HISTORY OF PHYSICS NEWSLETTER
Volume VI Number 5 -- October 1996

FROM THE EDITOR

The current edition of Stephen Brush's annual compilation entitled Recent Publications in History of Physics, whose previous numbers were published as supplements to the October 1994 and October 1995 editions of the History of Physics Newsletter, is available from the AIP Center for History of Physics. A hard copy version is being published as a supplement to the Center's Newsletter, which may be obtained free of charge by contacting Spencer Weart, Center for History of Physics, American Institute of Physics, One Physics Ellipse, College Park, MD 20740, e-mail: sweart@aip.org. A longer version is also available electronically via the Center's new site on the World Wide Web: http://www.aip.org/history/. [NB: additional information on the Center's website appears below in the APS and AIP News section.]

The February 1996 edition of this Newsletter included an Internet Use Survey along with the Forum's election ballot. Among those who responded to the survey, 118 indicated that they make regular use of e-mail, 50 that they do not; 116 indicated that they have access to the World Wide Web, 47 that they do not; 133 stated that they wish to continue to receive hard copy of the Newsletter. The Forum's Executive Committee decided, at its May 4, 1996, meeting, that the Newsletter would continue to be mailed out to all Forum members, on the grounds that a decided majority of those who expressed an opinion favored that option.

William A. Blanpied

FROM THE FORUM CHAIR: Physicists and History

Each of us has varying reasons for studying the history of physics. For most practicing physicists, the largest intellectual pleasure derived from the history is a better grasp of the field -- discovering deeper connections of recent work with previous efforts. In the words of the historian Allan Nevins, "History is a bridge connecting the past with the present, and pointing the road to the future." Study of history, particularly that of modern physics, has for many of us become a way of understanding our own roots and gaining a fuller sense of the intellectual world we have grown up in.

The role of the Forum on History of Physics is to encourage appreciation, research, and diffusion of the history of the field. One of its major activities is to arrange sessions at APS meetings on various historical topics. With the centenaries of the discovery of X-rays by Wilhelm R?entgen in 1895, the discovery of radioactivity by Henri Becquerel in 1896, and the discovery of the electron by J.J. Thomson in 1897, as well as the founding of the American Physical Society itself in 1899, our cup at the moment is running over. We try, in putting sessions together, generally to have a mix of physicists who contributed to aspects of the historical developments, together with working historians. The sessions are intended to contribute to historical research and also to educate practicing physicists about the history of their subfields. We especially hope that these sessions help to motivate young physicists who know little about the evolution of their fields, and to introduce them to some of the heroes -- whom they usually know only as names in textbooks -- as real people who lived through real times.

The Forum would specifically like to encourage physicists to turn more actively to the history of physics, because we have a particular responsibility to participate in writing the history of the field. Generally, the trained historians of science alone do not have the experience to get down to the nitty-gritty of the physics; to write the very important technical dimension of the history requires being able to understand fully the details of the papers. There are many ways to contribute: from carrying out internal studies, possibly in collaboration with historians, to setting down personal experiences, to making sure that important documentation, e.g., research

notes, letters, and photographs and other personal material, as well as plans for major facilities, becomes archived. [The AIP Center for History of Physics, at the AIP headquarters in College Park, MD, is very happy to assist in preservation of such documentary material.]

Physicists' contributions to history need to go beyond writing just the fun anecdotes (even though they do play an important role in giving life to the field), and to go beyond history as given in the textbooks, which tend too often to reorder the paths so that they become simple, logical and beautiful, without, as Thomas Kuhn remarked, giving "status to human idiosyncrasies, error and confusion."

Since with time participants pass on, memories fade, and material becomes lost, preparing for the writing of the history of recent physics has a certain urgency. As the old story, historically updated, goes, a distinguished long-retired colleague received the following e-mail note: Date: Mon, 16 Sept. 1996 16:03:42 +0200 From: x@physics.u-heaven.eden.par Subject: Heavenly Seminars Dear Friend, Now that we finally have e-mail, I want to tell you how exciting life is here. We have these wonderful seminars each month, with Newton, Bohr, Einstein, Fermi and all the other greats attending. Just last week, God, as a special treat, told us the answer to Dirac's famous question, "Why 137?" (Unfortunately, though, Pauli found a hole in the argument.) Anyhow, my real reason for writing is to let you know that you are scheduled as our seminar speaker next month. P.S. To learn more, please visit our web site at http://www.u-heaven.eden.par/physics/history/.

Were that one day such an e-mail link could be established, the problems of historians of physics would be greatly simplified. Until then, we as physicists must continue to make every effort to see that the history of physics is richly documented, while we have the opportunity to do so.

Gordon Baym

FORUM NEWS

Nominations for Officers

The Nominations Committee would appreciate receiving the names of Forum members who are willing to stand as candidates for its Spring 1997 election and who are willing to serve on various committees of the Forum or the American Physical Society. The Forum needs to elect a Vice-Chair who in succeeding years will become Chair-elect and then Chair, and two members of the Executive Committee each of whom will serve for three years. The By-laws require that we have at least two nominees for each position. Please send suggestions as soon as possible to the Chair of the Forum Nominating Committee, C. Stewart Gillmor, History Department, Wesleyan University, of Illinois, Middletown, CT 06459, e-mail: sgillmor@wesleyan.edu.

Forum Officers

Stanley Goldberg, Smithsonian Institution (nassh106@sivm.si.edu), became Chair-Elect in April 1996 and will succeed Gordon A. Baym, Physics Department, University of Illinois, Urbana (gbaym@uicu.edu), as Chair in April 1997. C. Stewart Gillmor, History Department, Wesleyan University, Middletown, Connecticut (sgillmor@wesleyan.edu), was elected Vice-Chair and will succeed as Chair-Elect in April 1997. Ruth H. Howes, Department of Physics and Astronomy, Ball State University (00rhhowes @bsuvc.bsu.edu), and Bertram Schwarzschild, Physics Today (bs2@aip.org), were elected to three year terms on the Executive Committee. The remaining members of the Executive Committee are George L. Trigg, retired Editor of Physical Review Letters (glt@aip.org), and Virginia Trimble, Physics Department, University of California, Irvine (vtrimble@uci.edu) and Astronomy Department, University of Maryland (vtrimble@astro.umd.edu), whose terms expire in April 1997; and Peggy A. Kidwell, Smithsonian Institution (maho146@sivm.si.edu), and K.C. Wali, Physics Department, Syracuse University (wali@suhep), whose terms expire in April 1998. David Cassidy, Natural Sciences Program, Hofstra University (dcassidy@pppmail.nyser.net), and Albert Wattenberg,

Physics Department, University of Illinois, Urbana (a-wattenberg@uiuc.edu), will continue to serve as Secretary-Treasurer and Forum Councillor, respectively, until April 1998. Spencer R. Weart, Director of the AIP Center for History of Physics (sweart@aip.org), continues to serve as Ex Officio member of the Executive Committee.

