

HISTORY of Physics NEWSLETTER

WHAT CAN THE FHP DO FOR YOU?

– Hans Frauenfelder, Forum Chair

Actually, the correct question should be: What can **you** do for the Forum? But I will come to this question at the end. The FHP can do at least three things for you – keep you informed of what is happening in the history of physics through the *Newsletter*, organize attractive invited sessions at the APS meetings, and provide occasions where members of the FHP can meet each other. The *Newsletter*, excellently edited by Bill Evenson, describes past meetings, informs you about future sessions, and tells you what is happening in the FHP community. The Program Committee of the FHP works hard at organizing outstanding invited sessions. The programs for the forthcoming APS meetings indeed show again very exciting sessions. In the past the FHP invited sessions have had large audiences and, in my opinion, the forthcoming ones may attract even more listeners, both FHP members and nonmembers. To my knowledge, the FHP has not systematically organized sessions or workshops where specific topics were discussed in detail, but it may be a challenge for the future.

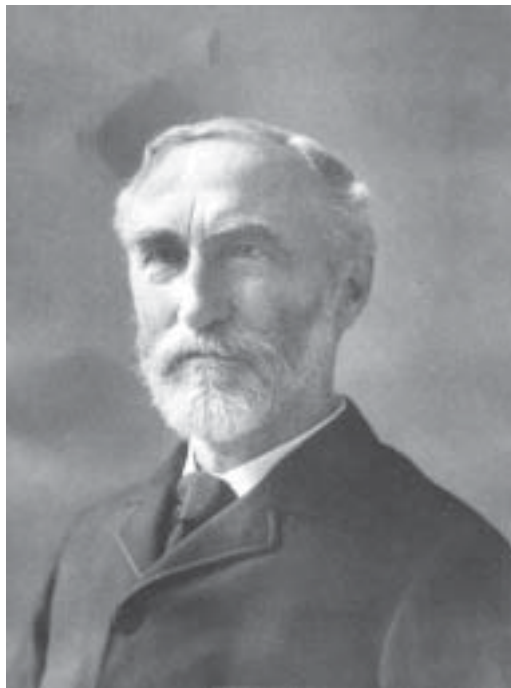
The history of physics can be looked at in at least two different ways – through biographies or sessions in which the life of a particular physicist is followed, or in books, papers, or meetings where the

development of a particular concept, law, or field is followed. Both approaches fall into the purview of the FHP. Incidentally, it is interesting to note how biographies can be written with different viewpoints and with different audiences in mind. Two recent books make this point clearly. The biography of Wolfgang Pauli, *No Time to be Brief*, by the physicist Charles P. Enz (Oxford 2002), traces the life of Wolfgang Pauli by concentrating on his science, and reading it is not easy, even for a physicist. The life of John Bardeen, *True*

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FORUM ELECTION

Forum Elections information is contained in this *Newsletter*. Please vote for Vice Chair, two Members-at-Large of the Executive Committee for three-year terms, and one Member-at-Large of the Executive Committee for a two-year term to replace Per Dahl, who had to resign. If you have email registered with APS, you will receive a message inviting you to vote electronically, as authorized by the FHP Executive Committee. If not, you should have received a paper ballot by mail. If you want a paper ballot but have not yet received one, please email your request, including your mailing address, to kwford@verizon.net or contact Kenneth W. Ford, 729 W. Westview Street, Philadelphia, PA 19119-3533, (215) 844-8054. **Ballots must be returned so they can be received by March 1** in order to notify winning candidates and invite them to the April Executive Committee meeting. Brief resumes and statements from the candidates are printed later in this *Newsletter*.



J. Willard Gibbs, courtesy AIP-Segre Photo Archives

J. Willard Gibbs, who died one hundred years ago, was one of the most important physicists of the 19th century. This year we celebrate both his life, at the centennial of his death, and the publication of his classic book in 1902, *Elementary Principles in Statistical Mechanics*, which established a new field of theoretical physics. See the notice below of a session at the upcoming APS March Meeting in Austin celebrating this “double centennial.”

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Briefly Noted:	
<i>Scientifically Speaking: A Dictionary of Quotations</i> , Gaither, Cavazos-Gaither, and Slocombe	
<i>Science in Translation</i> , Montgomery	
<i>Biography of Scientific Objects</i> , Daston	
Books Received	

Genius (Joseph Henry Press, 2002), written by the science historians Lillian Hoddeson and Vicki Daitch, concentrates more on John and his life and is far easier to read.

Finally, what can you, the reader, do to support the efforts of the FHP? If you are not yet a member, join. Help finance the History of Physics Prize. Send suggestions for

future invited sessions to the chair of the Program Committee, suggest Fellows, attend the APS meetings where FHP sessions are scheduled.

Editor's Note

In his message above, Forum Chair Hans Frauenfelder asks, "What can the FHP do for you?" and comes finally to the question of what you can do for FHP. I would like to ask a different but related question: "What can history of physics do for physics?"

Do we use history of physics as a guide in our research in physics? Sometimes, and in my experience more often among older physicists than younger. The lessons of history for our research programs include a deeper understanding of how important and recalcitrant problems were approached in the past. What kinds of attacks worked? How did theory and experiment interact? What important experiments have never been done (because they were too hard at the time or were simply overlooked in the then current paradigm of the science), although we all *think* we now know what the result must be? Where did data analysis go astray and what had to be done to solve the resulting problems? Some excellent contemporary work in history of physics addresses just

these problems – see, for example, my review of Allan Franklin's book, *Are There Really Neutrinos*, in the Fall 2001 *History of Physics Newsletter*, or Franklin's new book, *Selectivity and Discord: Two Problems of Experiment*. Franklin is only one of several historians addressing what I regard as practical and important issues for physics today.

Do we use history of physics as a guide in the teaching of physics? More often, but seldom with sufficient scope to convey fully the realities of doing physics. Those realities include discovery with all its false starts and blind alleys, recycling old concepts into new (particulate theories of light to photons, for example), the ways that routine, hard work is interspersed with exhilarating moments of new insight, and the deep satisfactions that come from developing a thorough understanding of some complicated working of nature. The biographies that Hans Frauenfelder mentions in his message are good sources of realistic information about how great physicists do physics. Can we, through our own experiences in physics, and vicariously through the experiences of those whose biographies we have access to, give students a more realistic view of how physics has developed and progressed? I find such insights useful. I believe students are well served by a realistic view of science. History of physics is a powerful tool in developing such a view.

Do we use history of physics as a guide in explaining science to the public and to policy makers? History of physics helps bring the perspective to understand and articulate what is meant by the "unity of physics." With that perspective, we can do better at relating between subdisciplines and at articulating to the public, to students, and to policy makers why what we are doing in physics is important and exciting and worthy of their attention. Further, I believe we should look at how history of physics teaches us to see physics as a discipline and consider what we are doing today that might figure in the history of physics written in 2053. History of physics can give us per-

spective that helps us set realistic priorities and value those activities and worldviews that will sustain both the unity and the freshness of physics.

There has been much attention recently to a "crisis" in physics. (See Sidney Nagel, "Physics in Crisis," *Physics Today*, September, 2002, and responses in the November, 2002, and January, 2003, issues.) Are we losing sight of the unity of physics? What unites the various subdisciplines? Are we so attached to the fundamentals as we learned them that we trap our students in an unchanging curriculum? Are we losing the ability to attract and excite the imaginations of students? Have we undervalued the need to communicate to students and the public our motivation and excitement in doing physics?

History of physics can help us find our way through such questions in the ways outlined above. I extend the challenge to our members to use history of physics to improve how we explain what physics is about and why it is important – to students, to colleagues, to policy makers and to the public. Insights from history can improve our research, our teaching, and our efforts to explain science to the public.

Call for readers to report their activities in history of physics

Readers who are engaged in research and writing in history of physics, biographies of physicists, histories of physics departments or colleges of science, memoirs, or other physics history work, please alert the editor to your interests and any requests for information from other readers. See the address and email in the box at the left.

Physics in Perspective

In response to my editorial in the last issue, one reader wrote that he would be willing to sponsor an annual subscription to *Physics in Perspective* for an individual (not institution) who could benefit from it. Does anyone else want to join this effort?

HISTORY of Physics NEWSLETTER

The *History of Physics Newsletter* is published twice each year by the Forum on History of Physics of the American Physical Society. It is distributed free to all members of the Forum. The Forum also has reciprocal arrangements with History of Science Society, Philosophy of Science Association, and HOPOS. Others who wish to receive it should make a donation to the Forum of \$5 per year (+\$3 additional for air mail). Each 3-year volume consists of six issues.

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FORUM NEWS

Forum Program at March and April APS Meetings

At the upcoming APS March Meeting in Austin, the Forum on History of Physics is sponsoring two symposia.

“J. Willard Gibbs and His Legacy: A Double Centennial,” organized by *Stephen G. Brush* and *Michael E. Fisher* of the University of Maryland, is scheduled for Monday, March 3, 2:30 to 5:30 pm in Ballroom B, Austin Convention Center. Chaired by *Michael E. Fisher*, University of Maryland, speakers will be *Martin J. Klein*, Yale University, “Gibbs and Statistical Mechanics a Century Ago,” *Ole Knudsen*, University of Aarhus, Denmark, “Gibbs in Europe,” *J.M.H. Levelt Sengers*, NIST, “Key Concepts from Gibbs that Empowered Van der Waals, Korteweg and Bakhuis Roozeboom,” and *Leo P. Kadanoff*, University of Chicago, “Reflections on Gibbs: From the Amistad to Complexity Theory.”

“The Early Days of Solid State Physics,” organized by *Lillian Hoddeson* of the University of Illinois is scheduled for Tuesday, March 4, 2:30 to 5:30 pm in Ballroom B, Austin Convention Center. The session will be chaired by *Howard Huff*, Sematech, with the following speakers: *Hans Bethe*, Cornell University (by speaker phone), “Arnold Sommerfeld and the Beginnings of Modern Solid-State Theory,” *Lillian Hoddeson*, University of Illinois, “The Quantum Theory of Solids Enters American Graduate Programs: John Bardeen at Princeton in the 1930s,” *Frederick Seitz*, Rockefeller University, “How We Came to Know What We Knew about Semiconductors During World War II,” and *Philip Anderson*, Princeton University, “When Band Theory Doesn’t Work: The Magnetic State.”

At the April APS Meeting in Philadelphia, the Forum is cosponsoring four symposia and a contributed session. The times of the sessions are to be arranged and will be listed on the FHP web site and the APS meetings site as soon as they are scheduled.

“Using History in Physics Education,” organized by *Daniel Siegel*, University of Wisconsin (cosponsored by the Forum on Education), is scheduled for Saturday, April 5, 2:30 to 5:30 pm. The session will be chaired by *Daniel Siegel* (U. of Wisconsin), and speakers are *Stephen G. Brush*, University of Maryland, “Is Physics Scientific?” *David*

Cassidy, Hofstra University, “Understanding Physics: A Textbook Integrating History into Physics Education,” *Robert March*, University of Wisconsin, “Bringing Physics to Life through History and Biography,” *Jed Z. Buchwald*, California Institute of Technology, “Recreating the Past in the Student Laboratory,” *Daniel Siegel*, Comments and Discussion.

