bibliographies in all major European languages, as well as brief bibliographies of the leading historians of science. This is volume 19 of Garland's series.

Henry Lowood - The Silicon Valley: A Research Guide and Bibliography Materials cited include books, journals, newspapers, technical reports, oral histories, etc. from 1910 to the present. The bulk of this guide is devoted high technology, research and development and includes electronics, computer science and technology, biomedicine, aerospace, and physics.

For more information on a new series of **Research Guides in the History of Science and Technology** and of the established series of **Bibliographies on the History of Science and Technology** write to Garland Publishing, 136 Madison Avenue, New York, NY 10016

G.K. Hall & Co.

Jerome Price - The Anti-Nuclear Movement This is a revision of Price's 1982 study and covers the nuclear policy of the Reagan-Bush era, the Chernobyl explosion and its effects on control, the battles in the north-eastern U.S., the Green movement, the European joint development of a reactor, and other signs of the progress and pitfalls of nuclear power. Write to G.K. Hall & Co., 70 Lincoln Street, Boston, MA 02111.

Princeton University Press

Three new paperback editions are: *Pietro Redondi - Galileo Heretic*; *Milton K. Munitz - Cosmic Understanding*; *J. Robert Oppenheimer - Atom and Void* this edition contains a new preface by *Freeman Dyson*.

Springer-Verlag

Edited by *B.M. Bolotovskii* and *V.Y. Frenkel* - **I.E. Tamm: Selected Papers** Tamm with I.M. Franck received the Nobel Prize in 1958 for the explanation of the Cherenkov effect. He was a great theoretical physicist of the middle of the 20th century who developed field theoretical techniques that had a major influence on the developments of the period. Many of these papers have not been previously available to Western readers. Among the people he influenced was Sakharov. The collection includes essays on Mandl's tam, Einstein, Landau, and Bohr.

M. Born - Physics in My Generation This is a paperback 1989 edition of one of Max Born's classic writings. It was his selection of his popular writings over 30 years and includes his 1921 introduction to Einstein's "Theory of Relativity" and the postscript to the 1951 American edition of "The Restless Universe." It also includes a short autobiography. Write to Springer-Verlag NY, 175 Fifth Avenue, New York, NY 10010.

SUMMARIES

Authors of books and articles on the history of physics are invited to send summaries for publication in this section. Maximum length: 75 words for articles, 150 words for books. 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 the publisher. Publication will be expedited if each summary is typed, on a separate sheet, in the format of the summaries below.

Summaries should be sent to Elizabeth Garber, History Dept., SUNY at Stony Brook, Stony Brook, NY 11794.

ADVANCES IN GEOSCIENCES

Schröder, W., editor *Selected papers from the IAGA General Assembly in Exeter, August 1989*, 400 pp., Bremen-Rönnebeck, 1989.

The book contains the lectures presented at the Landsberg memorial session during the IAGA Assembly. It contains papers on the relation between physics-geophysics, solar-terrestrial physics-astrophysics. Papers deal also with problems of the history and development of different geophysical problems and current research. Address: Dr. W. Schröder, Hechelstrasse 8 D-2820 Bremen-Roennebeck, Fed. Rep. of Germany.

COSMIC RAYS

Friedlander, Michael W., *Cosmic Rays*, 160 pp., Cambridge, Harvard University Press, 1989.

Cosmic ray research has progressed from simple electrometers on the laboratory bench to giant detecting systems, some in Earth orbit, others deep underground. The pursuit of cosmic rays has provided the observational foundations for elementary particle physics as well as high energy astrophysics. In this non-mathematical book, the historical development of this field is reviewed, from the identification of the radiation as having an extraterrestrial origin through the period when cosmic-ray research was the arena for the discovery of new elementary particles. Other chapters cover geomagnetic effects, solar particles and the galactic particles — their nature, energetics, propagation and possible origin(s). A final chapter describes the products of nuclear interactions including both stable and radioactive nuclides whose abundances can provide clues both to the cosmic rays' history and to geophysical processes.