Forum Committees

For 1996-97, the Standing Committees of the Forum are:

Program Committee and Electron Centennial Coordinating Committee: John Rigden (chair), J.N. Bardsley, Roger Stuewer, William Evenson, and Stanley Goldberg Nominating Committee: C. Stewart Gillmor (chair), Albert Wattenberg, William Evenson, and Gloria Lubkin Fellowship Committee: C.Stewart Gillmor (chair) and Caroline Herzenberg Publications Committee: William Blanpied (chair) and Bertram Schwarzschild. Membership Committee: David Cassidy Ad-hoc Committees and representatives to other organizations are: Liaison Committee for the APS Centenary: John Rigden (chair), Virginia Trimble, Stanley Goldberg and C. Stewart Gillmor U.S. Liaison Committee to 1997 Paris Symposium on the Centenary of Radioactivity: John Rigden (chair) and Roger Stuewer Representative to CAM [Canadian-American-Mexican] Committee for joint sessions at the April 1997 APS Meeting: Stanley Goldberg

Executive Committee

The annual meeting of the Executive Committee, held on May 4, 1996, in conjunction with the Indianapolis meeting of the American Physical Society, was chaired by John Rigden, outgoing Chair of the Forum. Rigden reported that the sponsors of the 1997 Paris Symposium on the Centenary of Radioactivity had sought Forum participation. With APS approval, he and Roger Stuewer have comprised a committee to provide U.S. input into the symposium.

Chair-Elect Stanley Goldberg informed the committee that he has been appointed U.S. representative to a Canadian-American-Mexican [CAM] committee which is planning joint sessions for the next CAM meeting to be held in conjunction with the April 1997 APS meeting in Washington, DC. He intends to explore the possibility of including participants from other hemispheric nations in history of physics sessions.

The major event for 1997 will be the electron centenary, a topic to which, among other things, APS can point in public discourse as an example of first-rate science and the profound public impact of fundamental research. Incoming Chair Gordon Baym recommended that the Forum also include the 50th anniversary of the transistor in this celebration. J.N. Bardsley summarized British plans to celebrate the centenary. He suggested that the APS should highlight US contributions in the decades following the discovery, as well as the impacts on industry, medicine and other fields. Rigden was appointed to chair a coordinating committee for the electron centenary, whose membership also comprises Bardsley, Roger Stuewer, William Evenson, and Stanley Goldberg. This committee will also serve as the Forum's Program Committee for 1996-97. [NB: a summary of decisions reached at the committee's first meeting on August 24 appears as the next item.]

Brian Schwartz, Special Assistant to the APS Executive Officer for the APS Centenary, reported on progress in planning that event [see APS and AIP News]. A liaison committee chaired by Rigden and including Virginia Trimble, Goldberg, and Gillmor was appointed to work with Stephen Brush, history of physics representative on the Centenary Committee.

Rigden reported that he had represented the APS at a February 1996 of representatives of history of science groups from various professional societies organized by the AIP Center for History of Physics. One topic predominated: the threat to science posed by the social constructivist position. The Forum's Executive Committee raised the question: what, if anything, should the Forum be doing in response? APS Associate Executive Officer Barrie Ripin noted that he has heard no official position from the Forum on this issue. However, Forum Councillor Albert Wattenberg noted that he had questioned the Smithsonian exhibit on modern science at the APS Council meeting. Ruth Howes noted that the Panel on Public Affairs (POPA) had formed a committee on this issue and that the APS had submitted a critique to the Smithsonian. Perhaps the Forum could work with the POPA committee.

K.C. Wali requested that the Executive Committee discuss the issue of whether the Forum's mission should go beyond arranging sessions at APS meetings. In this context, Rigden asked what action, if any, the Forum should take in response to mounting attacks on science from various quarters. After extended discussion it was agreed that the Forum should work in concert with the POPA committee and other professional groups, and that it should continue to emphasize the success of science in historical perspective. Howes noted that the Forum on Physics Education Forum has established a successful Media Fellows program with AAAS support. Perhaps the Forum could pursue something similar. Rigden agreed to follow up on this with Baym.

Electron Centennial: Forum Sessions at 1997 APS Meetings

At its August 24, 1996, meeting, the Forum's Program Committee, chaired by John S. Rigden, determined that most Forum-organized sessions at the March 17-21, 1997, meeting in Kansas City and the April 18-21, 1997, meeting should be associated with the centennial of the discovery of the electron. Invited papers would be devoted to history of J.J. Thomson's original discovery, the subsequent discovery of the electron's properties, and the impacts of those discoveries on physics and on technology. The committee is exploring the feasibility of two such sessions at each meeting. The possibility of a reception at the Smithsonian during the April meeting is also being investigated. Since 1997 is the bicentennial of the birth of Joseph Henry, artifacts associated with his research will, in any case, be on display at the Smithsonian.

Details about these sessions and associated events planned for the Electron Centennial will be available on a Web Site accessible through the Forum's homepage: /units/fhp.

APS AND AIP NEWS

APS Council Meeting

The APS Council met on May 5-6, 1996, in conjunction with the APS's spring meeting. The principal item of interest to Forum members was a report on the APS's major effort to develop and use electronic publishing for its journals. A particularly useful development has to do with the Physical Review On-Line Archive, or PROLA. This is a joint enterprise involving the Naval Research Laboratory, the Los Alamos National Laboratory, and the APS to develop an archive of past issues of APS journals with full linking and searching capabilities. The aim is to merge PROLA with current on-line APS journals. The status of this project can be monitored on line by starting with the Internet address: http://publish.aps.org.

Celebrate the Centenary of the APS

The following progress report has been prepared by Brian Schwartz, Special Assistant to the APS Executive

Officer for the Centenary.

The American Physical Society will be celebrating its 100th year in 1999, and the Forum on History of Physics is expected to play an important role in several of the centenary activities. These include the preparation of a chronological wall chart on 20th century physics, organization of a speakers bureau, and special sessions and displays at the Centenary Meeting in Atlanta scheduled for the last week in March 1999.

The APS has appointed a Planning Committee, chaired by Schwartz. Other members are Stephen G. Brush (University of Maryland), Luz Martinez-Miranda (University of Maryland), J. Thomas Ratchford (George Mason University), Martha H. Redi (Princeton Plasma Physics Laboratory), Edward W. Thomas (Georgia Institute of Technology), Hans C. von Baeyer (College of William & Mary) and James T. Wynne (IBM Watson Research Center).

Each APS unit has appointed "centenary liaisons" to work with the unit and with the Centenary Committee in planning the celebration. The Forum on History of Physics has named C. Stewart Gillmor, Stanley Goldberg, John Rigden and Virginia Trimble as liaisons. Forum members may send suggestions and information to them and/or to any of the committee members listed above. [NB: e-mail addresses of the Forum's centenary liaisons are given above under Forum Officers.]

Wall Chart. A time-line wall chart will be produced by the APS and distributed free of charge to physics departments, high school physics teachers, libraries and laboratories. It will present a history of physics with an emphasis on the 20th century, including relations to other sciences, technology, and contemporary culture. Modular production techniques could supplement the wall chart, such as a multimedia CD-ROM and/or an Internet-accessible program as well as a "coffee table" book. On the recommendation of the Centenary Committee, APS has hired two consultants to prepare the wall chart: Prof. Sidney Perkowitz of Emory University as physicist/historian/writer, and Albert Gregory as the designer.

A wall on the 5th floor of the American Center for Physics building in College Park, MD, has been reserved for displaying the research materials and to aid in developing design possibilities for the wall chart. A "zeroth draft" chart should be ready for previewing by late September 1996. All visitors to the ACP will be urged to view and comment on this work-in-progress. This should be especially convenient for anyone who visits the Niels Bohr Library (on the 3rd floor in the same building) or comes for APS/AIP/AAPT committee meetings. Near-final versions will be available for display and comments at the March 1997 APS meeting in Kansas City and the April 1997 meeting in Washington, DC. Printing and mailing are scheduled for Spring 1998.