“The Development of Electron-Positron Colliders,” organized by *Elizabeth Paris*, Argonne National Laboratory, and *Ronald Ruth*, Stanford Linear Accelerator Center (cosponsored by the Division of Physics of Beams), will be on Sunday, April 6, 2:30 to 5:30 pm. Chaired by *Andrew Sessler*, Lawrence Berkeley Laboratory, it will feature the following speakers and topics: *Elizabeth Paris*, Argonne National Laboratory, “The Birth of Lepton Colliders in Italy and the United States,” *John Rees*, SLAC, “The CEA Bypass Project and SPEAR,” *Albert Hofmann*, CERN, “Colliders Come of Age in Europe: PETRA and LEP,” *Burton Richter*, SLAC, “The First Linear Collider.”

“Benjamin Franklin, Civic Scientist,” organized by *Michael Riordan*, UC Santa Cruz, and *Bo Hammer*, Franklin Institute (cosponsored by the Forum on Physics and Society), is scheduled for Monday, April 7, 10:45 am to 1:45 pm. The session chair will be *Michael Riordan*, UC Santa Cruz, and speakers will be *Claude-Anne Lopez*, Yale University, “At the Dawn of Science,” *Dudley Hershbach*, Harvard University, “Ben Franklin: A Curiosity-Driven Scientist, a Service-Driven Citizen,” *James E. McClellan III*, Stevens Institute of Technology, “Franklin: Science, Politics, and France,” *Neal Lane*, Rice University, “The ‘Founding Father’ of Civic Science,” *Bo Hammer*, Comments and Discussion.

The final session is **“The History of Solar Neutrinos,”** organized by *Baha Balantekin*, University of Wisconsin, and *John Wilkerson*, University of Washington (cosponsored by the Division of Nuclear Physics), Tuesday, April 8, 8:00 to 11:00 am. The session chair will be *Hans Frauenfelder*, Los Alamos National Laboratory, with the following speakers and topics: *Allan Franklin*, University of Colorado, “Where are the Neutrinos? The Early History of the Solar Neutrino Problem,” *John Bahcall*, Institute for Advanced Study, “History of the

Solar Neutrino Problem: A Theoretical Perspective,” *Kenneth Lande*, University of Pennsylvania, “The Homestake Experiment,” *Vladimir Gavrin*, Institute for Nuclear Research, Russian Academy of Sciences, “The Gallium Experiments,” *Yoji Totsuka*, University of Tokyo, “The Kamioka Experiments”

APS/AIP Award for History of Physics

As already noted in the recent email sent by Ken Ford to all FHP members, our fund raising efforts in support of a new History of Physics award, to be jointly offered by APS and AIP, is proceeding well. Of special note are two grants received from John and Elizabeth Armstrong. The first is an outright gift of \$30,000, and the second is a matching grant. Gifts of \$750 or more will be matched by John and Elizabeth Armstrong, to a total of an additional \$30,000. We have already received several gifts which satisfy this requirement. While we will at a later time approach the general FHP membership for contributions, we will be particularly pleased to receive gifts at this time which satisfy the matching requirement. These should be sent directly to APS through the Development Office, Darlene Logan, Director, One Physics Ellipse, College Park, MD 20740-3844. Her telephone number is 301-209-3224. Alternatively you should feel free to contact any member of the Award Committee for further information. The members are: Ben Bederson (Chair), Stephen Brush, Gloria Lubkin, Harry Lustig, Roger Stuewer, Michael Riordan and Spencer Weart, as well as Darlene Logan and Sarah Davis from the APS Development Office. Email addresses and telephone numbers are available through the APS membership directory.

- Benjamin Bederson, Award Committee Chair

Forum Business and Executive Committee Meetings

The annual Forum Business Meeting will be held at the April APS meeting in Philadelphia. The time and place will be posted on the FHP web site. The Forum Executive Committee will also meet at the April APS meeting. This meeting is for members of the Executive Committee and guests.

Call for Nominations

Nominations are invited for Forum officers to be elected in early 2004. Offices that will be open in 2004 are Vice-Chair, Secretary-Treasurer, and two Members-at-Large of the Executive Committee. Send nominations to the chair of the Forum Nominating Committee: Prof. Virginia Trimble, Physics Department, University of California-Irvine, Irvine, CA 92697; vtrimble@astro.umd.edu.

APS Fellow Nominations

Fellow nominations are due to APS by March 31, and the Forum Fellowship Committee must review those who are proposed, make a recommendation, and complete the nomination file before that time. Nina Byers is chair of the Forum's Fellowship Committee for 2002-2003. Any Forum member who wishes to nominate a candidate for Fellow in APS is invited to send her their suggestion(s), along with a c.v. and letter describing the candidate's achievements in history of physics. Send suggestions to Prof. Nina Byers, Department of Physics, UCLA, 405 Hilgard Ave, Los Angeles, CA 90024; nbyers@physics.ucla.edu.

Current Forum Officers

Elizabeth Urey Baranger, eub@pitt.edu, Executive Committee

Benjamin Bederson, ben.bederson@nyu.edu. Past Chair, Chair of Award Committee

Nina Byers, nbyers@physics.ucla.edu, Vice Chair, Chair of Fellowship Committee

William E. Evenson, evenson@byu.edu, Newsletter Editor, Chair of Publications Committee (*ex officio*)

Michael E. Fisher, claremon@ipst.umd.edu, Executive Committee

Kenneth W. Ford, kwford@verizon.net, Secretary-Treasurer, Chair of Membership Committee

Hans Frauenfelder, frauenfelder@lanl.gov, Chair

D. M. Greenberger, dansuzy@nyc.rr.com, Executive Committee

Gloria B. Lubkin, glubkin@aip.org, Forum Councillor

Elizabeth Paris, eparis@anl.gov, Executive Committee

Michael Riordan, michael@slac.stanford.edu, Chair-Elect, Chair of Program Committee

Daniel Siegel, dmsiegel@facstaff.wisc.edu, Executive Committee

Spencer R. Weart, sweart@aip.org, Director, Center for History of Physics (*ex officio*)

Request for Information about Memorial Sessions for Prominent Physicists

When readers of this *Newsletter* hear of memorial sessions being planned to honor prominent physicists, please notify Bill Evenson, Editor of the *History of Physics Newsletter*, and Spencer Weart, Director of the AIP Center for History of Physics, at the addresses below. We want to be able to notify others in the history of physics community and gather records of the physicist's life, as appropriate.

Bill Evenson: Department of Physics, Brigham Young University, Provo, UT 84602-4645; evenson@byu.edu.

Spencer Weart: Center for History of Physics, American Institute of Physics, One Physics Ellipse, College Park, MD 20740; sweart@aip.org.

APS and AIP News

Peer Review Materials for *Physical Review*

The Physical Review, published by the American Physical Society, has preserved peer review materials, including referee reports, on submitted articles for several decades. Microfilm records go back as far as 1938 and are essentially complete since about 1960. In the future, new material will be saved electronically.

This material is confidential and access is restricted. Individual requests to access material will be considered by the Editor-in-Chief as they are received. Material involving living people will not be released.

Requests should be sent to: Editor-in-Chief, American Physical Society, Box 9000, Ridge, NY 11961-9000.

- Stephen G. Brush, Chair, Committee to Advise the Editor of *Physical Reviews* on Preservation of and Access to Referee Reports

AIP Center for History of Physics

Grants-in-Aid for History of Modern Physics and Allied Fields (Astronomy, Geophysics, etc.)

NEW DEADLINES for receipt of applications: APRIL 15 and NOVEMBER 15 of each year.

The Center for History of Physics of the American Institute 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 \$2,500 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 (easily accessible from Washington, DC), or to microfilm papers or to tape-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 (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, a letter of no more than two pages describing your research project, and a brief budget showing the expenses for which support is requested to: Spencer Weart, Center for History of Physics, American Institute of Physics, One Physics Ellipse, College Park, MD 20740, 301-209-3174, fax: 301-209-0882, sweart@aip.org.

History of Physics Syllabi on the Internet -- Call for Syllabi

As an aid to teaching and studying the history of physics, and as an introduction to the vast literature in the field, the AIP Center for History of Physics has put together a collection of syllabi. With the kind permission of their authors, sample syllabi are exhibited on the Internet at www.aip.org/history/syllabi/. They feature courses taught at a variety of universities, including "Scientific Revolution," "History of Modern Physics," "Nuclear Age," "Science after

WWII,” and “Historical Experimentation.” If you are teaching a course on the history of physics or a related science such as astronomy, please visit the site and send your comments. And please send a copy of your syllabus or reading list, in any paper or electronic format, to Alexei Kojevnikov and Spencer Weart, chp@aip.org.

AIP Center for History of Physics Grants to Archives

The Center for History of Physics of the American Institute of Physics is pleased to announce its 2003 program of Grants to Archives. The grants are intended to make accessible records, papers, and other primary

sources which document the history of modern physics and allied fields (such as astronomy, geophysics, and optics). Grants can be used only to cover direct expenses connected with preserving, inventorying, arranging, describing, or cataloging appropriate collections. Expenses may include acid-free storage materials and staff salary/benefits but not overhead or other indirect costs.

The AIP History Center’s mission is to help preserve and make known the history of modern physics and allied fields, and the grant program is intended to help support significant work to make original sources accessible to researchers. Preference will

accordingly be given to medium-size or larger projects for which the grant will be matched by the parent organization or other sources. To apply send a letter of no more than three pages describing the nature and research significance of the collection(s), plan of work, and budget, along with preliminary inventory (if available) and staff vitae by July 1, 2003 to: Joe Anderson, Center for History of Physics, American Institute of Physics, One Physics Ellipse, College Park, MD 20740; fax 301-209-0882; rja@aip.org.

The 2003 grants are funded by the Friends of the Center for History of Physics. Revised grant guidelines will be posted soon at www.aip.org/history/grntann.htm.

Notes and Announcements

Howard Huff, Senior Fellow, International SEMATECH, has prepared a substantial historical paper, “From the Lab to the Fab: Transistors to Integrated Circuits,” to be presented at the 2003 International Conference on Characterization and Metrology for ULSI Technology, March 24-28, in Austin, and again at the ECS meeting on ULSI Process Integration III, April 28-May 2. This paper will be published in the conference proceedings for the March conference in the AIP conference proceedings series.

Huff also sent an obituary for **Else Kooi** (1932-2001). Kooi was co-inventor of the “local oxidation of silicon” (LOCOS) methodology, “the mainstay for MOS and CMOS integrated circuit (IC) manufacturing for more than thirty years.” He was Director of Philips Research Laboratories, Sunnyvale from 1979 until his retirement in 1992.

