THE CARTOON MEDICINE SHOW

At the 2007 HSS Annual Meeting in Washington, David Cantor and Michael Sappol will screen rare animated cartoons from the National Library of Medicine collection.

In a health education film for men released in 1952, a cartoon character called Ed Parmalee worries that he might have cancer. He worries so much that he screams at his wife, tries all sorts of dubious remedies, and avoids seeking expert help. The same reactions he has to worries about his automobile.

The movie – *Man Alive*, produced for the American Cancer Society – shows how fear impels Ed to ignore the warning signs that his car engine needs attention. In the case of the car, Ed goes to a dodgy mechanic hoping to save money, but the mechanic ruins the engine, and it has to be junked. In the case of cancer, Ed eventually goes to his physician only to find that his worries were groundless.

Thereafter, Ed and his wife go for a regular check-up, as much for the continued reassurance that they do not have the disease, as for the possibility that it might be detected. *Man Alive* will be one of several movies presented at the HSS Annual Meeting. The Cartoon Medicine Show: Rare Animated Cartoons from the Collection of The National Library of Medicine will feature a rich sampling of rarely-screened medical cartoon animations from the 1920s to the 1960s, representing many medical themes and genres – dental hygiene, psychosomatic disease, physiology, mental health, malaria, tuberculosis, cancer, sanitary food preparation – some by well-known animators like Walt Disney, Fritz Freleng, Zack Schwartz, Walter Lantz and Shamus Culhane, others entirely obscure.

Most of these movies present a comforting message about the capacity of medical science to detect and combat dread disease. But, it is often a message built upon fear. These films try to scare their audiences, but they also seek to manage fears, alternating between efforts to reassure people that personal watchfulness and expert medical help can prevent and cure deadly disease, and efforts to promote anxiety about the body and its vulnerability to sickness. “It is foolish to worry day and night about [disease],” the narrator in *Man Alive* informs Ed, “but it’s just as foolish not to worry about it at all.”

Still from *Man Alive* (1952)

Courtesy: David Cantor

Most of these movies present a comforting message about the capacity of medical science to detect and combat dread disease. But, it is often a message built upon fear.
Notes from the Inside

This issue of the Newsletter offers our members two views from "non-historians." In the first of a new series titled "First Person," two of our members (one a chemist and the other a professor of English) examine the field as they see it. In the first piece, Anthony Millevalote, a chemistry professor with the University of Wisconsin Colleges, asks how we should promote history of science in the liberal arts curriculum. What are our goals and how do we reach them? He describes the evolution of his views, from a teacher of chemistry to non-chemists, to someone who realized that his real purpose was to teach the history of science. His suggestions for making history of science more accessible should be considered at length, especially as HSS encourages the inclusion of history of science in a broad spectrum of institutions, such as in historically black colleges and universities. He is joined in our First Person view by Laura Otis, a literary scholar from Emory University, who explores the value of archival research and compares how we do history of science to how scholars approach literary studies. Her intriguing conclusions provide some insights on the nature of the history of science and underscore the importance of multiple views of a topic or person. The creative process, she argues, which may lead to a young scholar's fresh interpretation of Newton, is as important as the archived letter.

Another first for this issue is the beginning of our history-of-science-program profiles, an ongoing feature where we will learn about graduate programs in our field. We begin with a look at the University of Oklahoma's program. We plan to select two schools by lot to feature in each Newsletter, which means we should be able to conclude the first round of descriptions by 2015. Please be patient, and also responsive, when we request your own program's profile.

This is our second issue of the revised Newsletter, and all the comments on the revision have been positive. We appreciate those who took the time to write and want to hear from the rest of you. Such responses will be easier to send with the launch of our new Web site, which will feature stories from the Newsletter and will afford you a quick way to send us an electronic note.

Thank you for your membership in the HSS.

Jay Malone, HSS Executive Director

EDITORIAL POLICIES, ADVERTISING AND SUBMISSIONS

The History of Science Society Newsletter is published in January, April, July, and October, and sent to all individual members of the Society; those who reside outside of North America pay an additional $5 annually to cover a portion of mailing charges. The Newsletter is available to nonmembers and institutions for $25 a year.