Centenary Speakers Bureau. The Centenary Committee, working with the APS unit liaisons, will identify a large number of first rate speakers willing to give historical/review talks on topics in physics. A booklet will be prepared, listing the speakers, their topics, and geographical locations; it will be widely distributed to colleges, universities, laboratories, high school teachers groups, etc., encouraging the recipients to schedule one or more talks at their institution to celebrate the Centenary during the 18-month period from Fall 1998 through the end of 1999. The booklets will be mailed in Summer 1998. Some funds may be available to subsidize invitations to speak at institutions with limited resources. APS members are encouraged to nominate speakers from all areas of physics, not only their own units.

Stamp. A proposal will be submitted to the U. S. Postal Service requesting a series of 4 stamps to celebrate the "Century of Physics" during the APS Centenary Year. Letters of support for this proposal, and suggestions for images and specific topics, should be sent directly to Brian Schwartz, c/o the APS, One Physics Ellipse, College Park, MD, 20740.

Atlanta Meeting. The Forum should start to plan special sessions for the 1999 Centenary meeting. Displays should also be prepared, such as history of women in physics in the 20th century, comparison of physics course work and text in 1899 with similar material in 1999, etc. In addition to Forum's own sessions, there will be

plenary sessions at which a few speakers review the accomplishments of various subfields of physics in the 20th century.

All living Nobel Prize winners in physics will be invited to attend, and to speak briefly about one or two events in their lives of scientific and personal importance. There will be a Nobel Prize exhibit using the AIP Meggers Collection of prizewinner photos.

The meeting is expected to be international in character, with representatives from governments and physics societies of many countries. It will combine the usual March and Spring APS meetings, and will begin with two extra days (Saturday and Sunday, March 20-21) for celebratory events.

Center for History of Physics

Grants-in-Aid. The AIP's Center for History of Physics has a 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 $2,400 each. 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 resources of the Center's Niels Bohr Library in College Park, Maryland, to microfilm papers, or to tape-record oral history interviews with a copy to be deposited in the Bohr Library. Applicants should either be working toward a graduate degree in the history of science (in which case they should include a letter of reference from their thesis adviser) or show a record of publication in the field. To apply, send a vitae plus a letter of no more than two pages describing your research project, and include a brief budget showing the expenses for which support is requested. Send to Spencer Weart, Center for History of Physics, American Institute of Physics, One Physics Ellipse, College Park, MD 20740, tel. (301) 209-3174, fax (301) 209-0882, e-mail sweart@aip.org. Deadlines for receipt of applications are June 30 and December 31 of each year.

New Web Site. A site featuring the history of physics and allied sciences is now available on the World Wide Web, mounted by the AIP Center for History of Physics. The address is http://www.aip.org/history/. The Web is an outstanding new way to advance public understanding of the physical sciences and their relationship to society, and the AIP Center has moved aggressively to take advantage of the opportunity.

Users entering the site will find a number of options:
pages about the Center for History of Physics with information on the programs and services--for example, grants-in-aid and advice on oral history interviewing.

information on the AIP's Niels Bohr Library, including general descriptions of the holdings, a sample of finding aids to archival materials and abstracts of oral history interviews in the Library's collections, and information on how to get access to the materials (in person or by mail or e-mail).

an introduction to the Emilio Segr? Visual Archives, including a sample of photographs--some of them enlivened with quotes or vignettes--and forms that can be submitted to request copies of pictures.

a variety of Web links to other sites useful to anyone interested in the history of physics and allied sciences such as astronomy, geophysics and optics.

pages for the Friends of the Center for History of Physics, including "plaques" honoring past donors, and information on programs such as the donation of bookplates to honor or memorialize colleagues.

the AIP History of Physics Newsletter with information on current work, bibliography of books and articles, reports of new archival deposits in the field, photographs, etc.

a featured Web exhibit: Einstein: Image and Impact, using photographs, quotes, and text to present highlights of

Albert Einstein's life. By the end of the year this will be expanded to a major site including over 80 photographs and 70,000 words of text.
Besides expanding the Einstein exhibit, during the coming year Center staff will mount a number of additional finding aids to collections and hundreds of additional photographs from the visual archives. Under development is a major search engine to support on-line access to abstracts of all the Library's archival holdings (published in the 1994 Guide to the Archival Collections in the Niels Bohr Library, but including more recent accessions), the Library's catalog of books, and the entire International Catalog of Sources for History of Physics and Allied Sciences.

ANNOUNCEMENTS

The National Academy of Sciences Biographical Memoirs

An important historical effort that the National Academy of Sciences undertakes is to commission the writing of a biographical memoir of each deceased member. Memoirs, which are typically three to five thousand words in length, attempt to put the person's scientific work in historical perspective, in addition to giving biographical material, a selected publication list, and perhaps personal reminiscences.

The Physics Section of the Academy has a backlog of memoirs, either unwritten or in progress, of physicists, including historical figures such as Samuel Allison, Luis Alvarez, Carl Anderson, Herbert Anderson, Walker Bleakney, Gregory Breit, Lee DuBridge, William Fairbank, James Franck, Samuel Goudsmit, Karl Herzfeld, Robert Hofstadter, Carson Jeffries, Edwin Land, Robert Marshak, Brian O'Brien, Leo Rainwater, Emilio Segr?, George Uhlenbeck, Gregor Wentzel, and Eugene Wigner. These memoirs become all the more urgent as time passes, when fewer and fewer people will be around who knew these people and their activities firsthand.

While the tradition of the Academy has been that the prime responsibility for writing should rest with current members of the Academy, these projects could be excellent opportunities for historians, physicists interested in history, and especially their students, to become involved as co-authors or otherwise assist with writing or research. Readers who have a special interest in physicists for whom no memoir has been published and who would like to contribute to this writing effort are encouraged to contact, for further information, Gordon Baym, the current chair of the Physics Section, <gbaym@uiuc.edu>, or Heinz Barschall (University of Wisconsin) <barschall@uwnuc0.physics.wisc.edu> or J. D. Jackson (University of California, Berkeley) <jdj@kelvin.lbl.gov> who are coordinating the writing of Academy memoirs of physicists.

Science in Culture: A Conference in Tribute to the Work of Gerald Holton

A conference in tribute to the work of Gerald Holton, Mallinckrodt Professor of Physics and the History of Science at Harvard University and Chair of the Forum on History of Physics in 1993-94, was held at the American Academy of Arts and Sciences in Cambridge, Massachusetts, on October 12, 1996. Co-organized by the Departments of History of Science and Physics at Harvard and the American Academy, the conference featured talks by Lorraine Datson, (Max Planck Institute-Berlin), James Ackerman, Edward O. Wilson and Peter Galison (Harvard University), Martin Klein (Yale University), Robert K. Merton (Columbia University), Yehuda Elkana (ETH-Zurich and Tel Aviv University), and Patricia Graham (Spencer Foundation). Steven Weinberg of the University of Texas, Austin, presented the keynote address.