The seventh annual Seven Pines Symposium will be held in May, 2003, on the subject, “The Concept of the Vacuum in Physics.” A report will appear in the next issue of this *Newsletter*.

J. Willard Gibbs and his Legacy: A Double Centennial: New Haven, CT, 28 February 2003; Austin, TX, 3 March 2003; College Park, MD, 5-6 March 2003.

J. Willard Gibbs (1839-1903), Professor of Mathematical Physics at Yale University, was one of the most important American scientists of the 19th century, although his achievements were recognized in Europe before they became known in his own country. His formulation of the laws and concepts

of thermodynamics is a fundamental part of theoretical physics and physical chemistry; it has found widespread applications in research on the properties of matter and in engineering. In 1902, Gibbs published his classic book, *Elementary Principles in Statistical Mechanics*, in which, building on the work of Maxwell and Boltzmann, he established (and named) a new branch of theoretical physics. Statistical mechanics proved to be the best way to treat systems of a large number of atoms and molecules, as well as photons and other particles, especially when quantum effects play a crucial role. In addition, the technique of vector analysis, which Gibbs published in 1901, is widely used in calculations involving quantities that have spatial direction as well as magnitude.

The following sessions have been planned to celebrate the double centennial of Gibbs and statistical mechanics:

1. At New Haven, a symposium on Friday, February 28, 2003, 1-6 pm, sponsored by Yale University

2. At Austin, a symposium on Monday, March 3, 2003, sponsored by the Forum on History of Physics of the American Physical Society

3. At College Park, a two-part symposium on Wednesday and Thursday, March 5 and 6, 2003, 4-6 pm, sponsored jointly by the University of Maryland, through the Institute for Physical Science & Technology, the Committee on Philosophy & the Sciences, and the Chemical Physics Graduate Program; and by the National Institute for Standards and Technology.

For further information (regarding Session 1) contact Prof. Daniel Kevles, Department of History, Yale University, daniel.kevles@yale.edu, or (regarding Session 2) Prof. Michael E. Fisher, Institute for Physical Science & Technology, University of Maryland, claremon@ipst.umd.edu, or (regarding Session 3) Prof. Stephen G. Brush, Department of History and Institute for Physical Science & Technology, University of Maryland, brush@ipst.umd.edu.

“**Science and Values**,” a five-week institute for college and university teachers sponsored by the National Endowment for the Humanities, will be held June 23-July 25, 2003 at University of Pittsburg. Information can be obtained from Peter Machamer and Sandra Mitchell, Department of History and Philosophy of Science, University of Pittsburg, www.pitt.edu/~pkmach/valusci.htm. Application deadline is March 1, 2003.

Physics in Perspective. Most journals are targeted to a small group of scholars. That is not the case for the journal *Physics in Perspective*, which has now been published since early 1999 for a wide audience of historians, philosophers, physicists, and the interested public. The editors believe that scholarly papers written by historians of physics, philosophers of physics, and physicists themselves can be an effective means for bringing the ideas, the substance, and the methods of physics to non-specialists, provided jargon is avoided and care is taken in the writing.

Physics in Perspective is published quarterly. Besides articles and book reviews, the journal has two regular features: first, "The Physical Tourist," identifies sites for the traveler whose interests include artifacts from the history of physics, laboratories with historical significance, birthplaces of well known physicists, and the like; second, "In Appreciation" is written about a physicist by a student, first-hand acquaintance, or colleague. *Physics in Perspective* is available to members of the American Physical Society at the special subscription rate of \$35 per year plus \$10 shipping and handling. Additional information can be found at the Birkhäuser Verlag website, www.birkhauser.ch/journals/1600/1600_tit.htm.

First-hand accounts of participants in interesting and important research projects – experimental, theoretical, or computational – often become documents of historical import. The editors of *Physics in Perspective* welcome such first-hand accounts and hereby extend an invitation to physicists, and particularly to members of the Forum on History of Physics, to submit manuscripts for publication. (John S. Rigden, American Institute of Physics, One Physics Ellipse, College Park, MD 20740, jsr@aip.org and Roger H. Stuewer, Tate Laboratory of Physics, University of Minnesota, 116 Church Street SE, Minneapolis, MN 55455, rstuewer@physics.spa.umn.edu).

The Basic Prize in History of Science.

The Basic Prize is intended to encourage young scholars and to communicate the importance and interest of the subject to an intelligent general readership. The Prize is open to any new scholar in the fields of History of Science, History of Technology, History of Medicine, and closely related areas. Only first-time authors will be considered. To be eligible, manuscripts must not be under contract with any publisher at the time the award is decided.

Selection Criteria: The Prize will be awarded for the best book-length manuscript submitted during each year. Manuscripts must be unpublished and must either fall clearly within the subject area or be closely relevant to it. Consistent with the goals of the prize, manuscripts will be evaluated both for their scholarly contribution and for quality of writing.

The Prize will consist of publication by Basic Books; a \$7,500 advance against royalties; and a \$1,000 stipend for travel to the annual convention of the History of

Science Society.

Guidelines for Submission: The next deadline for receipt of manuscripts is 30 June 2003. Submit two (2) copies of the manuscript, one to Basic Books and one to any one judge listed below. This year's Prize will be announced at the 2002 meeting of the History of Science Society.

Judges: Norton Wise, Department of History, UCLA, Los Angeles, CA 90095. Mary Jo Nye, Department of History, Milan Hall 306, Oregon State University, Corvallis, OR 97333. Robert J. Richards, Morris Fishbein Center for The History of Science, University of Chicago, Chicago, IL 60637. David Lindberg, Department of History of Science, 7143 Social Sciences Bldg., University of Wisconsin, Madison, WI 53706.

Send one copy of the manuscript to: Basic Books - History of Science Prize, 387 Park Avenue South, 12th Floor, New York, NY 10016. For more information email william.frucht@perseusbooks.com.

Cushing Prize in History and Foundations of Physics.

A prize has been established in memory of James T. Cushing (1937-2002), who at the time of his death was a Fellow of APS and a long-time member of the Forum. The annual prize of \$1,000, honoring Cushing and his contributions to the history and philosophy of physics, will be awarded for significant new work by younger scholars in the history and philosophical foundations of modern physics. The 2002 Call for Nominations can be found at www.nd.edu/~cushpriz/Nomination.htm.

Contributions to the endowment for the prize are being accepted at Cushing Memorial Prize, Program in History and Philosophy of Science, University of Notre Dame, 346 O'Shaughnessy, Notre Dame, Indiana 46556. For more information, please contact Don Howard at 574-631-7547 or Cushing.Prize.1@nd.edu.

The Annals of Science Prize for Junior Scholars

is offered each year to the author of an unpublished essay in the history of science or technology. The article must not be under consideration for publication elsewhere. The prize, supported by Taylor and Francis, is intended for those who have been awarded their doctorate within the past four years, and for doctoral students. Essays should be submitted to the Editor in a form suitable for publication in *Annals of Science* and may be in English, French, or German. Essays should be between 6,000 and 9,500

words in length, including footnotes. The winning essay will be published in the journal and the essay's author will be awarded \$500. Papers should be submitted by 1 September. For further information, visit the Taylor and Francis Web site at www.tandf.co.uk.

The Singer Prize, of up to £300, is awarded by the British Society for the History of Science (BSHS) every two years to the writer of an unpublished essay based in original research into any aspect of the history of science, technology or medicine. The Prize is intended for younger scholars or recent entrants into the profession. The Prize may be awarded to the writer of one outstanding essay, or may be divided between two or more entrants. Candidates must be registered for a postgraduate degree course or have completed such in the last two years. Entry is not limited to British nationals. For further information, contact Paula Gould, BSHS Media Officer; Tel/Fax: 01244 680044; Paula.Gould@absw.org.uk; www.man.ac.uk/Science_Engineering/CHSTM/bshs/bshssin2.htm.

The Ivan Slade Prize is awarded by the British Society for the History of Science biennially for an essay (published or unpublished) making the best critical contribution to the history of science. The 2001 competition has been awarded to Professor Yves Gingras, of the Université du Québec à Montréal, for an essay on "The Social and Epistemological Consequences of the Mathematization of Physics." It offered a critical reevaluation of the unintended consequences of Newton's conjectures. Professor Gingras argues that, prior to Newton, everybody could understand a mechanical block universe more or less intuitively. Before Newton's work, knowledge had always been manifest – simply by reading the Book of Nature all knowledge would be revealed – especially in theistic societies. With Newton's use of mathematics in his physical theories, many people could no longer understand or comprehend the world. That is, for many learned people, Newton's scientific innovations led to an 'un-understandability' of the world in which they lived.

Society For The History Of Astronomy is being formed in Britain. Information is available from Stuart Williams, flamsteed@v21mail.co.uk, or www.historyofastronomy.fsworld.co.uk.

The Andrew W. Mellon Travel Fellowship Program is intended to assist scholars at both pre-doctoral and post-doctoral levels. The program is designed to provide travel expenses and a reasonable per diem to researchers who reside outside the central Oklahoma area, and who have well-defined research projects that can be served by the holdings of the History of Science Collections. Support is available for qualifying projects for periods ranging from two to eight weeks. It is expected that pre-doctoral applicants will be graduate students actively engaged in projects for the M.A. thesis or Ph.D. dissertation that are formally approved at the student's home institution. For information, please contact: The Andrew W. Mellon Travel Fellowship Program, The University of Oklahoma, Bizzell Library, 401 West Brooks, Room 521, Norman, OK 73019; mogilvie@ou.edu, kmagruder@ou.edu; <http://libraries.ou.edu/depts/histscience/mellon/index.html>. Proposals will be evaluated three times each year, with deadlines for submission October 15, February 15, and May 15.

The American Philosophical Society Library Resident Research Fellowships 2003-2004. The American Philosophical Society Library accepts applications for short-residential fellowships for conducting research in its collections. The Society's Library, located near Independence Hall in Philadelphia, is a leading international center for research in the history of American science and technology and its European roots, as well as early American history and culture. Outstanding historical collections and subject areas include the papers of Benjamin Franklin; 18th and 19th-century natural history; western scientific expeditions and travel, including the journals of Lewis and Clark; polar exploration; history of biochemistry, physiology, and biophysics; and history of physics.

The fellowships are intended to encourage research in the Library's collections by scholars who reside beyond a 75-mile radius of Philadelphia. The fellowships are open to both U.S. citizens and foreign nationals who are holders of the PhD or equivalent, PhD candidates who have passed their preliminary exams, and independent scholars. Applicants in any relevant field of scholarship may apply. The stipend is \$2,000 per month, and the term of the fellowship is a minimum of one month and a maximum of three, taken between June 1,

2003 and May 31, 2004. Fellows are expected to be in residence for four consecutive weeks during the period of their award.