THEORETICIAN

Osterbrock, Donald E., *Don Menzel at Lick: A Young Theoretical Astrophysicist at an Old Observational Observatory*, Bulletin of the American Astronomical Society, 1988, 20: 984.

Donald H. Menzel, an outstanding Princeton Ph.D. in 1924 under Henry Norris Russell, was hired on the Lick Observatory staff in 1926 to reduce, analyze and interpret W. W. Campbell's observational data on the solar chromosphere and corona, obtained on eclipse expeditions going back to 1898. Menzel also did pioneering research on planets, stars and gaseous nebulae, from a theoretical standpoint which was new and important, but strange and sometimes disturbing from the traditional Mount Hamilton point of view. This is an abstract of an oral paper, which was the preliminary version of a written paper in preparation. No preprints yet available. Author's address: Lick Observatory, University of California, Santa Cruz, CA 95064.

CHAOS AND SYMMETRY

Gutzwiller, M. C., *Chaos and Symmetry in the History of Mechanics*, Il Nuovo Cimento, 1989, 11D: 1-17.

The treatises on mechanics by Stevin, Galileo, Newton, Euler, Lagrange, Hamilton and Jacobi, Poincaré, Dirac, appearing at intervals of 50 years, are quickly examined to find the predecessors of two modern concepts: Symmetry as an argument to justify the basic mathematical relations, and the chaotic behavior of their solutions. The personalities and philosophical inclinations of the authors come out very clearly.

PLASMA PHYSICS

Eliezer, Yaffa and Shalom, *The Fourth State of Matter: An Introduction to the Physics of Plasma*, ix + 266 pp., Bristol, Adam Hilger, 1989, U.S. distributor AIP.

This book is a husband and wife collaboration, a physicist who speaks "physics" and a secretary who understands English. The end result is a simple and clear and popular book on plasma physics understandable to the public at large as well as useful for undergraduate students. Over 30 rhyming verses are included to put big ideas and complicated issues into a compact, simplified and sometimes easy to remember form.

The fourth state of matter, plasma, is a fluid of electrically charged particles often at very high temperatures. It is the material of which stars are made. At one time in the early Universe it was the state in which all matter was found.

In addition to describing complicated phenomena, the book includes a history of plasma physics depicting the landmarks of the different eras.

NEWTON

French, A. P., *Issac Newton: Explorer of the Real World, In Newton's Dream (Marcia Sweet Stayer, ed.)*, McGill, Queen's University Press (1988), pp. 50-77.

A short survey, prepared for a tercentenary celebration of the *Principia*, describing a number of Newton's fundamental contributions to our knowledge of the physical world. Author's Address: Department of Physics, M.I.T. Cambridge, MA 02139. Reprints are available.

ANTIMATTER

Augenstein, B. W., Bonner, B. E., Mills, F. E., and Nieto, M. M., editors, *Antiproton Science and Technology*, x + 759 pp., Singapore & New Jersey, World Scientific Pub. Co., 1988.

The Workshop on Antiproton Science and Technology, addressed three aspects of the field of low energy antimatter. i) Machines: Low energy antimatter production capabilities of present and proposed accelerators; ii) Basic Science: Fundamental physics experiments which can and should be done; iii) Applied Science and Technology: Uses of antimatter for deep space propulsion, materials testing, and biomedical purposes.

These Proceedings are divided accordingly. Besides a general introduction and review to start the volume, at the beginning of each section there is a summary of the activities of the participants in that section. Then there are a number of detailed papers on the major subject at hand.

Also, Sec. I contains a general description of "Potential Low Energy

Antiproton Sources in the U.S." In Sec. II a "Basic Physics Program for Low Energy Antiproton Source in North America" is elucidated and a nonspecialist paper on "Antimatter: Its History and Its Properties" is given. Finally, Section III concludes with an exhaustive "Antimatter Science and Technology Bibliography."

THE SECOND REVOLUTION

Brush, Stephen G., *The History of Modern Science: A Guide to the Second Scientific Revolution, 1800-1950*, xv + 544 pp., Ames, Iowa, Iowa State University Press, 1988.