National Endowment for the Humanities Programs

The National Endowment for the Humanities (NEH) has several programs of potential interest to historians of physics. Brief descriptions, together with telephone numbers and e-mail addresses for further information, follow:

Research Grants (202-606-8210, research@neh.fed.us) provide up to three years of support for collaborative research in preparation for publication of editions, translations, and other important works in the humanities, and in the conduct of large or complex interpretive studies, including the humanistic study of science and technology. Fellowships for University Teachers (202-606- 8466, fellowsuniv@neh.fed.us) and Fellowships for College Teachers and Independent Scholars (202-606-8467, fellowscollind@neh.fed.us) provide support for six to twelve months of full-time work on projects that will make a significant contribution to thought and knowledge in the humanities. Summer Stipends (202-606-8551, stipends@neh.fed.us) support two months of full- time work on projects that will make a significant contribution to the humanities.

National Science Foundation Programs

Two programs within the National Science Foundation's Division of Social, Behavioral and Economic Research (SBER) may be of interest to Newsletter readers:

The Science and Technology Studies (STS) program supports historical, philosophical, and social research about the character and development of science and technology, the nature of theory and evidence in different fields, and the social and intellectual construction of science and technology. The Societal Dimensions of Science, Engineering, and Technology (SDSET) program joins together two former NSF programs: Ethics and Values Studies, and Research on Science and Technology. Its goals are: to improve approaches and information that address research questions in these areas, and to make results from research of broad use in educational, policy and other settings; to consider the implications of research results for the actions of a wide range of individuals and groups; and to reflect on the implications of findings from the research it supports, for theories and methods in all scientific and engineering fields.

Additional information is available from the website for NSF's Directorate for Social, Behavioral and Economic Sciences (http://www.nsf.gov:80/sbe/start.cfm) and selecting the SBER Division, or directly from the respective mangers of the two programs: Edward J. Hackett (ehackett@nsf.gov) and Rachelle Hollander (rholland@nsf.gov).

NSF/STS Program Manager

Ronald Overmann, long time NSF Program Manager for History and Philosophy of Science and, later, Science and Technology Studies (STS) retired from the Foundation at the end of 1995 after more than 20 years. He was succeeded by Edward J. Hackett, a Professor of Sociology from Rensselaer Polytechnic Institute. Hackett received his Ph.D. from Cornell University in 1979, and has since published on a variety of STS topics, including the social organization and dynamics of research groups, peer review, misconduct, and the interaction between law and science. As program manager he hopes to nudge STS in the direction of greater integration among its constituent disciplines and to stimulate new work that transcends some of the recent conflicts afflicting the field. Despite the recent turbulence in the federal science budget, the STS program awarded nearly $3 million in research grants in fiscal year 1996 (which ended on September 30).

The STS program supports doctoral research, post-doctoral training and research grants for senior scholars (with or without academic affiliations). Once a year the program also holds a competition to award Small Grants for Training and Research, which pay up to $100,000 for up to 3 years in support of graduate and post-doctoral training.

Pollock Award of Dudley Observatory

The Dudley Observatory announces its seventh competition for the Herbert C. Pollock Award, given in support of an innovative project in the history of astronomy or astrophysics. The maximum Pollock Award is $10,000, with secondary awards in lesser amounts, at the discretion of the panel of judges and the Board of Dudley Observatory. The deadline for the current competition is Monday, December 9, 1996.

Additional information on the Award, such as eligibility and the procedure for application, is available from the, Pollock Award Committee Dudley Observatory, 69 Union Avenue, Schenectady, New York 12308. Phone: 518-382-7583, e-mail: alpherr@union.edu

A brief description of the Awards programs of Dudley Observatory is available on the Dudley Observatory link at the following Internet site on World Wide Web: http://www.rpi.edu/~waitsc/Dudley.cfm

Dibner Institute Awards

The Dibner Institute for the History of Science and Technology was established in Cambridge, Massachusetts in 1990 as an international center for advanced research in the history of science and technology. The Institute, which includes the Burndy Library as its own scholarly resource, organizes colloquia, workshops, seminars, and lecture series on diverse topics in support of its goals to foster and disseminate outstanding scholarship in the history of science and technology and to initiate new directions in these fields. It offers resident, visiting, and post-doctoral fellowships to distinguished scholars from around the world and supports the dissertation research of outstanding graduate students enrolled at the consortium-member institutions: the Massachusetts Institute of Technology, the host institution, Boston University, Brandeis University, and Harvard University.

The Institute's 20 Resident Fellows for 1996-1997 and their research projects are:

Bruno Belhoste, Professeur charge de recherches, Institut National de Recherche Pedagogique, France, is the author of Augustin-Louis Cauchy: a Biography, published by Springer, 1991. At the Dibner Institute, he will continue his research on scientific education in the 19th century, investigating the connections between pure and applied sciences, specifically in the areas of applied geometry and applied mechanics.

J. Bruce Brackenridge is Chapman Professor of Physics at Lawrence University, Appleton, Wisconsin. His most recent work, The Key to Newton's Dynamics: The Kepler Problem and the Principia, was published by the University of California Press, Berkeley, 1995. While at the Dibner Institute, Professor Brackenridge will conduct a comparative study of the major diagrams in Newton's Principia using materials in the Grace K. Babson Collection of Newtonian, now permanently housed at the Dibner Institute's Burndy Library.

Geoffrey Cantor, Professor of the History of Science at the University of Leeds, United Kingdom, is the author

of Michael Faraday: Scientist and Sandemanian. A Study of Science and Religion in the Nineteenth Century, published by Basingstoke, Macmillan & New York, St. Martin's Press, 1991. His project while at the Dibner Institute is entitled Quakers in British Science to 1900.

Lisa Downing, Assistant Professor of Philosophy at the University of Pennsylvania, has contributed chapters to several recent volumes on George Berkeley, including The Cambridge Companion to Berkeley (in press), and Berkeley's Metaphysics. At the Dibner Institute, she will continue research for her book, tentatively titled Empiricism and Newtonianism: Locke, Berkeley and the Decline of Strict Mechanism, in which she will explore the mid-eighteenth-century triumph of Newtonian dynamics.

Menachem Fisch, Senior Lecturer, The Cohn Institute for the History & Philosophy of Science, Tel Aviv University, Israel, is the author of William Whewell , Philosopher of Science. While at the Dibner Institute, he will continue work on a book titled Antithetical Knowledge: Doubles and Splits and Paradigm Shifts in Early Victorian Metascience.

Alejandro Garciadiego is Professor in the Department of Mathematics at Universidad Nacional Autonoma de Mexico, Mexico. His work, Bertrand Russell and the Origins of the Set-Theoretic Paradoxes, was published by Birkauser in 1992. At the Dibner Institute, he will explore the ways in which American mathematicians such as Dirk Struik, George David Birkhoff, Garret Birkhoff, Solomon Lefschetz, and Norbert Wiener influenced the development of a professional mathematics community in Mexico.

Jeremy J. Gray is Senior Lecturer in Mathematics at the Open University, United Kingdom. He is the author of Linear Differential Equations and Group Theory from Riemann to Poincare, Birkhauser, 1986. While at the Dibner Institute, he will explore modernism in mathematics through a study of philosophical and practical issues in geometry and related areas. He will also continue his work on the history of differential geometry and the theory of manifolds.