Address applications or inquiries to: Library Resident Research Fellowships, American Philosophical Society Library, 105 South Fifth St., Philadelphia, PA 19106-3386, (215) 440-3400. Applications must be received by March 1, 2003. Notice of awards will be mailed after May 1, 2003.

Bakken Research Travel Grants: Beginning in 2003, the Bakken Library and Museum in Minneapolis will offer research travel grants for the purpose of facilitating scholarly research in its collection of books, journals, manuscripts, prints, and instruments. The focus of the Bakken's collection is on the history of electricity and magnetism and their applications in the life sciences and medicine. Significant holdings include the writings of natural philosophers, scientists, physicians, electro-therapists, and electrophysiologists of the 18th, 19th, and early 20th centuries. The instrument collection includes electrostatic generators, magneto-electric generators, induction coils, physiological instruments, recording devices, and accessories. See www.thebakken.org for more details of the collections.

Grants up to a maximum of \$500 (domestic) and \$750 (foreign) are to be used to help to defray the expenses of travel, subsistence, and other direct costs of conducting research at The Bakken. The minimum period of residence is one week. There will be two deadlines: February 1, 2003 and July 1, 2003. For further details and application guidelines, contact Elizabeth Ihrig, Librarian, The Bakken Library and Museum, 3537 Zenith Avenue South, Minneapolis, MN 55416 (612-926-3878, ext. 227; fax: 612-927-7265; ihrig@thebakken.org; www.thebakken.org).

Bakken Visiting Research Fellowships: Each year, the Bakken Library and Museum in Minneapolis offers visiting research fellowships for the purpose of facilitating scholarly research in its collection. The fellowship is a maximum of \$1,500 and is to be used to help to defray the expenses of travel, subsistence, and other direct costs of conducting research at the Bakken. The minimum period of residence is two weeks. The next deadline is February 15, 2003. Preference will be given to researchers who are interested in collaborating with The Bakken on exhibits or other programs. For further details and application guidelines, please contact Elizabeth Ihrig,

Librarian, at the address in the above note.

Smithsonian Institution Libraries Resident Scholar Programs 2004: The Smithsonian Institution Libraries (SIL) offers two programs for scholars to use SIL Special Collections for the calendar year 2004. Each program awards stipends of \$2,500 per month for up to six months. Historians, librarians, doctoral students, and post-doctoral scholars are welcome to apply. Scholars must be in residence at the Smithsonian.

Dibner Library Resident Scholars will do research in the Dibner Library of the History of Science and Technology. The Dibner Library specializes in the physical sciences and technology, and contains books and manuscripts from the 15th to the 20th centuries. Subject areas include mathematics, astronomy, classical natural philosophy, theoretical physics (up to the early 20th century), experimental physics (especially electricity and magnetism), engineering technology (from the Renaissance to the late 19th century), and scientific apparatus and instruments. This award is supported by The Dibner Fund.

Baird Society Resident Scholars will do research in other SIL Special Collections located in Washington, DC and New York City. This award is supported by the Smithsonian Libraries Spencer Baird Society.

Deadline for applications is March 1, 2003. For application materials and further information about SIL Special Collections visit: www.sil.si.edu, write to Smithsonian Institution Libraries Resident Scholar Programs, P.O. Box 30712, NMAH 1041 MRC 672, Washington, DC 20013-7012 (202-357-1568), or email: libmail@sil.si.edu.

NASA History: News and Notes is published quarterly by the NASA History Division. You can receive *NASA History: News and Notes* via email. To subscribe, send a message to domo@hq.nasa.gov. Leave the subject line blank. In the text portion simply type "subscribe history" without the quotation marks. You will receive confirmation that your account has been added to the list for the newsletter and to receive other announcements that may interest you. The latest issue of this newsletter is also available on the web at www.hq.nasa.gov/office/pao/History/nltrc.html.

The Dictionary of Nineteenth-Century British Scientists (www.thoemmes.com/dictionaries/science_dic.htm) is one of the latest titles in the series of biographical dictionaries produced by Thoemmes Press, an independent publisher based in Bristol, UK. 85% of the 1300 entries to be included in this dictionary have now been commissioned, and the title is on course for publication in June 2004. The General Editor, Bernard Lightman, York University, Toronto, is looking for individuals to contribute to the project. For a full list of entries that still require contributors, please visit www.thoemmes.com/dictionaries/sci_wanted.htm. For more information on the project, please visit www.arts.yorku.ca/human/lightman/research.html. If you would like to participate in this project, please contact Bernard Lightman (lightman@yorku.ca).

Knowledge, Technology & Policy issue on "Science Wars:" Vol. 15, Nos. 1&2 is just out, www.moted.org/kt&p/15-1.htm. The issue includes "The Academic Brand of Aphasia: Where Postmodernism and the Science Wars Come From" by James Drake. Drake's article tracks down the origins of cultural relativism, political correctness, multiculturalism, de- and constructivism, etc. Subscriptions or single copies can be obtained via links from the web site or from Transaction Publishers at 888-999-6778 or orders@transactionpub.com.

Conferences

21st Annual Mephistos Conference, a Graduate Student Conference on the History, Philosophy, and Sociology of Science, Technology, and Medicine will be held 6-8 March 2003 at the University of Wisconsin-Madison. For more information visit www.philosophy.wisc.edu/mephistos2003/mephistos.htm.

"Discovering the Nanoscale" conference will be held 20-23 March 2003 at the University of South Carolina, Columbia, and 10-12 October 2003 at the Technische Universität Darmstadt, Germany. Philosophers, historians, sociologists of science and technology will explore the significance of nanoscale research. The discussions will begin in Columbia, SC and continue six months later in Darmstadt, Germany. For more information concerning topic and format visit www.cla.sc.edu/Phil/scistud/call.html.

"Technologies/Moralities: The Ethical Grammar of Technological Systems," workshop to be held March 28-29, 2003, in Blacksburg, VA, with guest participants Profs. Andrew Feenberg and Brian Martin. The Graduate Students of Virginia Tech's Center for Science and Technology Studies are hosting a workshop examining the intersections (or dual tracks) of morality and technology, and what people can do about them. For more information see www.cis.vt.edu/sts/NEmain.htm.

International Conference on "Thematic and Stylistic Elements in Scientific Thought," April 3 to 5, 2003, to be held at the University Mohammed V in Rabat, Morocco, partly in recognition of the 30th anniversary of the publication of Gerald Holton's *Thematic Origins* book.

The Canadian Society for History and Philosophy of Science (CSHPS) is holding its annual conference in Halifax, Nova Scotia, on 29-31 May 2003. Information about Congress registration and accommodation can be found at the Humanities and Social Sciences Federation of Canada web site. Canadian Society for History and Philosophy of Science: www.ukings.ns.ca/cshps/. Congress of the Social Sciences and Humanities: www.hssfc.ca/.

Quantum Theory: Reconsideration of Foundations-2, an international conference, June 1-6, 2003, at the International Center for Mathematical Modeling [in physics, technique and cognitive sciences], Vaxjo University, Sweden, www.msi.vxu.se/aktuell/konferens/Quantum.pdf. Supported by EU-network: "Quantum Probability and Applications." Organising committee: H. Barnum (Los Alamos Lab., USA), C. Fuchs (Bell Labs., USA), R. Hudson (Nottingham U., UK), A. Khrennikov (Vaxjo U. Sweden).

Invited speakers: L. Ballentine (Simon Fraser U., Canada), O. Barndorff-Nielsen (MaPhySto, Aarhus, Denmark), H. Barnum (Los Alamos Lab.), V. Belavkin (Nottingham U., UK), V. Belokurov (Moscow U., Russia), K.F. Berggren (Linköping U., Sweden), C. Fuchs (Bell Labs., USA), I. Helland (Oslo U., Norway), B. Hellsings (Chalmers, Gothenburg, Sweden), K. Hess* (Beckman Inst., Urbana-Champaign, USA), A. Holevo (Steklov Inst., Moscow, Russia), G. 't Hooft* (U. of Utrecht, Netherlands), R. Hudson (Nottingham U., UK), A. Khrennikov (Vaxjo

U., Sweden), E. Loubents (Moscow Inst. of Electronics, Russia), S. Stenholm (KTH, Stockholm, Sweden) K. Valeev (Inst. of Physics and Tech, Moscow, Russia), I. Volovich (Steklov Inst., Moscow, Russia), ... *- to be confirmed

The main aim of this conference is to reconsider foundations of quantum theory. The following problems will be discussed during the conference: 1) Analysis of the creation of the quantum formalism: quantum probability; quantum logic, quantum information. 2) Interpretations of wave function, relation to foundations of probability theory. Superposition principle. 3) Einstein-Podolsky-Rosen experiment. Bell's inequality: realism/nonlocality/contextualism? 4) Quantum information and teleportation, computing and cryptography: Shannon meets Bohr: Quantum Foundations in the Light of Quantum Information 5) Pilot-wave theory, nonlocality. De Broglie double-solution theory. 6) Local realistic models, hidden variables. 7) Quantum mechanics: a peculiarity of nature or just a special statistical method of the description of nature? 8) Evidences of violations of quantum mechanical description? 9) Contextual approach to quantum probability 10) Discrete deterministic quantum models.

The Conference will start 1 June (Sunday), arrival 31 May (Saturday), and lectures will finish at 13.00, 6 June. Abstract, 1 page + application form can be found at conference homepage. Any questions to our secretary: cecilia.eriksson@msi.vxu.se. Please send abstract/application form before 1 April.

Robert Hooke Tercentenary Conference will be held at The Royal Society, London, 6-10 July, 2003. Keynote speakers are Michael Nauenberg (UC-Santa Cruz) on *Robert Hooke's Dynamics*, Jim Bennett (Museum of the History of Science, Oxford) on *Robert Hooke and Scientific Instrumentation*, Moti Feingold (Cal Tech) on *Robert Hooke: Gentleman of Science*, Jacques Heyman (U of Cambridge) on *Hooke and Bedlam*.

Robert Hooke (1635-1703) was a true polymath. Author of the influential *Micrographia* (1665), he was one of the leading natural philosophers of his day. As an inventor, he was second to none. He also played a major role in the rebuilding of London after the Great Fire, while his diaries give a revealing picture of his lifestyle and milieu in the Restoration metropolis.

This major international conference, organized under the auspices of Gresham College, London, and co-sponsored by The Royal Society, will give attention to all aspects of Hooke's life and work.

Those who would like to attend or wish additional information should correspond with the administrator, Mrs Julie Jones (julie.jones6@btinternet.com) or telephone her (01235 762744). Information and registration details can also be obtained from the Gresham College website at www.gresham.ac.uk/hooke.

Vienna International Summer University 2003: "Biological and Cosmological Evolution," Vienna, July 14-27, 2003, organized by the University of Vienna and the Institute Vienna Circle. This is a two-week high-level summer course on questions about evolutionary aspects in physics and genetics from a comparative and interdisciplinary point of view.