Reference work for teachers and graduate students. Contains 13 chapters, covering books and other resources in history of science, evolution, genetics, psychoanalysis and psychology, atomic theory, thermodynamics, electromagnetism and relativity, aspects of mathematics, nuclear physics and the atom bomb, astronomy, philosophy and sociology of science. Each chapter includes suggested readings for students, synopsis, and bibliography of recent research literature.

A PRINCIPIA FALLACY?

Weinstock, Robert, *Long-Buried Dismantling of a Centuries-old Myth: Newton's Principia and Inverse-square Orbits*, American Journal of Physics, 1989, 57: 846-849.

The author's 1982 report of a fallacy inherent in the *Principia* treatment of inverse-square orbits was anticipated in Ferdinand Rosenberger's 1895 book on Newton's life and work. The present article offers a new formulation of the case against the *Principia* treatment surpassing in effectiveness both Rosenberger's and the author's 1982 formulations. Also offered is exposure of a long-enduring misrepresentation of Proposition XVII in *Principia* Book 1. For reprints: Robert Weinstock, Department of Physics, Oberlin College, Oberlin, OH 44074.

MARIA GOEPPERT MAYER

Kurath, D., *Maria Goeppert Mayer (1906-1972)*, Nuclear Physics, 1990, A507: 1c-4c.

This is a biographical sketch of the career of Maria Goeppert Mayer, co-founder of the nuclear shell model. Starting with her academic background and the stimulating environment of

Göttingen in the early days of quantum mechanics it follows her career. Particular attention is given to her difficulties with the strong anti-nepotism rules of the day since she was married to the well-known chemist Joseph Mayer. She shared the Nobel prize for physics in 1963.

YUKAWA

Brown, Laurie M., *Yukawa in the 1930's: A Gentle Revolutionary*, Historia Scientiarum, 1989, 36: 1-21.

Yukawa occupies a position in the history of Japanese physics that is unique. One of a small band of dedicated scientists on whom Japan's preeminence in science is based, his Nobel Prize in 1949 was a tremendous encouragement to a Japan just emerging from the terrible destruction of the Second World War. This paper reviews the origin of Yukawa's paradigmatic meson theory and its acceptance after the discovery of the cosmic ray mesotron. For reprints: L. M. Brown, Department of Physics and Astronomy, Northwestern University, Evanston, IL 60208

EINSTEIN BEFORE 1905

Gearhart, Clayton A., *Einstein Before 1905: The Early Papers on Statistical Mechanics*, American Journal of Physics, 1990, 58: 468-480.

Einstein's 1905 work on the quantum and on Brownian motion was preceded by three papers on kinetic theory and statistical mechanics published between 1902 and 1904. In these early papers, which give us considerable insight into Einstein's early education and development, Einstein independently derived many of Boltzmann's and Gibbs' results, including the canonical ensemble, an analysis of fluctuations, and the relation between entropy and probability. This essay discusses those papers and their background in nineteenth-century physics. Reprints are available from the author, c/o Department of Physics, St. John's University, Collegeville, MN 56321.

THE EARTH'S AGE

Badash, Lawrence, *The Age-of-the-Earth Debate*, Scientific American, Aug. 1989, 251: 90-96.

In 1862 William Thomson (later Lord Kelvin) argued that the earth was a once-molten globe, and that its

age could be determined by its rate of cooling. To the dismay of geologists and biologists, who in their stones and bones knew that a longer period was required, Thomson said that the earth formed sometime between 20 and 400 million years ago. "Hard" science prevailed, for its opponents had only intuition and some logic, while physics had irrefutable data. Indeed, over the next four decades, geologists generated their own data that conformed to Thomson's limits.