Daryl Hafter, Professor of History at Eastern Michigan University, is the author of European Women and Preindustrial Craft, Indiana University Press, 1995. While at the Dibner Institute, she will extend her study of guildwomen in 18th-century France into the first years of the French Revolution for a work titled Women's Skilled Work in France from 1776-1791: An Era of Reform and Revolution.

Thomas Hawkins, Professor of Mathematics at Boston University, is the author, most recently, of the forthcoming, The Dedekind-Frobenius Correspondence in Context: A Brief History of the Theory of Group Characters and Representations, Springer-Verlag. At the Dibner Institute, he plans to continue his research for a book with the working title, The Emergence of the Theory of Lie Groups 1867-1927: A Study in the Growth of Mathematical Knowledge.

Klaus Hentschel is Wissenschaftlicher Assistent at the Institute for History of Science, University of Gottingen, Germany. He is the author of many articles, including "Erwin Finlay Freundlich and Testing Einstein's Theory of Relativity," Archive for History of Exact Science, 47 (1994); "The Discovery of the Redshift of Spectral Lines in the Sun's Fraunhofer Spectrum by Rowland and Jewell in Baltimore around 1890," Historical Studies in the Physical and Biological Sciences, 23 (1993); and "The Conversion of St. John -- a Case Study on the Interplay of Theory and Experiment," Science in Context, 6 (1993). At the Dibner Institute, he plans to continue exploring the techniques used to depict spectra in a work titled Mapping the Spectrum: Techniques of

Representation in their 19th and early 20th Century Research Context."

Paul Josephson is the author of Physics and Politics in Revolutionary Russia, University of California Press, 1991. As a Dibner Institute Fellow, he will continue work on his next book, Atomic-Powered Communism: The Cult of the Atom in the Postwar Soviet Union," to be published by W.H. Freeman.

Elaheh Kheirandish, has been a post-doctoral fellow at the Department of History of Science, Harvard University. She is the author of the forthcoming The Arabic Tradition of Euclid's Optika, Springer-Verlag. At the Dibner Institute, she will re-examine the Greek textual tradition of Euclidean Optics; Arabic responses to the Greek corpus; and the textual transmission of Arabic 'versions' of Euclidean visual theory.

Patrick Malone is Professor of Urban Studies and American Civilization at Brown University. He is the author, with Robert Gordon, of The Texture of Industry: An Archaeological View of the Industrialization of North America, Oxford University Press, 1994. His project while at the Dibner Institute will be an interdisciplinary study of technology, topography, and urban development, emphasizing the role of waterfalls in the urban history of the United States and Canada.

Herbert Mehrtens, Professor of Modern History, Technische Universitat Braunschweig, Germany is the author of Moderne - Sprache - Mathematik: Eine Geschichte des Streits um die Grundlagen der Disziplin und des Subjekts formaler System, Suhrkamp, 1990. During his stay at the Dibner Institute, he plans to investigate how the modernization of mathematics connects to symbolic techniques that were deployed across a broad "mathematical culture," which includes the natural and social sciences.

Dorinda Outram, Visiting Scholar at the Max-Planck Institut f?r Wissenschaftesgeschichte, Germany is the author of The Body and the French Revolution: Sex, Class, and Political Culture in the French Revolution, Yale University Press, 1989. The project she will work on at the Dibner Institute is entitled Epistemology, Instrumentation, and Exploration in Enlightenment Science."

Leonard Rosenband, Professor of History at Utah State University, is the author of the forthcoming Managing to Rule: The Montgolfier Paper Mill, 1761-1805, University of Illinois Press. His project while at the Dibner Institute is titled Profiting from Change: Technological Transfer in 18th Century France.

Terry Shinn is Directeur de Recherche, Centre National de Recherche Scientifique, Paris, France. He is the author most recently of "The Bellevue Grand Electromagnet, 1900-1940: Birth of a Research-Technology Community," Historical Studies in the Physical and Biological Sciences, 24 (1993). At the Dibner Institute, he will continue his work on The Rise of the American Research-Technology Community, 1920-1950."

George Stocking, Jr. is Distinguished Professor of Anthropology and Conceptual Foundations of Science at the University of Chicago. He is the author of After Tylor, British Social Anthropology, 1888-1951, University of Wisconsin Press, 1995. At the Dibner Institute, he will explore the history of anthropology between World War II and the late 1960s in a project titled Anthropology Yesterday.

Ezio Vaccari is Collaborator/Research Assistant in the Department of Modern and Contemporary History at the University of Genoa, Italy. He has several works in press including "Giovanni Arduino e lo Sviluppo Della Moderna Geologia Stratigrafica" in Giovanni Arduino e i Geologi del Settecento, Societa Veneziana di Scienzi

Naturali, 1996. He is also the author, with Patrick Wyse Jackson, of "The Fossil Fishes of Bolca and the Travels in Italy of the Irish Cleric George Graydon in 1791," Museologia Scientifica, 1995, XII. At the Dibner Institute, he will work on the classification of mountains and the idea of geohistory in the 18th century.

Ido Yavetz, Lecturer at the Cohn Institute for the History of Science and Ideas, Tel Aviv University, Israel, is the author of From Obscurity to Enigma: The Work of Oliver Heaviside, 1872-1889, Birkhauser Verlag, 1995. While at the Dibner Institute, he will examine the history of research on lightning in the 19th and 20th centuries.

Two Visiting Fellows have also been appointed, each of whom will spend two months at the Dibner during the current academic year:

Anthony Grafton, Professor of History at Princeton University, is the author of many books including, Defenders of the Text: The Traditions of Humanism in an Age of Science, 1450-1800, Harvard University Press, 1991, paperback reprint 1994. He plans to work on two projects while at the Dibner Institute: a detailed case study on medical astrology in the 16th century in collaboration with Nancy Siraisi, and a continuation of his analysis of Isaac Newton's work in historical chronology.

Nancy Siraisi is Distinguished Professor of History, Hunter College and the Graduate School, City University of New York. She is the author of Medieval and Early Renaissance Medicine: An Introduction to Knowledge and Practice, University of Chicago Press, 1990. At the Dibner Institute, she will work with Anthony Grafton on a project titled The Relation between Astrology and Medicine in the Writings of Girolamo Cardano and continue her ongoing research for a work tentatively titled Studies on Vesalius and the Classical Tradition.

Of the 10 graduate student fellowships awarded by the Dibner for 1996-97, seven are in the broad area of history of physics:

Anne Ashley Davenport, Harvard University, is a cum laude graduate of Radcliffe College and has been a teaching fellow at Harvard since 1993. Her studies have focused on medieval theories of the infinite. In her dissertation, she plans to demonstrate that late medieval theology provided the theoretical backbone for a distinctive devotional metaphysics, notably in the works of Kepler, Berulle, and Saint-Cyran, which radically transformed expectations about human knowledge.

Karin Ellison, MIT, is a graduate of the University of Illinois with a dual major in Chemistry and the History of Science. She has been a Teaching Assistant at Harvard and a Lecturer at Cornell University while completing her degree requirements. Her dissertation will examine the changes in engineering practices and education during the construction of the Grand Coulee Dam in the State of Washington in the 1930s and the dam's impact on industrial development in the American West.