Main Lecturers: Karl Sigmund (U of Vienna), Robert M. Wald (U of Chicago), Eörs Szathmáry (Eötvös Loránd U, Hungary). Assistant Lecturer: Daniel Holz (UC-Santa Barbara).

Application deadline January 15, 2003. (Later applications may be considered if space is still available.) For further information, contact Professor Friedrich Stadler, Friedrich.Stadler@univie.ac.at or consult the IVC's Web site: ivc.philo.at/VISU or the University of Vienna's Web site: www.univie.ac.at (click Vienna Summer University).

Panel on "20th Century Physics, International Human Rights Legislation, and Conceptions of Human Agency," in the Association of Social Anthropologists Decennial Conference, University of Manchester, 14-18 July, 2003, organized by Stephanie Koerner (University of Manchester), les1.man.ac.uk/sa/ASA/Decennial.

The Seventh International History, Philosophy and Science Teaching Conference will be held in Winnipeg, Manitoba, July 30-August 3, 2003. The conferences are attended by educators, school teachers, scientists, historians, philosophers and cognitive scientists. Among confirmed presenters at the 2003 conference are Trevor Levere (HPS, U. of Toronto), Hans von Baeyer (Physics, College of William & Mary), Peter Machamer (HPS, U. of Pittsburgh), Nancy Brickhouse (Education, U. of Delaware), Cathleen Loving (Education, Texas A&M

University), Jonathon Osborne (Education, King's College) and Peter Slezak (HPS, U. of New South Wales). Further details of the conference can be found at the conference web site at www.ihpst.org. Paper proposals (500 words) need to be to the conference chair by April 1, 2003. The Conference Chair is Prof. Arthur Stinner, Faculty of Education, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2N2; stinner@cc.umanitoba.ca.

Workshop on "The Science of Complexity: Chimera or Reality?" is scheduled for September 2-5, 2003, in Arcidosso, Italy. This biennial workshop will have sessions on physics, biology, economical and social sciences, and history and philosophy of science. Those interested in attending should communicate their intent to participate not later than April 30, 2003. Send a brief abstract if you desire to give a short talk to the workshop. Send responses and inquiries to cerrai@dm.unipi.it, fax: 0502213224.

History of Science Society, 2003: 20-23 November in Cambridge, MA. Information can be found at www.hssonline.org. In 2004 HSS will meet in Austin, TX, 18-21 November.

Mundi Subterranei: Scientific Instrument Collections in the University, an international symposium at Dartmouth College, 24-27 June 2004, co-sponsored by the Scientific Instrument Commission and Dartmouth College, Hanover, NH.

Like many institutions around the world, Dartmouth is currently reorganizing and cataloguing its collection of historic scientific instruments, one of the oldest and largest at a North American university. Taken individually, such collections present unique windows into the role of instruments in higher education and in transmitting scientific knowledge to public audiences. Taken collectively, they represent a vast scholarly resource that is still largely hidden from view and under-appreciated.

With this in mind, Dartmouth will host a conference in June of 2004, focusing on the theme of instrument collections in academic institutions. We hope 1) to encourage the development of a network among these collections, 2) to provide a forum to discuss practical problems that pertain to such collections, including cataloguing, web exhibits, storage and exhibition space, safety issues such as potentially toxic substances, and the profile of such collections on

campus and their use in teaching and research, 3) to facilitate presentation of scholarly papers and posters relating to scientific instruments, their histories and the collections in which they reside.

Parts of the Dartmouth Collection will be on display and the Shattuck Observatory (1853) will be open. In addition, excursions are planned to the Precision Museum in Windsor, Vermont, and to turret telescopes in Springfield, Vermont. For those who wish to explore other nearby instrument collections, the Harvard collection in Cambridge and the University of Vermont collection in Burlington are each about 2 hours away by auto.

For further information, to express interest, or to receive the second circular, contact Frank Manasek, francis.j.manasek@dartmouth.edu.

22nd International Congress of History of Science: July, 2005, Beijing, China. See <http://2005bj.ihns.ac.cn>.

Web Resources

History of Physics links: The AIP Center for History of Physics posts a diverse set of web links and updates them regularly at www.aip.org/history/web-link.htm.

AAAS History and Archives Website: The American Association for the Advancement of Science has launched a new AAAS History and Archives website at archives.aaas.org.

Guide to the History of Science. The History of Science Society maintains a guide to people and programs at www.hssonline.org/guide.

The British Society for the History of Science has a newly redesigned and expanded website at www.bshts.org.uk. The Society now has an expanded links directory at www.bshts.org.uk/links, covering journals, societies, lists, museums and online resources by subject area. An updated BSHS Guide to History of Science Courses in the UK can be found at www.bshts.org.uk/courses.

Electricity in Life: A Bibliography of Secondary Literature on the History of Electricity and Magnetism in Medicine and the Life Sciences is available online from The Bakken Library and Museum. The bibliography, at www.thebakken.org/research/bibliography-on-electricity-in-life.htm, includes

760 secondary works that constitute a major resource for scholars.

An online student guide to the History of Science titled *Horus Gets in Gear: A Beginner's Guide to Research in the History of Science*, by Professor Ronald Tobey of the University of California-River-

side is at www.horuspublications.com/guide/tp1.html. Send any corrections or suggestions to Professor Tobey at the University of California-Riverside, Department of History, Riverside, CA 92521-0204.

Evolution of the Solar System by Hannes Alfvén and Gustaf Arrhenius (NASA SP-345,

1976) is on-line at history.nasa.gov/SP-345/sp345.htm. While this volume on planetary science includes some scientific equations, it also includes many diagrams and images, and the authors strove to make the material understandable to the educated lay reader.

Forum Elections

Please vote for Vice Chair, two Members-at-Large of the Executive Committee for three-year terms, and one Member-at-Large for a two-year term to replace Per Dahl, who had to resign. If you have email registered with APS, you will receive a message inviting you to vote electronically, as authorized by the FHP Executive Committee. If not, you should have received a paper ballot by mail. If you want a paper ballot but have not yet received one, please email your request, including your mailing address, to kwford@verizon.net or contact Kenneth W. Ford, 729 W. Westview Street, Philadelphia, PA 19119-3533, 215 844-8054. **The closing date of the election is March 1 – ballots must be received by that date to be valid.** Brief resumes and statements from the candidates begin on this page. The candidates are

For Vice-Chair. Vote for ONE:

Allan Needell, Smithsonian Air and Space Museum

Robert Romer, Amherst College

For Executive Committee Members-at-Large, three-year terms. Vote for TWO:

Ilana Harrus, NASA Goddard

Mariet Hofstee, Colorado School of Mines

Gerald Holton, Harvard University

Michael Nauenberg, UC Santa Cruz

For Executive Committee Member-at-Large, two-year term. Vote for ONE:

Harry Lustig, City College and APS, retired

W. Patrick McCray, AIP History Center

Nominees for Vice-Chair

Allan A. Needell is Curator of Human Space Flight in the Space History Division

of the Smithsonian Institution's National Air and Space Museum (NASM). He has published on the history of physics, the origins of American national laboratories, and government/science relations. He has recently completed a study of the career of a major American science administrator, *Science, Cold War and the American State: Lloyd V. Berkner and the Balance of Professional Ideals* (Routledge, 2000).

Needell joined the National Air and Space Museum in 1981, when he led the museum's efforts to commemorate the twenty-fifth anniversary of the beginning of space flight, and edited a collection of essays: *The First 25 Years in Space: A Symposium* (Smithsonian Press, 1983; paperback, 1989). He is responsible for the museum's manned space flight collection, Mercury through Apollo, and is currently leading a multi-year effort to preserve one of the remaining Saturn V launch vehicles and working on a study of the Apollo fire of January 1967 and its impact American science and technology policy.

From 1978-81, Needell served as associate historian at the Center for History of Physics, American Institute of Physics, where he had research and staff responsibilities for a three-year, federally funded project to investigate and recommend ways of improving the identification and preservation of records documenting the history of the U.S. Department of Energy's research laboratories.

From 1999-2002 he served as Chairman of NASM's Space History Division.

Needell was born in Paterson, New Jersey in 1950. He has degrees from Cornell University (BA Physics, 1972) and Yale University (PhD History of Science, 1980). He is married and lives in Washington DC with his wife and two children.

Statement: As Vice Chair, Chair-Elect and then Chair of the Executive Committee of the APS History Forum my major goal would be

help continue and expand communications between the physics, historical and museum communities. I sincerely believe that the professional interests and public responsibilities of all three communities intersect at various places in many ways. I believe that my museum and the Smithsonian can benefit greatly from close association with the efforts of physicists to preserve, understand and celebrate their history and accomplishments.

A secondary goal would be explore possible ways that the history of physics (and the expertise and experiences of its practitioners and supporters) might be made more accessible and useful to national policy makers in all branches of the federal government. I recognize that, quite independent of the APS History Forum, the professional physics community plays an active role in the policy arena. In my view, there may well be instances when the perspective that one would hope derives from the consideration of historical issues and contexts could be valuable both for policy makers and for those professional physicists who venture into the policy arena. It seems to me that the History Forum might well play a useful, if yet not well-defined, role working to inform various participants in the policy-making process. In any case, it is a possibility I would be interested in exploring over the next four years.

Robert H. Romer received his Ph. D. from Princeton University in 1955, doing his thesis with Robert H. Dicke. Since that time he has been on the physics faculty at Amherst College, with visiting appointments at Duke University, Brookhaven National Laboratory, the Centre de Recherches sur les Très Basses Températures (Grenoble), and at Voorhees College (an historically black college in Denmark, S.C.). In addition to physics, from time to time he has taught first-year calculus and various general education courses, e.g.,

“Energy & the Environment,” “Light, Color, & Vision,” and “Energy & Entropy.” From 1955 to 1968, he taught in the “Physics & Calculus” course led by Arnold Arons, a course that was required of all first-year Amherst students. Beginning in 1970, he began to teach and write about energy. In 1972 he published a Resource Letter in the *American Journal of Physics* (AJP), and later two books: *Energy – An Introduction to Physics* (W. H. Freeman, 1976), and *Energy Facts and Figures* (Spring Street Press, 1985). He has done low temperature experiments on superconductivity as well as on helium 3 and helium 4. In 1982, he was appointed Book Review Editor of AJP, and from 1988 to 2001 he was the Editor of that journal.

Recently retired from the editorship of AJP, Romer is pursuing a variety of interests, in and out of physics. In collaboration with John King of MIT, he is engaged in “Physics on the Subway” (and on the buses): placing placards in lieu of advertisements on buses in the “Five College” area near Amherst (and later, they hope, on metropolitan subway systems), with provocative elementary physics questions for jaded riders, along with a website with hints, answers, and more questions. As a member of the curatorial staff at Historic Deerfield (Deerfield, Massachusetts), he is exploring a different kind of history, that of slavery in 18th-century Massachusetts. He has been a member of APS, AAAS, and AAPT since 1952 and is a fellow of APS and of AAAS.