Henri Becquerel discovered radioactivity in 1896, and within a few years it was recognized that an enormous amount of heat was being emitted in radioactive decay—enough, indeed, to destroy rate-of-cooling as a dating technique. But the concept of decay series with stable end-products, and radioelements in secular equilibrium, provided a better measuring tool. Credit for the idea that the earth's age can be determined by radioactivity goes to Ernest Rutherford. Credit for implementation of the helium method (alpha particles, which can leak out) goes to Robert J. Strutt (later the fourth Lord Rayleigh), while the method of measuring accumulated lead was developed by Bertram Boltwood. Geologists, having been burned once by bowing to the demands of physical science, were reluctant to accept this new standard, which took them into the billion-year range. The discovery of isotopes, which for a time confused the technique, had them saying "I told you so." But Arthur Holmes brought order to the isotope problem, and by the 1920s the lead method of radioactive dating was recognized as the best yardstick for the earth's age.

ERTEL & FICKER

Schröder, W., *Hans Ertel and Heinrich Ficker*, Wetter und Leben, 1989, 9-24.

Heinrich Ficker and Hans Ertel had many interests, among them the history of science, especially of meteorology and geophysics. During a long active course they worked with many of the most prominent meteorologists. In this paper some aspects of the cooperation between Ficker and Ertel during their time at the Berlin Meteorological Institute are reported, including some of Ertel's first studies in geophysical hydrodynamics. There is no doubt that the Berlin Meteorological Institute was a world-leading center during the time of Ficker and Ertel.

SOLAR SYSTEM

Brush, Stephen G., *Theories of the Origin of the Solar System 1956-1985*, *Reviews of Modern Physics*, 1990, 62: 43-112.

Attempts to find a plausible naturalistic explanation of the origin of the solar system began about 350 years ago but have not yet been quantitatively successful. The period 1956-1985 includes the first phase of intensive space research; new results from lunar and planetary exploration might be expected to have played a major role in the development of ideas about lunar and planetary formation. While this is indeed the case for theories of the origin of the moon (selenology), it was not true for the solar system in general, where ground-based observations (including meteorite studies) were frequently more decisive. During this period most theorists accepted a monistic scenario: the collapse of a gas-dust cloud to form the sun with surrounding disk, and condensation of the disk to form planets, were seen as part of a single process. Theorists differed on how to explain the distribution of angular momentum between sun and planets, on whether planets formed directly by condensation of gaseous protoplanets or by accretion of solid planetesimals, whether the "solar nebula" was ever hot and turbulent enough to vaporize and completely mix its components, and on whether an external cause such as a supernova explosion "triggered" the initial collapse of the cloud. Only in selenology was a tentative consensus reached on a single working hypothesis with quantitative results.

SEMICONDUCTORS

Busch, Georg, *Early History of the Physics and Chemistry of Semiconductors—From Doubts to Fact in a Hundred Years*, *European Journal of Physics*, 1989, 10: 254-264.

S. Gray, J. T. Desagulters and A. Volta discovered and investigated electric conduction in solids. Davy found a decrease of the conductivity σ in metals and Faraday observed a strong increase with temperature in a number of binary chemical compounds. J. W. Hittorf's measurements on Ag_2S and Cu_2S led to a linear relation of $\log \sigma$ against $1/T$. The controversial case of Ag_2S is described. Hall and Rowland discovered a transverse voltage of a current carrying metal film in a magnetic field. G.V. E. Riecke and P. Drude developed the first electron theory of metals and L. Koenis-

berger tried to explain the temperature dependence of the electrical conductivity by a dissociation theory.

Baedecker was the first to observe semiconducting properties of CuI depending on the stoichiometric composition. Wagner proved that the conductivity of Ag_2S is essentially electronic and not ionic. Gudden suggested that semiconduction is the result of impurities and imperfection in solids and Wagner and Schottky developed their theories of lattice defects (Fehlerrordnungs-Erscheinungen). Wilson presented the first band theory of intrinsic and extrinsic semiconductors. The existence of intrinsic conduction has been questioned by experimentalists and is verified only by the preparation and investigation of high-purity semiconducting elements.

SIMULATION OF HISTORICAL EXPERIMENTS

Bevilacqua, F., Bonera, G., Borghi, L., De Ambrosis, Massara, C., *Computer Simulations and Historical Experiments*, *European Journal of Physics*, 1990, 11: 15-24.