Slava Gerovitch, MIT, received the B.S. in Applied Mathematics with honors from the Institute of Oil and Gas Industry in Moscow and a Ph.D. from the Institute of the History and Philosophy of Science, The Russian Academy of Sciences in 1992. He is the author of a forthcoming article in Technology and Culture entitled, "Perestoika of the History of Technology and Science in the USSR: Changes in the Discourse." The subject of his doctoral dissertation is the early history of Soviet cybernetics, 1952- 1964.

Rebecca Herzig, MIT, received her B.A. from Oakes College, University of California, Santa Cruz with the

highest academic honors. Since 1991, she has been a Teaching Assistant at MIT and at the University of California, Santa Cruz. For her dissertation, she plans to investigate the emergence of the word and the concept, "technology," and its usage as an indicator of cultural and institutional change. The title of her dissertation is "The Word of Nations: The Idea of "Technology" in America."

Robert Martello, MIT, received the S.B.from MIT in 1990 in earth, atmospheric and planetary sciences and the S.M. in civil and environmental engineering in 1995. In his doctoral studies he will investigate the relationship between technological change and industrialization in 18th and 19th century America and the development of ecological awareness.

John Ongley, Boston University, received his B.A. in Philosophy from Kent State University, Ohio. He has been a lecturer in Philosophy at the University of Michigan and Boston University. In his dissertation, "Logics of Discovery," he will study the origin of the claim that a logic of discovery is impossible, as well as the intellectual and cultural reaction to the rise of statistical inference in the 18th and 19th centuries.

Thomas D. Wilson, Brandeis University, received the B.S.Ed. and M.A. from Central Missouri State University. In his studies he has concentrated on integrating themes from European intellectual and political science with issues from the history of science. At the Dibner Institute, he will continue work on his dissertation, "Early Modern Conceptions of Scientific Fraud: Allegations of Fabrication at the Royal Society and the Academie des Sciences, 1662-1793."

Applications for Dibner Institute Awards for 1997-98

The Dibner Institute for the History of Science and Technology invites applications to its two fellowship programs for 1997-1998: the Senior Fellows program and the new Post-Doctoral Fellows program: Senior Fellows Program candidates should have advanced degrees in appropriate fields and offer evidence of substantial scholarly accomplishment and professional experience. Scholars may apply to the Senior Resident Fellows Program for the Fall (Term 1), the Spring (Term 2), or both. Term 1 extends from August 1 through December 31, with full activities beginning on September 1. Term 2 extends from January 1 through May 31, with full activities beginning on February 1. Scholars may also apply to the Visiting Fellows Program for less than a full term but in any case, for at least two consecutive months.

Post-Doctoral Fellows Fellowships are awarded to outstanding young scholars of diverse countries of origin who have obtained the Ph.D. or equivalent within the previous five years. Post-Doctoral Fellowships run for one year, from July 1 through June 30, and may be extended for a second and final year at the discretion of the Dibner Institute.

Further information may be obtained from Trudy Kontoff, Program Coordinator Dibner Institute for the History of Science and Technology, Dibner Building, MIT E56-100 38 Memorial Drive Cambridge, Massachusetts 02139. Telephone: (617) 253.6989; FAX: (617) 253.9858, e-mail: dibner@mit.edu.

REPORTS

Topics in the History of Radioactivity: APS Meeting in St. Louis, March 19, 1996

This session, organized and chaired by William Evenson of Brigham Young University, was held in honor of

the centennial of the discovery of radioactivity. A large audience came to hear talks by three scholars in the history of science: Susan Quinn, author of Marie Curie: A Life, Simon and Shuster, 1995; Erwin N. Hiebert, Department of The History of Science, Harvard University; and Helena M. Pycior, Department of History, University of Wisconsin-Milwaukee.

Evenson introduced the session by reminding the audience of the anniversary we are celebrating. On January 20, 1896, Henri Becquerel first was made aware of Roentgen's discovery of x-rays and the images produced by this penetrating radiation. The x-rays appeared to emanate from a fluorescent spot on a cathode-ray tube, and Becquerel, who had previously studied phosphorescence, immediately followed up a suggestion by Poincar? and sought to discover whether other luminescent bodies would emit penetrating radiation.

Becquerel and his father had studied phosphorescence in uranium salts, among others. So during the next four months, Becquerel looked for penetrating radiation, fortuitously beginning with uranium salts. He exposed his uranium salts to sunlight and placed them on wrapped, light-tight photographic plates. On February 24, 1896, he reported success. Then on March 1, he reported that exposure to sunlight was not necessary, a discovery that occurred because of a series of sunless days. During March and April, he found that even non-phosphorescent uranium salts emitted penetrating radiation, while other phosphorescent bodies did not. On May 18, Becquerel announced that uranium metal, the element itself, was the source of the rays.

Becquerel's discovery was the result of careful and persistent experimentation, just the right background, some good luck, and an ability to accept and follow up unexpected results. The real significance of Becquerel's discovery was not recognized for a few more years. The Curies coined the term radioactivity. Becquerel himself identified electrons in the radiations of radium and published the first evidence of a radioactive transformation. His early work opened the way to the new field of nuclear physics and led to applications in nuclear medicine, reactors and nuclear weapons. Henry Becquerel shared the Nobel Prize with the Curies in 1903.

Quinn spoke about the Curies's discoveries related to radioactivity and how those discoveries helped lead to a new theory of matter. She pointed out that the Curies were very much outside the French establishment at the time of their discoveries, while Henri Becquerel was the quintessential insider. After Becquerel's initial discovery, it was the Curies who discovered that this new radiation was a phenomenon present in other elements in addition to uranium, would give it the name radioactivity, and would begin to understand its deep significance. Marie Curie was an outsider because she was a woman and a foreigner from Poland. Pierre Curie once said he had vowed to be "extreme in everything;" was a supporter of the political left, shy and introverted; probably had some kind of learning disability; had no respect for formality or pomposity. He was dreamy and cared little for honors or recognition. Before radioactivity, Pierre had already made important discoveries in magnetism and crystallography, often with the help of his brother Jacques. He developed a theory of symmetry which was described by 1991 Nobelist Pierre Gilles de Gennes as the work of a prophet. He and his brother also discovered piezoelectricity. But because he refused to play the game of courting power, he was definitely on the fringes of the French science of his time.

Becquerel's rays were not viewed as nearly so interesting as x-rays in the first years after they were discovered, but in spite of this Marie Curie decided to explore these uranium rays for her Ph.D. thesis. Marie excelled as an experimenter and quickly found additional radioactive materials. By March 1898 both Pierre and Marie were working very hard on what they had realized was not an anomaly of uranium but some sort of more general phenomenon which required naming and explanation.

In the summer of 1898, Marie Curie was rewarded the Prix Gegner, a 3,800 franc prize, which was very important for their support, but the French Academy did not inform her of it directly. Instead, Henri Becquerel and Marcelin Berthelot sent letters to Pierre asking him to tell his wife and convey their compliments, following a kind of propriety that suggests how unused they were to a collegiate relationship with a woman.

Over the next ten years these early discoveries led finally to unlocking secrets of the structure of the atom through understanding the transmutation processes of the elements. But it was Ernest Rutherford, along with Frederick Soddy and others, who would first begin to understand the causes of radioactivity.

By the end of her life, Marie Curie herself had become an insider in the world of science. She established an institute which laid the foundation for the Council for Scientific Research (CNRS), the principal funder of French science today, and she was the founder of a family scientific dynasty in the twentieth century, like the nineteenth century Becquerel dynasty.