Statement: Every physicist should know something about the history of our wonderful subject – not the superficial “tidbits of history” that were often offered to me as a student but the creative intellectual struggles, the blind alleys and the temporarily successful approaches, the competitions between various theories and experiments, and the ways in which decisions between competing explanations have been made in the past. Indeed, I believe that all physicists will have happier and fuller lives if they know more of our history. Physics teachers at all levels should be encouraged to teach their students not just the accepted results but also how we know what we know, and not only where physics is today but how we got to where we are and who the men and women are who did it. Including even a modest amount of serious history in our teaching can reveal to our students the fact that physics is a very human activity and can serve to

counteract the all too prevalent negative attitudes toward science. Of all the papers that I solicited and edited during my tenure as Editor of the *American Journal of Physics*, some of those of which I am most proud are history of physics papers. The Forum should continue to be a presence at APS meetings (regional as well as national meetings), and I would like to see the Forum cooperate with AAAS and AAPT in organizing sessions at the meetings of those societies. It is an honor to be nominated to be an officer of the Forum, and, if chosen, I look forward to supporting its important work.

Nominees for Members-at-Large of the Executive Committee (3-year terms, two to be elected)

Ilana Harrus: A native of France, Ilana Harrus came to the United States to attend graduate school in physics at Columbia University after having worked at CERN on a particle physics experiment (NA31). She switched to astrophysics soon after and did most of her Ph.D. research as a Smithsonian Predoctoral Fellow at the Center for Astrophysics in Cambridge, Massachusetts. She received her degree in 1997. She is currently a member of the XMM-Newton Guest Observer Facility at the Goddard Space Flight Center and is the press officer for the High Energy Astrophysics Division of the American Astronomical Society.

She is also involved in several Education and Public Outreach (EPO) projects. She is part of the XMM-Newton and the fledgling ASTRO-E2 EPO teams. She is also a member of the “Ask a High-Energy Astronomer” team, answering questions from the public, writing for the “Imagine the Universe” website, and participating in several smaller EPO projects at the Laboratory for High Energy Astrophysics.

Statement: History is a wonderful tool to teach physics: A class on quantum mechanics is often first a history class, a tale on how science progresses and how new theories emerge. My work in Education and Public Outreach taught me that teaching physics can be a difficult proposition and that history is one way to capture the attention of the audience. Telling the story of Mendeleev’s childhood to DC public school students before explaining the periodic table of elements proved a success because it helped the children relate to the personal aspect of the story instead of only being taught abstract facts.

Developing physics lesson plans with large historical components could be one of the ways to trigger children’s interest in science. History is a wonderful tool to teach physics but history of physics is more than that: As the success of the play “Copenhagen” and the debate it generated have demonstrated, history of science is also a means to look at larger problems which are still relevant today, for example the responsibility of scientists in society or the long-term impact of their research. The Forum for the History of Physics has a vital role to play in that context to help put this debate in its historical perspective. This has become even more important in the past year. It is a debate physicists should be part of (for example there was no physicist, but a journalist and a philosopher, in the recent President’s Council on Bioethics) and one in which FHP can play a vital role.

Mariet Hofstee received her Masters degree in 1986 and her Ph.D. 1992 (in nuclear physics) from the University of Groningen in the Netherlands. In high school she became interested in the history of astronomy and physics. During her undergraduate and graduate career she gave guest lectures and wrote articles for the Dutch youth astronomy club on historical topics and visited historical sites throughout Europe.

After receiving her PhD, she moved to the United States to pursue a professional career in nuclear astrophysics. Currently she is an assistant professor at the Colorado School of Mines, where she teaches courses in mechanics, modern physics, astronomy, astrophysics, and the history of physics, often paying extra attention to historical perspective.

Statement: I believe that knowledge and appreciation for the history of physics can help all students of physics better to understand where we are coming from, and where we are going. The retention and understanding of modern physics improves if it has been placed in its historical context. Having been educated in Europe, where many universities are older than the USA, this historical perspective is a natural part of my perception of physics. Although I have not had the opportunity to contribute to professional publications in the field of the history of physics, I do feel that I can make a valuable contribution to this Forum. As an officer I would like to work towards interesting a broader and younger audience in the his-

tory of physics. I believe this can be achieved by working together with groups such as the American Association of Physics Teachers and the Society of Physics Students. I have extensive experience with using the Web, which I can apply to spreading information about the history of physics.

Finally, I see an important role for the Forum in high-school education. While students are not likely to do a physics project for fun, they might do a history of physics project and thus get exposed to physics and physics role models.

Gerald Holton is Mallinckrodt Professor of Physics and Professor of the History of Science, Emeritus, at Harvard University. He obtained his Ph.D. at Harvard under P. W. Bridgman. His chief interests are in the history and philosophy of science, in the physics of matter at high pressure, and in the study of career paths of young scientists.

Among his books are *Thematic Origins of Scientific Thought* (2nd ed., 1988); *Science and Anti-Science* (1993); *Einstein, History, and Other Passions* (2000); two books with Gerhard Sonnert: *Who Succeeds in Science? The Gender Dimension* (1995), and *Ivory Bridges: Connecting Science and Society* (2001); *Physics, The Human Adventure: From Copernicus to Einstein and Beyond* (with Stephen Brush, 2001); and *Understanding Physics* (with David Cassidy and James Rutherford, 2002).

Holton is a Fellow of the American Physical Society, the American Philosophical Society, the American Academy of Arts and Sciences, and Fellow of several Learned Societies in Europe. Founding editor of the quarterly journal *Daedalus*, and founder of *Science, Society, & Human Values*, he has been on the editorial committee of *The Collected Papers of Albert Einstein* (Princeton University Press). Holton's institutional service on behalf of the history of physics has been long and extensive, ranging from the founding of AIP's Center for the History of Physics in 1962 to acting as chair of APS's Forum on History of Physics in 1992-3.

Statement: Among the Divisions and Forums of the APS, ours has become one of the largest. That testifies to the inherent interest and curiosity of physicists in their field's history; but it also presents our Forum with special challenges. If elected to the Executive Committee, I hope to be able to provide guidance on some of the main challenges. I put them in the form of questions (not in some order of importance, since

all seem to me important); in the first period of service I would have to learn more about the urgent needs and possible actions of the Forum.

1) Can we assure that at least at major APS meetings, and also at as many of the others as possible, there be a session of interesting papers on the history of physics? Some good meetings of this sort have of course been arranged in the past. Examples of others in recent years would have been reviews and assessments of the work and life of some major contributors whose recent centennial could have served as an organizing principle, e.g., Pauli, Heisenberg, Fermi. Similarly, sessions on the history of science of significant institutions, agencies, and industries; or of the way physical scientists acted on societal needs.

2) Might such events not also help to further increase our Forum's membership and effectiveness, e.g., in enlarging the horizon of physicists, especially those who are educators and might be induced to introduce some historical perspectives into their teaching? The recent report from the National Academy of Sciences, titled "National Science Education Standards," recommends just such an attempt (primarily at the high school level, but applicable beyond that): "In learning science, students need to understand that science reflects its history and is an ongoing, changing enterprise. The standards for the history and nature of science recommend the use of history of science in...science programs, to clarify different aspects of scientific inquiry, the human aspects of science, and the role that science has played in the development of various cultures."

3) Could we not be more helpful to physicists who would be interested in incorporating such an approach in their classes, especially the introductory ones? When I was President of the History of Science Society in the 1980s, a Committee on Education was formed which is providing syllabi and other helpful publications. Possibly our *Newsletter* and the *American Journal of Physics* Resource Letters could provide more help in that direction.

4) As *Physics Today*, *Science*, and the AIP releases show, there is again a sense of "crisis" among some physicists, with respect to the falling proportion of Bachelor's degrees and of American graduate students; the relatively slow growth in the number of female physicists; and the insufficiency of funding in some specialties. Might not his-

torians, some of whom have seen and studied a variety of "crises" in physical science in the past, provide some perspectives of trends, context, and solutions that worked then and might again be worth considering now?

5) Might the infrastructure of our Forum not be improved? Perhaps extra effort will be needed to assure that more of the suitable candidates for Fellowship of the APS be proposed for election; that endowment funds be searched for, for example, for the proposed prize or lectureship? And finally, on a personal note, I admit that I resisted the request to be a candidate in this election cycle because I wanted to have more "young blood" to be involved. However, I was told that all efforts in that direction failed. Therefore I shall be especially concerned with broadening the outreach to qualified younger physicists with historical knowledge and interests, to bring them as candidates into our governing structure.

Michael Nauenberg obtained his Ph.D. in Physics under Hans Bethe at Cornell University in 1959, and is currently an emeritus professor at the University of California, Santa Cruz where he has been teaching and doing research in physics since 1966. He has published articles in particle physics, quantum mechanics, nonlinear dynamics, phase transitions, and astrophysics. During the past decade he has been doing research in the history of physics and mathematics during the 17th and 18th centuries, and has published over a dozen articles on the works of Newton, Hooke, and Huygens. He has also been studying the early development of quantum mechanics, and has lectured on the contributions of Planck and Schrödinger.

Nauenberg is interested in promoting a deeper understanding of the early development of physics and astronomy, and for this purpose he has organized sessions on these topics for the History of Science Society and for the APS Forum on the History of Physics. Together with R. Dalitz he edited a book, *The Foundations of Newtonian Scholarship*, based on lectures given at a meeting which he helped organize at the Royal Society of London in 1997. His most recent contributions in this field consist of an article with J.B. Brackenridge on "Curvature in Newton's Dynamics," which appeared this year in *Cambridge Companion to Newton* (G. Smith and I.B. Cohen, Eds.), and an article, "Kepler's area law in Newton's *Principia*," to appear in *Historia Mathematica*.

In 2003 he will give a keynote address at the tercentenary for Robert Hooke to be held at the Royal Society of London. (For further information see <http://mike.ucsc.edu/~michael>)

Statement: The history of physics enriches the understanding of our field and its role in our culture and society. Biographies and studies of the original writings of great physicists provide us with new insights, and a deeper appreciation of their creative work. This subject also helps to inspire and motivate our students. As a member of the Executive Committee of the FHP I plan to have a more active role in promoting the study of the history of physics in our community.

Nominees for Member-at-Large of the Executive Committee (2-year term, one to be elected)

Harry Lustig is an emeritus professor of physics and Provost Emeritus at the City College of the City University of New York. He received his PhD degree in physics from the University of Illinois at Urbana-Champaign in 1953. During his 33-year career at CCNY he held visiting appointments at Stanford University and the Universities of Colorado, Illinois, and Washington. In 1964-65 he was a Fulbright Professor at University College, Dublin and from 1970 to 1972 he served as Senior Officer in the Department of Science and Technological Education at UNESCO, Paris.