This paper deals with an approach to physic teaching based on the joint use of computer simulations and the history of physics. A package dealing with the fall of bodies was prepared and tested with students in introductory physics courses. We have aimed at improving students' understanding of fundamental concepts in kinematics favoring a comparison between the students' way of reasoning and the models underlying simulations. Galilei's inclined planes and Atwood's machine offered the students examples of original settings while a historical guide illustrated the original conceptual frameworks. First results suggest that the use of computer-simulated historical experiments can help us reach the above mentioned goals.

SPECIALTIES OF KELVIN & STOKES

Wilson, David B., *Kelvin and Stokes: A Comparative Study in Victorian Physics*, xvi + 253 pp., Bristol, Adam Hilger, 1987.

A comparative study of several aspects of Kelvin's and Stokes' careers from their student days to their final researches. The book argues that their contrasting undergraduate experiences influenced not only the quite different physics courses that they

taught as professors, but also the different subjects of their early researches and their different views of the luminiferous ether. Pursuing research in hydrodynamics and optics, Stokes regarded the ether as primarily an optical medium, which posed mechanical-hydrodynamical problems arising from the interaction of ether and matter. Pursuing research in heat, electricity, and magnetism, Kelvin sought speculative insight into the ether as the unifying material substratum of all physical phenomena. Middle chapters explore Stokes' and Kelvin's respective theological views while maintaining that they shared a theological basis for their "cautious realism" regarding scientific knowledge. Continuing the general theme of their early divergences, the book concludes with one chapter which discusses Stokes' behind-the-scenes influence on late-Victorian physics and another which revises accepted opinions of Kelvin's much maligned research on radioactivity.

LIIOUVILLE'S CONTRIBUTION TO MECHANICS

Lützen, Jesper, *The Geometrization of Analytical Mechanics. A Pioneering Contribution by J. Liouville (ca. 1850)*, *The History of Modern Mathematics*, Volume II, Institutions and Applications. Boston, Academic Press, 1989 pp. 76-97.

Joseph Liouville's papers from the 1850's and his unpublished lecture notes show that he was aware of the connection between the two problems: 1) find the geodesic on a surface by minimizing $\int ds$ and 2) find the trajectory of a mechanical system by minimizing the action integral $\int \sqrt{2(h-U)} E_g dq_i$. Thereby he began the use of differential geometry in mechanics which later, in the hands of Lipschitz, Darboux, Ricci and Levi-Civita, became the classical basis for the work of Einstein.

LIIOUVILLE'S THEOREMS

Lützen, Jesper, *Joseph Liouville und die nach ihm benannten Sätze*, *NTM* 1989, 26: pp. 5-17.

Six theorems named after Joseph Liouville (1809-1882) are used as a framework for a biographical sketch of this French mathematician. From the point of view of history of physics the two most interesting theorems carrying Liouville's name are the theorem on the "constancy of the volume in phase space" under a Hamiltonian flow,

and the theorem stating that Hamilton's equations can be integrated by quadrature, if "half" of the integrals are known and they are in involution. Liouville formulated the first theorem in 1838 as a theorem on the constancy of a certain determinant, for solutions of certain types of differential equations. He considered it as a contribution to perturbation theory, but did not mention "volume of phase space" and still less statistical mechanics. He published the latter theorem in 1855 without proof, but Jacobi had already proved it in his lectures of 1842/43.

AMATEURS AND ASTRONOMY

Dunlop, S. and Gerbaldi, M., *Stargazers: The Contribution of Amateurs to Astronomy: Proceedings of Colloquium 98 of the IAU*, 237 pp., Berlin, Heidelberg & New York, Springer-Verlag, 1988.

Historically, amateurs have played an essential part in the development of astronomy, and collaboration between amateur and professional astronomers remains vital for many current projects. The contributions presented at the first major international Colloquium on the subject, held on the centenary of the formation of the Société Astronomique de France, include discussion of the work of several individuals, both well-known (such as Hevelius), and obscure (such as the incomparable photographer Marcel de Kerolvr). Some contributions set astronomy in its historical context at specific periods, while others were selected on the criterion that past results suggest possible future studies and methods of collaboration. Approximately two-thirds of the book discuss modern methods, projects, and observational results, as well as the presentation of astronomy to the general public. The editors have taken pains to ensure that all items, even the (rewritten) abstracts are fully referenced.