Hiebert spoke of radioactivity and the philosophy of chance. He pointed out that until the end of the nineteenth century, chance and probability were taken by most scientists and philosophers as expressions of ignorance and not as basic components in the structure of the world. However, with the discovery of radioactivity in 1896, such views were put into question. Here was an event obeying an exponential decay law in which chemical elements were known to disintegrate and transmute into other elements in a process that could not be made to alter its course by external changes. Fluctuations in the radioactive decay process were real and probabilistic.

Radioactivity initially came as a total surprise. In due time, it came to be characterized as a statistical process concordant with the law of large numbers at the macroscopic level, and as an irregular, random, spontaneous, and non-periodically fluctuating phenomenon of the counting process when the number of observed events is small. Rutherford and his collaborators at McGill University during the years 1899-1906 laid the foundations for understanding radioactivity. This is the work for which Rutherford was awarded the Nobel Prize in chemistry in 1908.

Rutherford worked out the mathematics of the law of radioactive decay, but the mechanism of the process was not really understood until the advent of quantum mechanics. Nevertheless, Rutherford and Soddy, in 1902, did show that the decay process represents the spontaneous change of one element into another. One of the great puzzles, however, was that the course and rate of radioactive decay, unlike a monomolecular chemical reaction, is not governed by the environmental conditions of the reaction.

A group of Austrian physicists, including Schweidler, Loschmidt, Stefan, Boltzmann, Exner, Meyer, Hess, Kohlrausch and Schr?dinger, first began to clarify radioactivity as an atomic phenomenon exhibiting random behavior. Schweidler showed in 1905 that this was a random process, the first ever to be encountered in nature, where the principle of causality conceivably was in jeopardy. Fluctuation experiments by Geiger and, independently, Meyer and Regener in 1908, established the probabilistic nature of radioactive decay. It was only in the late 1920's, with the development of quantum mechanics, that there was a resolution of the puzzles about radioactivity.

Pycior spoke on Marie and Pierre Curie as complementary partners in the study of radioactivity, analyzing the Curies specifically as a research team. Their differences, of personality, modes of thought, scientific style, and

levels of commitment to physics and chemistry, were very nicely balanced so that each was able to be more productive in collaboration with the other.

Marie was competitive and tenacious. She cared about credit and attribution. She was cautious in drawing conclusions from her data. She was methodical, while still capable of profound insight. Pierre, by contrast, was dreamy and speculative, often about very deep ideas. He cared not at all for honors and credit. He was not driven to publish his research results and, indeed, left unfinished papers at his death. He was open and collaborative with little competitiveness. Both of them were interested in both physics and chemistry, but he cared more for the deep, philosophical questions of physics, while Marie brought greater interest to questions of chemistry and applied physics.

Before meeting Marie, Pierre had collaborated with his brother Jacques in a manner very similar to his later collaboration with Marie. By geographic separation, his collaboration with Jacques was mostly over, so he was ripe for both the personal and the scientific relationship that developed when he met Marie.

Perhaps because there were so few women in science at that time, Pierre and Marie were especially careful to give Marie proper credit for her scientific work. They published independent as well as joint papers, and in their joint papers they scrupulously indicated the contributions of each partner. They documented their separate contributions to their joint work so carefully that no one could mistake the crucial roles that each played in the work.

The picture that comes from looking at their lives and personalities along with the documentation in their published scientific work puts to rest the old myths about Marie as laboratory drudge, while Pierre did the real science, or Marie as the chemist and Pierre the physicist, each in his or her own compartment. In fact, they worked together with wonderful productivity and support. Pierre's untimely death in 1906 was an enormous loss for Marie, both personally and scientifically. [NB: Excerpts from a tribute to the Curies by former French President Fran?ois Mitterand appears below in the Opinion section.]

Contributions of Women to Physics
APS/AAPT Meeting in Indianapolis, May 4, 1996

Katherine Gebbie of the National Institute of Standards and Technology, Chair of the APS Committee on the Status of Women in Physics, organized this session to highlight important contributions of women to physics. The session papers demonstrated that women have made significant contributions to physics which are frequently less well-known than those of their male counterparts. Women physicists share ability in physics, determination to pursue careers in science, and strong, sometimes eccentric, personalities.

Caroline Herzenberg, Argonne National Laboratory, presented the archive project, Contributions of Women to Physics 1898-1998, which is under construction for the APS Centenary celebration in 1998-99. The archive can be reached at http://www.physics.ucla.edu/cwp/. Herzenberg solicited contributions to the archive and pointed out that some areas of physics are much better represented than others so that help is needed.

Steven Moszkowski, UCLA, described the life and work of Maria Goeppert Mayer with emphasis on her discovery of the shell model and the on-going importance of the work. Moszkowski highlighted the clarity of Mayer's thought and her intuitive approach to physics.

Ruth Howes, Ball State University, spoke on women physicists who worked in the Manhattan Project. The study, conducted by Herzenberg and Howes, of women's role in the science and engineering in the Manhattan Project, has uncovered many women physicists whose technical contributions have previously not been publicized.

Finally, Loretta Johnson, University of Kansas, described the life and work of physicist Fanny Gates who studied the nature of radioactivity as a member of the faculty at Goucher College. Gates also worked with Rutherford at McGill in the years 1902 -1903.

Historical Perspectives on Computing and Physics
APS/AAPT Meeting in Indianapolis, May 3, 1996

Jack Worlton, Los Alamos Scientific Laboratory, spoke about "The Roots of Computational Physics". He began by noting that the year 1996 marks the 50th anniversary of the dedication of the ENIAC, the first computer to demonstrate the power and potential of electronic computation for the physics community. Several national laboratories, including Los Alamos Scientific Laboratory, used the ENIAC for weapons calculations, and this led to the development of several one-of-a-kind machines at these laboratories, including the MANIAC at Los Alamos. The use of these early electronic computers for the solution of complex problems in physics contributed to the development of computational methods, such as the Monte Carlo method, and to the development of the discipline of computational physics.

Because of the complexity and time criticality of weapons calculations, Los Alamos and other weapons laboratories (Lawrence Livermore National Laboratory and Sandia National Laboratories) collaborated with commercial computer vendors to develop ever more powerful computers to meet these needs. These laboratories became early customers for these new machines, thereby encouraging their development and contributing to the rapid growth of the computing industry in the United States.

These laboratories continue to work at the forefront of science and engineering. For example, the Department of Energy has chartered the Accelerated Strategic Computing Initiative (ASCI) for the development of computers that will exceed current capabilities by several orders of magnitude, again leading the way to new frontiers in computational physics.

Arthur J. Freeman, Northwestern University, spoke on "Computational Condensed Matter Physics": Computational physics, in general, and computational condensed matter physics (CCMP), in particular, is now seen to be in a golden age. In all fields of CCMP research, there has now been achieved a high level of reliability concerning predictions of physical and chemical properties and phenomena - thanks in large part to the continued rapid development and availability of high-performance computers and their easy accessibility (via networks and workstations) and the new computational methods/algorithms which this permitted to be generated. A prime area continues to be electronic structure theory where new theoretical/computational methods - based on the density functional theory of Hohenberg, Kohn and Sham - have been developed (by us and others) that permit highly precise solutions of complex many-body systems at the level of the local density approximation. Looking back over 40 years, the present state has been slow in coming. The way was marked by pitfalls and frustrations in (a) attempting to satisfy the ever increasing demands of experimentalists seeking to understand results obtained with ever more sophisticated equipment and (b) the struggle with performing

increasingly complex calculations without having adequate computing power. As will be described, these decades were also marked by triumphs and the growing acceptance of the value and importance of these complex numerical investigations.