The Newsletter is edited and desktop published in the Executive Office. The format and editorial policies are determined by the Executive Director in consultation with the Committee on Publications and the Society Editor. All advertising copy must be submitted in electronic form. Advertising is accepted on a space-available basis only, and the Society reserves the right not to print a submission. The rates are as follows: Full page (7 x 9.25"), $400; Horizontal or Vertical Half page (7 x 4.6"), $220; Quarter page (3.5 x 4.6"), $110. The deadline for insertion orders is six weeks prior to the month of publication and should be sent to the attention of the HSS Executive Office. The deadline for news, announcements, and job/fellowship/prize listings is firm: Six weeks prior to the month of publication.

Long Items (feature stories) should be submitted eight weeks prior to the month of publication. Please send all material to the attention of Michael Mayer: micheal@hssoline.org.

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I eventually and confidently concluded that - whatever the curricular venue - the "nature of scientific knowledge" needed to be a central focus for these students. It seemed undeniable that the liberal arts mission required some reflection on the intellectual and cultural features of science and must offer insight into the knowledge claims scientists make.

Spreading the Words

History of science is a rare creature in much of the liberal arts curriculum in the United States. Chemistry professor Anthony Millenolte says it is up to the history of science community to transform the intellectual and cultural features of science into a vital part of the liberal arts mission.

As an HSS member and an enthusiastic non-historian of science from another discipline (chemistry), I answered the online survey sent out to members last year. Apparently, I had admonished the entire discipline for not filling a larger role in the liberal arts tradition - or something to that effect. The HSS Newsletter staff asked me to elaborate.

As a science educator I believe there is tremendous room for history of science to grow in liberal arts curricula. The opportunity exists due to both a need for history of science courses and the fact that the discipline is rarely represented in undergraduate programs. In writing this piece, I conducted an informal survey of 22 of the non-Ph.D. granting institutions in Wisconsin (all 12 public and 10 of the private colleges and universities). Of these 22 bachelors and master's degree granting institutions (with total enrolments well beyond 100,000 students), I found only two classes in the history of science scheduled for the Fall 2007 semester - one in a department of history, another in a department of physics. A cursory look at other non-Ph.D. granting public and private universities across the U.S. suggests that the Wisconsin situation is not at all unusual (though I may have detected an exception to this pattern at the more exclusive private liberal arts colleges).

A more thorough survey may be beneficial for this discussion and for the HSS.

The absence of the history of science in university curricula is striking for a country whose physical and cultural features have been defined by its science and technology. In the last 15 years the National Academy of Sciences (NAS) and the American Association for the Advancement of Science (AAAS) have put forth recommendations for including the history and nature of science in K-12 science instruction.

(continued next page)
There has been no large-scale, systematic response to these recommendations by the universities who are charged with training teachers.

In higher education, the best sustained effort to incorporate the history and nature of science into the liberal arts curriculum appears to have been the Harvard Project Physics, which published an entire curriculum with course materials in the 1960s. I am unaware of a similar effort that has been undertaken since then. Given the increasing specialization of academic scientists and the pressures of their reward systems, prospects for such a large curricular change in science pedagogy now seem quite dim. This isn’t to say scientists are opposed to including the history of science in the curriculum. On the contrary – most scientists I’ve interacted with get quite animated when discussing the subject. The problem is that scientists are too busy doing science to begin grappling with the subject knowledgeably. Most don’t have the resources or working environment to retool.

I came to these opinions after teaching a liberal arts chemistry course for the first time. Until then, my role as a teacher was well defined: I taught classical modern chemistry to students who desired to become chemists, biologists, pharmacists, doctors, and engineers. But in my liberal arts chemistry course, the students had no interest or need to develop that kind of technical proficiency – they were taking the course because it would count towards a general degree requirement. So, I adopted the straightforward and by now well-worn path for these kinds of courses: to render the fundamentals of modern chemical theory into an easily accessible form and to then show the students how well it works by wielding it successfully in a variety of relevant or interesting situations. For example, we offer theoretical explanations for commonly experienced phenomena such as floating ice and six-sided snowflakes and relate daily-living sorts of issues (drugs, nutrition, and the environment) to chemical and biological theory. This pedagogy was somewhat satisfying to me at first – the students were learning some fundamental aspects of chemistry and were presumably leaving with some broader take-home message about science.