THE EARTH'S AGE

Brush, Stephen, G., *The Age of the Earth in the Twentieth Century*, Earth Science History, 1989, 8: 170-182.

At the end of the nineteenth century, Lord Kelvin's upper limit of only 20 or 30 million years for the age of the Earth was challenged by the Ameri-

can geologist T. C. Chamberlin, who showed that Kelvin's limit was soon afterwards repealed by the new science of radioactivity, which yielded ages of a few billion years. While some geologists resisted this expanded time-scale, Chamberlin was the only one who could provide a comprehensive cosmogonical theory that did not submit to the epistemological superiority of physics and astronomy. In the 1940s, as radiometric age determinations improved in accuracy, they came into conflict with the expanding-universe cosmology — a conflict which the cosmologists eventually avoided by expanding their distance and time scales. In 1953, Patterson announced the result 4.5 billion years, which is still accepted as the best estimate for the age of the Earth. But geologists, liberated from Kelvin's limit, define the epoch of the Earth's formation as being outside the scope of their science, and their textbooks rarely give credit to the person who established the number that once seemed so important to accounts of the Earth's history.

STEFAN'S EQUATIONS

Strnad, J., *Stefan's Equations of Electrodynamics*, European Journal of Physics, 1989, 10: 276-280.

The relation of the Ampère form, $d^2F_{12} = (\mu_0/4\pi)I_1I_2[3(dr_1 \sum r_{12}/r_{12}^3) - 2(dr_1 \sum dr_2)I_{12}/r_{12}^3]$, to the Biot-Savart, or Grassmann, form, $d^2F_{12} = (\mu_0/4\pi)I_1I_2[3(dr_1 3r_{12})/r_{12}^3]$, or the law for the force between current elements is revisited from time to time. Recently experiments were reported to support the claim that the two forms are not equivalent. One hundred and twenty years ago J. Stefan answered most of the questions which reappear in contemporary work. Though the paper is seldom quoted it is instructive even today.

EXPERIMENTS IN PARTICLE PHYSICS

Cahn, Robert, N., and Goldhaber, Gerson, *The Experimental Foundations of Particle Physics*, 428 pp., New York, Cambridge University Press, 1989.

This book describes the developments of modern particle physics with emphasis on the experimental accomplishments. This description is supported by a selection of some 60 crucial experimental papers which trace the

development of particle physics over nearly 60 years starting with Chadwick's discovery of the neutron and going up to the discovery of the intermediate vector bosons. By stressing the experimental developments in particle physics this book takes a different approach to the field. It attempts to show the reader the role that serendipity has frequently played in opening up new avenues and how theory develops from experiment as often as vice versa.

The text is divided into 12 chapters which correspond roughly to the major developments in modern particle physics and are in approximate chronological order. Each chapter gives brief descriptions of the underlying theory, as well as enough information to supplement the reprinted papers.

The text is meant to be accessible to a wide audience of students and researchers in particle physics as well as historians of science. A major portion of the text is written in non-technical language, however for students and experts a more complete description is also included.

THEORY AND EVIDENCE

Brush, Stephen, G., *Prediction and Theory Evaluation: The Case of Light Bending*, Science, 1989, 246: 1124-1129.

Is a theory that makes successful predictions of new facts better than one that does not? Does a fact provide better evidence for a theory if it was not known before being deduced from the theory? These questions can be answered by analyzing historical cases. Einstein's successful prediction of gravitational light bending from his general theory of relativity has been presented as an important example of how "real" science works (in contrast to alleged pseudosciences like psychoanalysis). But, while this success gained favorable publicity for the theory, most scientists did not give it any more weight than the deduction of the advance of Mercury's perihelion (a phenomenon known for several decades). The fact that scientists often use the word "prediction" to describe the deduction of such previously known facts suggests that novelty may be of little importance in evaluating theories. It may even detract from the evidential value of a fact, until it is clear that competing theories cannot account for the new fact. (Reprints available.)

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