His early research and publications were in the areas of theoretical nuclear physics and the Mössbauer effect. He has also contributed to the field of energy studies, where he is currently writing a book on the physics of solar energy, to science education, to international cooperation in science, and to the economics of scientific publishing.

During the last decade, Lustig's interests have increasingly focused on the history of physics. Among his publications in that field are, with E. M. Henley, a 1998 biographical memoir of Robert E. Marshak for the National Academy of Sciences, and "To Advance and Diffuse the Knowledge of Physics - an account of the one-hundred year history of the American Physical Society," *Am. J. Phys.* **68**, 595-636 (2000).

Lustig served as Treasurer of the American Physical Society from 1985 through 1996 and, in 1993-94, simultaneously as the Society's Acting Executive Secretary.

Statement: Physicist-historians seem to follow two career paths, that – to conjure up unlikely role models – of Herodotus, by making significant contributions as professional historians from the beginning of their professional lives, and that of Tacitus, by becoming admired historians later in life, after having made their mark in other fields. And then there are those of us, like me, who turn a life-long interest into an avocation, if not a cause, before they fade away.

It is the singular achievement of APS's Forum on the History of Physics to unite these three archetypes in the pursuit of two very worthwhile endeavors – to advance and diffuse the knowledge of the history of physics and to promote an interest in this history among our colleagues in the APS. FHP's increasingly effective invited paper sessions at Society meetings are making an invaluable contribution, as will the about-to-be-established APS Award in the History of Physics (on whose fund-raising committee I serve). The collaboration in the design and management of the Award between FHP and the American Institute of Physics' Center for History of Physics should animate further collaboration between the two entities.

I believe that I can make a contribution on the Executive Committee of FHP, not only because of my great interest in and modest contributions to the field, but also because I am wise in the ways of the APS. Before, during, and after my service as an operating officer, I served on many APS and AIP committees and governing bodies. While I was Treasurer, as part of a many-faceted effort to bring greater unity as well as diversity to the Society, I contributed to preserving and strengthening the annual meetings and, in particular, to enhancing the financial resources and standing of the forums.

W. Patrick McCray has been a historian at the Center for History of Physics, American Institute of Physics, in College Park, Maryland since 2000. He received his PhD in Materials Science and Anthropology from the University of Arizona in 1996, where he was named Teaching Assistant of the Year. His doctoral research examined the history of different materials technologies, specifically focusing on the history of glassmaking in the Renaissance. This work was partially funded by the Corning Museum of Glass and appeared as a book titled *Glassmaking in Renaissance Venice: The Fragile Craft*

(Ashgate Press, 1999).

Since 1997, McCray has been conducting research and writing about the history of postwar astronomy. With support from the NSF, he has supplemented traditional archival research with interviews of over 100 astronomers, telescope engineers, and other scientists. This research has led to his most recent book, tentatively titled *Winning the Sky: How Astronomers Built a New Generation of Big Telescopes* (Harvard University Press; forthcoming 2003). He and Robert W. Smith are also helping document NASA's plans to build the successor to the Hubble Space Telescope; this \$2 billion space observatory will be launched in 2010.

While at the Center for History of Physics, McCray has conducted over two dozen biographical oral-history interviews with notable physicists, astronomers, and science managers. These will serve as a resource for future scholars and scientists interested in the history of physics and allied fields. He has also contributed to several major Web-based exhibits aimed at high-school students and teachers, including ones on the life and times of Ernest O. Lawrence, the papers of great American physicists, and a major new exhibit on the history of cosmology. He has taught courses in the history of science and technology, including the history of physics, and is also active in other educational and outreach activities for the Center. McCray is a member of the Society for the History of Technology, the History of Science Society, and the Organization of American Historians.

Statement: My position at the Center for History of Physics allows me to interact closely with students, the public, academic historians, and scientists. As a member of the Executive Committee of the APS Forum on the History of Physics, I would work to expand the Forum's communication between these diverse communities. I am especially interested in helping students and historians appreciate the importance that physics, broadly construed, has had in shaping the history of the modern world. My recent work at the Center in developing Web exhibits and providing resources for students and teachers is one manifestation of my ambitions in this area. Finally, as a member of the Executive Committee, I would like to help foster a continued appreciation among physicists for the intellectual and social history of their discipline.

Book Reviews

True Genius: The Life and Science of John Bardeen, Lillian Hoddeson and Vicki Daitch (Joseph Henry Press, Washington, DC, 2002). xi+467 pp. ISBN: 0 309 08408 3, \$27.95 (cloth).

Reviewed by Howard Huff, International SEMATECH.

John Bardeen was among the earliest group of American physicists, in the early to mid-1930s, who received their introduction to the new Quantum Mechanics and their Ph.D training in America, in contradistinction to the 1920's when Robert Oppenheimer, John Slater and Isidor Rabi, for example, went to Europe for their training in the new Quantum Mechanics. Bardeen's research during the 1930's (Princeton for the Ph.D and Harvard for post-graduate work) was critical for his two Nobel Prizes in Physics, the only person to achieve such a distinction. The first Nobel was in 1956 for the invention of the transistor (with Walter Brattain and William Shockley) and the second in 1972 (with Leon Cooper and J. Robert Schrieffer) for his description of the fifty-year riddle of superconductivity (i.e., the persistence of an electric current in the absence of an electric field). The authors share a number of golden nuggets as regards Bardeen; the bibliography is especially rich and useful, while the notes and references to the interviews are exemplary, as expected from the senior author's previous legendary historical studies [1-2].

The authors interestingly note that students of current or future Nobel Prize winners often tend to achieve Nobel Prizes themselves, emulating a style, tactics, a methodology to enhance success. Indeed, both Bardeen's undergraduate teacher in Quantum Mechanics, John Van Vleck, and Eugene Wigner (Bardeen's PhD advisor at Princeton) received a Nobel Prize in Physics. In Wigner's case, the emphasis was to reduce the problem to "the simplest possible case so you can understand that before you go on to something more complicated." While other pre-eminent scientists had a similar approach, Bardeen was regarded as especially tenacious in pursuing this mantra, and exploring complementary approaches if the first approach proved unfruitful, as noted by his Nobel colleague Philip Anderson. Van

Vleck, who had transferred from the University of Minnesota to Harvard, was instrumental in facilitating Bardeen's acceptance as a Junior Fellow, even before he had received the PhD, reflecting both Bardeen's credentials and the influence of Van Vleck. Additional Nobel Prize teachers from whom Bardeen "learned a great deal from important leaders of modern physics" included Paul Dirac, Percy Bridgman and Peter Debye.

Bardeen's PhD research at Princeton considered the energy required to remove an electron from the surface of a metal into a vacuum, of immense importance at the time for the field of vacuum tubes. Bardeen examined the influence of the exchange and correlation potential in reducing the free-electron spillover into the vacuum at the surface (leaving an equal, spatially-fixed positive charge due to the positively charged ionic cores in the metal) and the resultant decrease in the surface dipole moment, a formidable problem which included elements of what later became known as many-body phenomena. Conyers Herring, a colleague of Bardeen at Princeton as well as later at Bell Telephone Laboratories (BTL) and Emeritus Professor of Physics at Stanford, has noted Bardeen's theory as valid to this day [3]. This was the beginning of the burgeoning of the utilization of Quantum Mechanics to real problems in solid-state physics (today referred to as condensed matter physics) [1], although elements had already begun in Germany in the late 1920's.

Bardeen pursued a number of topics in many-body theory during his post-doctoral research at Harvard in the late 1930's that had piqued his interest at Princeton. These areas included superconductivity, discovered in 1911 by Kammerlingh Onnes, which the brothers Fritz and Heinz London had hypothesized in 1933 as originating from the existence of an energy gap tending to zero as superconductivity approached zero, with increasing temperature or increasing magnetic field. The superconductivity enigma and the implications of an energy gap in the excitation spectrum were pursued by Bardeen, on and off, for the next fifty years. Although Bardeen, with Cooper and Schrieffer, resolved the problem in 1957, Bardeen continued pursuing additional aspects of the phenomenon throughout his later years.

After briefly serving on the academic faculty at the University of Minnesota subsequent to Harvard, Bardeen joined the Naval Ordnance Laboratory (NOL) in the Fall of 1940 in view of the upcoming war clouds. He eventually supervised 93 personnel in Acoustics, Magnetics, Graphical Analysis and Detection units, building on his previous industrial geophysics experience at the Gulf Research Laboratories in Pittsburgh between his undergraduate and Masters years at the University of Wisconsin and subsequent PhD studies at Princeton. Although this may not have been the most exciting time of Bardeen's career, his team's achievements were significant and recognized with his being awarded the Meritorious Civilian Service Award as a result.

With the war winding down, it became obvious to Mervin Kelly, BTL's research director, that the interdisciplinary teams that contributed to the development of radar at the Massachusetts Institute of Technology's Radiation Laboratory in conjunction with BTL and Western Electric, and the atomic bomb at Los Alamos (the Manhattan project) might be usefully emulated to solve the most perplexing technology issues facing BTL's parent company, American Telephone & Telegraph (AT&T). Bardeen joined Bell Laboratories in October, 1945 and was assigned to Shockley's semiconductor team in the Solid-State Physics group, which included Walter Brattain, an experimental physicist (an old bridge playing partner of Bardeen's from his Princeton days), Robert Gibney, a physical chemist, physicist Gerald Pearson and Hilbert "Bert" Moore, an electronics expert. Their goal was the replacement of the vacuum tube amplifier and the electro-mechanical relay type devices, utilized in the Bell System, by a solid-state amplifier and switch, respectively. Although the focus was the scientific comprehension of the relevant phenomena, the mission-oriented goal was clearly acknowledged.

Shockley's approach was to electrostatically modulate the conductivity of a semiconductor by the field effect; initial experimental results, however, were disappointingly small. Bardeen verified the correctness of Shockley's calculations and subsequently addressed the source of the discrepancy, resolving the issue in March, 1946 by his

introduction of the concept of surface states (theoretically anticipated in the late 1930s by Tamm and Shockley). The surface states arose as a result of the termination of the bulk material *at the surface* as well as extrinsic adsorbed chemical species on the material's surface. Bardeen's analysis not only explained the lack of a significant electrostatically-induced conductivity modulation at the material's surface, due to the trapping of a significant fraction of the electrons induced by the applied electric field, but a host of additional experimental observations which had accumulated between the late 1930's and mid 1940s [2]. The authors then describe the technical forest that Bardeen and Brattain encountered during the next year or so until they developed the methodology for negating the surface states (building on a suggestion by Gibney on November 17, 1947) and within one month (December 16, 1947) they had achieved their mission – a solid-state amplifier. This device was called the point-contact semiconductor amplifier, based on Bardeen and Brattain's discovery of transistor action; that is, the observation of a significantly enhanced (amplified and modulated) output voltage due to a variable source current, which resulted in their being awarded a patent in 1951. The device operated as a result of the electrical introduction of minority carriers – holes in this case – which previously could only be introduced by thermal energy or sufficiently energetic photons. Perhaps the most endearing description of Bardeen and Brattain's working relationship by the authors is noted as "Bardeen loved to peer over Brattain's shoulder and watch him prepare his experiments. Sometimes Bardeen would offer Brattain a hand in routine tasks, such as recording measurements or holding a piece of apparatus in place while Brattain soldered it." Indeed, Bardeen's handwriting of experimental data in Brattain's notebook has been previously described [2].