After a few years of teaching the course, I had growing misgivings about its adequacy. I began to reflect on the nature of my task – not as a chemistry instructor, but as a science educator whose allegiance to his home discipline was beginning to weaken with the challenge. I eventually came to believe that my students were learning chemistry not because the chemistry I was teaching them was part of a rationally-designed liberal arts science curriculum, but simply because I was a chemist who had a liberal arts course added to my teaching load. But if I didn’t begin with the assumption that chemistry should be central to the liberal arts science curriculum, what should the students be learning instead?

Could I consider myself to be knowledgeable about science without knowing something about its origins? Or does the practice of science trump a meta-understanding of it? Did my ignorance even matter?

Biology? Physics? Geology? I eventually and confidently concluded that – whatever the curricular venue – the “nature of scientific knowledge” needed to be a central focus for these students. It seemed undeniable that the liberal arts mission required some reflection on the intellectual and cultural features of science and must offer insight into the knowledge claims scientists make.

It was difficult for me to pursue this new goal, because I lacked a sound appreciation for the nature of scientific knowledge myself. I first became aware of this deficiency as a graduate student when I periodically suffered from episodes of epistemological doubt over the nature of my own understanding. The continued successes of chemical theory notwithstanding, the more competent I became as a chemist the more perplexing and mysterious it seemed to me that modern chemical theory could ever have arisen in the first place. Far too much of it seemed counterintuitive.

Could I consider myself to be knowledgeable about science without knowing something about its origins? Or does the practice of science trump a meta-understanding of it? Did my ignorance even matter? So I began to read, and started with a fellow chemist – A Personal Knowledge, Michael Polanyi’s honest reflection on epistemological ambiguity. I followed this with Kuhn’s The Copernican Revolution. A dozen books later I was designing and teaching a history of science course in partnership with two historians and with the encouragement of our History Department. After a time, reading books was not sufficient – I needed to learn how historians of science thought about their discipline and did their work. The faculty at the History of Science and Technology at the University of Minnesota graciously met this need by inviting me into their department for a sabbatical leave. There, I sat in on courses and seminars and learned more about the subject and its pedagogy from its faculty and graduate students.

The outcome of this experience is found in one of the two history of science courses that are offered at the University of Wisconsin Colleges (the junior college network of the University of Wisconsin System). These courses have been well received by students and continue to generate interest both within and beyond our institution.

The history-of-science community can seize opportunities for growth if it has the inclination to do so. The short-term payoffs may not be attractive, but in the long run, a sustained effort offers history of science a more important and visible position within the greater culture of higher education. If a critical number of bachelor and master’s granting institutions begin to offer history-of-science courses, then additional growth could take on a life of its own as a “keeping up with the Jones’s” effect takes hold.
The difficulty is, of course, how the discipline “gets its foot in the door.” Given the variety of institutional goals and curricular and staffing idiosyncrasies from one institution to the next, it is unlikely that a single model would be successful. There is a need for a variety of imaginative solutions much like the kind that historians of science employed when they first gained footholds in the universities. The discipline now has the opportunity to leverage the great scholarship it has produced since that beginning by embarking on a second expansion – one which would inevitably benefit existing history-of-science programs.

Here are some possible approaches:

Get out more. Design targeted presentations for scientists and historians at institutions that have few or no history-of-science courses. These talks could also be given at scientific society meetings (most of which have education or history division sessions). Advanced graduate students, fellows, and faculty could all be encouraged to contribute in some way.