Charles J. Murray explored the topic, "How Physicists Drove the Development of Supercomputers" He noted that makers of the world's fastest computers now claim they can operate their machines at one trillion operations per second. That's about 10,000 times faster than today's Pentium chips. To reach such speeds, however, users must often pay more than $30 million per machine. Who needs such speed? And who can afford it? Up to now, physicists at the country's national defense labs have been the primary users of such machines. With these so-called "supercomputers," they have simulated the detonation of countless weapons, thereby reducing or eliminating the need for actual nuclear testing. They have also dramatically improved the country's weather forecasting abilities, enabling forecasters to predict hurricanes and floods days in advance. By creating a market for these machines, the physics community has also made the United States a world leader in computing. Technologies developed in the supercomputing arena have trickled down to other mainframes and desktops. This presentation will explore the unusual world of supercomputing: the needs of the physics community, the unique atmosphere within which the machines are designed, and the industry's future.

OPINION: "In Praise of Pierre and Marie Curie"

Editor's Note: On April 20, 1995, the remains of Pierre and Marie Curie were reintered in the Pantheon in Paris in the presence of an audience which included President Lech Walesa of Poland and a distinguished group of French scientists. On that occasion Fran?ois Mitterand, on what was to be his last public appearance as President of France, made extended remarks. Excerpts of a translation of these remarks by William Evenson, Physics Department, Brigham Young University, follow. An electronic version of the complete text of Evenson's translation may be obtained by request from the editor of the Newsletter: wblanpied@nsf.gov.

"By transferring these ashes of Pierre and Marie Curie into the sanctuary of our collective memory, France not only performs an act of recognition, it also affirms a faith in science, in research, and its respect for those who dedicate themselves to science, just as Pierre and Marie Curie dedicated their energies and their lives to science."

"Today's ceremony is of particular significance because it marks the entry into the Pantheon of the first woman in our history honored for her own accomplishments."

. . . . "As you know, Mr. President of Poland, Marie Curie's struggle began in your country. One could not comprehend the course of such a life, so many obstacles surmounted, without making reference to this land so close to ours through history and in feeling, so torn through the ages between the powers that wished to subjugate it, where character is steeped in a thousand-year tradition of unbreakable resistance."

"From her childhood, Marie Sklodovska resisted: against the humiliations of foreign powers, against her 'difficult nature that has to be conquered,' as she said herself, against the limitations of women's roles, against dogmas of all kinds which attempted to restrict her. She desired to control her own life and to pursue her own destiny. And for such a task she had all the needed qualities."

"She was thus a Polish patriot girl. As President Lech Walesa has just suggested, to pursue her studies during those times and in those conditions, it was necessary to leave. The passion to understand, the faith in the

possibility of progress that possessed Marie Curie had a name in her family: the Sorbonne. Marie could not conceive of perfecting her knowledge elsewhere."

. . . . "The knowledge acquired in the study of the natural radioactive elements directed the evolution of atomic theory. And on yet another track the work of Pierre and Marie Curie led to developments of great importance: that of therapeutic applications and the use of radioactive materials in biology."

"Since 1910 gamma rays from radium have been used in what is called 'curietherapy' or radiation therapy. This therapy took on such great importance that it was necessary to add a department of medical applications to the Radium Institute. Thus was born in 1920 the Curie Foundation. For Marie the benefits of irradiation to cancer patients were the crowning accomplishment of her research."

"Such were the landmarks of these two lives that nothing in the memory of posterity has tarnished. We admire the brilliance of their creations which are the very epitome of the impact of the human spirit in history. In their work are united the fields of physics, chemistry, and biology. In it the great secrets of matter and life come together, secrets whose exploration would remake our world."

"The layman, often, remembers nothing of the great scientists beyond the most popular of their discoveries, such as the isolation of radium. But the work of Pierre and Marie Curie continues. Its fruitfulness has not diminished. It has built, little by little, the foundation from which atomic physics and molecular biology take their flight."

"We admire also the common virtues of these two persons, too soon separated: their ardor and enthusiasm, their obstinacy in work, their rigor and moderation in all things, their taste for contemplation and the strength of solitude. One characteristic brings them together more than any other: disinterestedness, which is, in their eyes, the foundation of all scientific ethics."

"But there is another example that has the attention of the nation this evening and which I have the honor to put into words for you: that of the remarkable battle of a woman who decided to assert her abilities in a society that too often reserved intellectual functions and public responsibilities to men."

. . . . "In 1933 Marie Curie presided at Madrid over a meeting of leaders of many disciplines on the subject The Future of Culture. 'I am,' she declared, 'among those who think that science has great beauty. I do not believe that in our world the spirit of adventure is at risk of disappearing. If I see around me something vital, it is precisely this spirit of adventure which seems to me impossible to uproot and is tied to curiosity.'"

"Without curiosity of mind, what would we be? Such is the beauty and the nobility of science: endless desire to push back the frontiers of knowledge, to follow the secrets of matter and of life without a preconceived idea of the eventual results. Pasteur stated the rule: 'Encourage scientific disinterestedness because it is a living well of progress in theory, from whose application arises all progress.'"

"Let us respect this rule. There is no scientific progress if one shackles that which moves it, if one bridles this curiosity from which everything develops."

. . . . "Listen again to Pierre Curie when he received the Nobel prize: 'One can conceive,' he said, 'that in

criminal hands radium could become very dangerous, and one could ask whether humanity is benefited by knowing the secrets of nature. I am among those who think that humanity will draw more good than bad from these discoveries.'"

"There is in this confidence, as in all hope, a portion of desire and a portion of dream. Without such confidence, there can be no advance of the mind. And if other paths could be followed to moderate human pain, where has anyone shown that we can afford to deprive ourselves of this one?"

"One day, you know, Earth will no longer be the center of the universe. Today biology is beginning to be able to change the individual in his very being, in the intimacy of his genes and of his brain. Must we reject science for all this even while we keep a clear view of the immense dangers which menace this advance of knowledge?"

"The destiny of civilizations is not to mistrust the knowledge of things, but to master it. The refusal of knowledge, the fear of creative thought, belong, I am certain, to dead societies."

"The struggle of science is that of reason against the forces of obscurity, it is the struggle of freedom of the mind against the slavery of ignorance. Yes, freedom, even if at times the discoveries of science can be misdirected to destroy life. Liberty grows when suffering is alleviated; liberty grows when the material and spiritual dependencies that shackle the capacity of humans to choose their own destiny are reduced."

"Therefore, I thank you in the name of the nation as we thank Pierre and Marie Curie. I have waited long for this day when we could add such illustrious ashes to the Pantheon of our glories. I would have felt as if in debt to the country if I had not been able, before leaving my present responsibilities, to add here the names of Pierre and Marie Curie who represent in the memory of their peoples the beauty of the quest even at the cost of self sacrifice. Through these two names, which unite two peoples in friendship, the Republic pays deserved homage to all the servants of science, many of whom are here. Because they bear witness to one of the brightest powers of humanity, the thirst to know and the desire to create."