Shockley was not a co-patent holder on the transistor device and transistor action, inasmuch as his contribution, the field-effect principle, had in effect already been patented a decade earlier by Lilienfeld and, moreover, was a majority carrier device structure. Shockley was extremely disappointed, to say the least, and was spurred to his own "magic month" (December 23, 1947 – January 23, 1948), identifying the injection concept (January 23, 1948) and the bipolar junction (bulk) transistor, for which he received a patent in 1951. Interestingly, Shockley's

injection patent was awarded before either of the transistor patents. Nevertheless, all three men made seminal contributions, resulting in their joint Nobel Prize in Physics in 1956. The competitiveness that had ensued in early 1948, however, distinctly soured a previous collegial relationship, which was already becoming frayed in December, 1947. Bardeen re-initiated his studies in superconductivity at BTL and shortly thereafter continued these studies by joining his colleague Fred Seitz – author of the seminal 1940 textbook *Physics of Solids* – in the Physics Department of the University of Illinois at Champaign-Urbana, which in short order became the premier physics department in America.

Anticipating Lev Landau's theory of Fermi liquids and well aware of Richard Feynman's investigations into the superconductivity enigma "using all sorts of complicated field theory," Bardeen knew the race was on. Leon Cooper introduced the concept of electron pairing and J. Robert Schrieffer identified the wave function that described the electron coherence. Bardeen macroscopically pulled the various threads together, assigning Cooper, Schrieffer and himself explicit responsibilities to ensure the coherence of the approach with the host of experimental data, which nevertheless required "an intuitive leap." The theory accounted for the experimental data (i.e. the Meissner effect and related electromagnetic properties, the isotope effect, the kT energy being less than the electron-phonon-electron coupling energy and related thermodynamic phenomena, etc.) Their theory (now referred to as the BCS theory) was submitted on February 15, 1957 in a letter to *Physical Review* and presented in two post-deadline papers at the March, 1957 meeting of the American Physical Society in Philadelphia by Cooper (Schrieffer, having received word too late to attend the meeting and deliver one of the papers, was writing up his thesis in New Hampshire). Bardeen preferred his younger colleagues to present the results, "even to the extent beyond that which is due and also pushing young people as fast as they can to become professionals, and treating them as professional, and making them rely on themselves," Schrieffer noted in a description of the events. This comment is just one of the many gems distributed throughout the book, which en masse present a picture of Bardeen as a truly self-confident man in his knowledge and accomplishments! The experimentalists

were delighted with the BCS theory, while many theorists, who had also worked assiduously on the problem, were rather reticent and skeptical in their acceptance, requiring more definitive evidence. Nevertheless, the BCS theory was recognized with Bardeen, Cooper and Schrieffer being awarded the 1972 Nobel Prize in physics for solving the riddle of superconductivity, which was now realized to be a macroscopic quantum effect. The theory was later recognized as "among the 'big ideas' of physics, a theory applicable to problems in many areas of physics," such as superfluidity of nuclear matter and superfluid pairing of matter inside neutron stars.

The authors detail how Bardeen, especially desirous of his colleagues' recognition for their contributions, successfully established interest in the BCS theory being awarded the Nobel Prize in Physics. That is, he proposed the Nobel Prize in Physics for subsequent exceptional work by others – Leo Esaki for interband tunneling in p-n junction semiconductors, Ivar Giaever for tunneling through a thin oxide layer and Brian Josephson for supercurrent flow through a tunneling junction – and, indeed, the BCS theory and personnel were awarded the 1972 Nobel Prize in Physics. Subsequently, the 1973 Nobel Prize in Physics was shared by Esaki, Giaever and Josephson. Charles Slichter observed that "John was a very politically savvy person." Although Cooper noted upon his arrival at Champaign-Urbana that he "didn't like the geography" of this "corn-field place," he soon discovered the wonderful physics environment, charm and camaraderie of the physics department. Clearly, the Physics Department of the University of Illinois at Champaign-Urbana was a very collegial group.

So what does one do after two Nobels in Physics? Bardeen certainly had no intention to pontificate on this and that, as numerous other Nobel winners were prone to do, although he did "meet the social obligations that arose from his scientific stature," including service on a number of Presidential scientific commissions. Perhaps more significant was the expression "John will know," when knotty conundrums arose. Of course, there were errors, such as in the Brian Josephson case as to whether paired tunneling would occur through an insulating barrier, which the authors straightforwardly discuss, and Bardeen eventually recanted his opposition. Interestingly, and perhaps not surprisingly, was Bardeen's reaction to

invite Josephson to Illinois to further work out his theory, which resulted in Josephson writing his “now-famous paper on the second-order phase transition to the superfluid state.” Additionally, Bardeen also charged ahead into clarifying charge density waves (CDW) in the 1980s. Although initial successes became tempered by alternative approaches, explanations and some acrimonious exchanges, it is clear that doing physics was Bardeen’s great passion to the end of his days.

Or almost. What was most sad from this reviewer’s viewpoint was the passing of John’s enchanting wife Jane; their relationship simply was quite deep. On a more personal note, a cousin of this reviewer was a Bardeen PhD student in the late fifties, at the same time when the reviewer declined to attend the University of Illinois’ College of Engineering, often to his dismay in retrospect. So, while I have spent a weekend in the late 1960s with Brattain – certainly a garrulous individual – and a two-hour one-on-one discussion in the mid 1980s with Shockley – a most brutally frank person – perhaps I can take the liberty of associating myself spiritually with Bardeen. Although Bardeen was reticent compared to, say, Feynman, he certainly was not a timid or non-competitive person, as amply described by the authors in Bardeen’s sports endeavors, whether as a young man or later in golf as well as in physics. Perhaps Nick Holonyak, Bardeen’s colleague for forty years, as graduate student, professor and the first (and current) holder of the John Bardeen Chair Professor of Electrical and Computer Engineering and Physics at the University of Illinois at Champaign-Urbana, best summed up the essence of his mentor, “John Bardeen knew he was John Bardeen!”

[1] L. Hoddeson, E. Braun, J. Teichmann and S. Weart, *Out of The Crystal Maze – Chapters From the History of Solid-State Physics*, Oxford University Press (1992).

[2] M. Riordan and L. Hoddeson, *Crystal Fire – The Birth of The Information Age*, W.W. Norton & Company (1997).

[3] C. Herring, *Recollections From The Early Years of Solid-State Physics*, Phys. Today, April, 26-33 (1992).

Briefly Noted:

Scientifically Speaking: A Dictionary of Quotations, Carl C. Gaither and Alma E. Cavazos-Gaither, compilers, Andrew

Slocombe, illustrator (Institute of Physics Publishing, Bristol and Philadelphia, 2000) xiv+482 pp. ISBN: 0 7503 0636 X, \$29.99 (£19.99) paper.

This large collection of scientific quotations is organized by general subject from “Abstraction” to “Understanding.” Along the way we encounter such topics as “Administration of Science,” “Anti-Science,” “Beauty,” “Communication in Science,” “Experiment,” “Facts,” . . . “Science and Women,” “Truth,” etc. The quotations are generally interesting and well chosen to fit the compilers’ stated purpose: “to present quotations so that the reader can get a feel for the depth and breadth of science, and the visions and styles of scientists past and present.”

The illustrations are cartoons that nicely supplement the quotations, some connected to a particular quotation and others illustrating the general topic of the chapter. An extensive bibliography gives publication details for the sources of the quotations. Two indexes make it easy to find subjects by author and authors by subject.

This book is a useful addition to previous collections of quotations on science, with a somewhat broader base than those I have worked with previously.

Science in Translation: Movements of Knowledge Through Cultures and Time, Scott L. Montgomery (University of Chicago Press, 2000, 2002) xii+326 pp. ISBN: 0 226 53480 4, \$28 cloth (2000), ISBN: 0 226 53481 2, \$21 paper (2002).

This significant book consists of three parts: I. The Heavens through Time and Space: A History of Translating Astronomy in the West, II. Science in the Non-Western World: Levels of Adaptation, and III. The Contemporary Context: Realities of Change and Difference. The author is “a consulting geologist, writer, and independent scholar who worked as a part-time technical translator for more than a decade.”

In Part I he traces the translation of classic Greek science to medieval manuscripts, then to Syriac and Persian-Indian versions, to Arabic, and finally to the Latin versions through which this learning was finally handed down to the West. The importance of the intermediate Eastern cultures and languages in this process is examined and clarified, forcing a reevaluation of the sources of “Western civilization.” Part II deals primarily with the role of translation in the development of modern Japanese science. And

Part III brings in contemporary examples and issues in scientific translation today.

This important book gives new perspective on cross-cultural influences in the development of science from antiquity to the present.

Biography of Scientific Objects, Lorraine Daston, ed. (University of Chicago Press, 2000) x+310 pp. ISBN: 0 226 13672 8, \$19 paper.

This collection of essays has its origin in a conference on “The Coming into Being and Passing Away of Scientific Objects,” held in September 1995 in Berlin. They address the questions, “Why does an object or phenomenon become the subject of scientific inquiry? Why do some of these objects remain provocative, while others fade from center stage? And why do objects sometimes return as the focus of research long after they were once abandoned?”

Of particular interest to readers of this *Newsletter* could be essays by Jed Z. Buchwald, “How the Ether Spawned the Microworld,” and Rivka Feldhay, “Mathematical Entities in Scientific Discourse.” Other essays in this volume, while not so closely related to history of physics, give additional perspectives on scientific objects in fields from sociology, psychology, and anthropology to biology and medicine.

Books Received

The following books are among those received for review in recent months. Some of these still need reviewers. If you are interested, please email the editor: Bill Evenson, evenson@byu.edu.

Minding the Heavens: The Story of Our Discovery of the Milky Way, Leila Belkora (IOP, 2003).

Physicists of Ireland: Passion and Precision, Mark McCartney and Andrew Whitaker, eds. (IOP, 2003).

A History of Light and Colour Measurement: Science in the Shadows, Sean F. Johnston (IOP, 2001).

Schönland, Scientist and Soldier: From Lightning on the Veld to Nuclear Power at Harwell: The Life of Field Marshal Montgomery’s Scientific Adviser, Brian Austin (IOP, 2001).

Splitting the Second: The Story of Atomic Time, Tony Jones (IOP, 2000).

The Door in the Dream: Conversations with Eminent Women in Science, Elga Wasserman (Joseph Henry Press, 2000).