Find a way to share and value pedagogical and curricular accomplishments professionally. If your society or program doesn’t value these activities, no one else will. Most scientific societies have pedagogy sessions built into their meeting programs. In the HSS, this would have the added benefit of creating a social space for some non-historians of science (like me) who are poised to make curricular advances on your behalf. I found it ironic that the Preliminary Program for the 2007 HSS Conference includes several sessions dedicated to the pedagogy and dissemination of science, but only one session clearly communicated its own pedagogy.

Create pathways for interested mid-career science or history faculty to teach introductory or capstone history of science courses at their institutions. These people are valuable internal advocates for your discipline, and they have the potential to expand the history of science curriculum, which could lead to the eventual hiring of a bona fide historian of science. A consortium of history of science programs could co-design and develop a series of short courses and seminars for science or history faculty. Consider Web-based instruction and/or summer residency programs.

Create accessible history-of-science minors for Ph.D. candidates in the sciences. Recruit history of science graduate students who hold a master’s degree in a scientific discipline and give them encouragement to remain active in the pedagogy of that discipline. Encourage them to secure occasional teaching assistantships or temporary teaching appointments in other departments or colleges. This experience may keep the door open for them to remain candidates for employment in liberal arts college science departments after they earn their history of science Ph.D.

Be prepared to collaborate with Schools of Education. The NAS and AAAS recommendations, which are very visible, have been included in many state education standards.*

These suggestions are neither exclusive nor exhaustive (and some are better than others). Certainly, identifying fruitful strategies for getting one’s foot in the door is important for growth. So is tenacity. But in the end your discipline will sell itself – it simply promises too many benefits to the wider education community to be ignored for much longer.

What's an Archive? A Literary Scholar’s View of the History of Science

Laura Otis, who comes from a background in Biochemistry, Neuroscience, and Comparative Literature, questions the history of science rules.

"Doing the history of science without archival research," said Michael Hagner, "is like doing biochemistry without lab work." Exasperated by my total lack of interest in archives, Hagner realized he was going to have to say something drastic. For a year I had been excitedly reading published letters and secondary sources, believing that I was making great progress on my book, *Müller's Lab*. Hagner, who had invited me to the Max Planck Institute in Berlin, couldn't understand why I wasn't going to archives. When he compared it to lab work, I finally got it. From that moment, I realized that the history of science is more like science than it is like literary studies.

One of the things I like best about the history of science is that everyone in it has a good story. No one seems to have decided, at age six, that she wanted to study eighteenth-century microscopes. Almost everyone has come to the field via an interesting, round-about route and has enriched it with the experience he's acquired. Like many, I'm a former scientist, a biochemistry major who spent eight years decapitating rats, running gels, and reading autoradiographs. What makes me more unusual is that for the past 20 years, I've been teaching literature classes, especially courses on literature and science.

My interest in nineteenth-century biology brought me to the 2001 HSS meeting in Denver, where the emphasis on archival research roused my rebellious tendencies. As I listened to the praise of some talks and the condemnation of others, I remembered a phrase we used to use in the lab: "she does good science." Back there, doing good science meant showing original thinking, reliable data, and rigorous questioning. Being told that one did good science was the highest praise. At HSS, doing good science seemed to mean going to archives, getting data, and doing interesting things with it. Without the archive, the science was no good.

At dinner, one professor told me that he'd had a student who wanted to work on the Spanish neurobiologist Santiago Ramón y Cajal, but he'd advised him against it because he didn't think he'd find any archival material. To a literary scholar, this sounded insane. Who would tell an English graduate student not to write on Shakespeare because she wouldn't find any unknown plays? Admittedly, some literary scholars need to think harder about how the texts they study came into being, and a Shakespearean should know about the different versions and editions of his plays. But in literary studies, archival work is respected, not required. I couldn't understand why a new interpretation of Cajal — a thinker just as interesting as Shakespeare — wouldn't be considered a contribution to knowledge.

In literary research, discovery and interpretation are inseparable. You don't need to have found something new to say something new. No one respects claims made without textual evidence, but the scholarly "news" is an original reading, often inspired by a new comparison between texts. In English departments, we rejoice when scholars recover lost manuscripts, but no one needs to have found one to earn a degree. To be fair, though, I should include the voice of Emory undergraduate Ryan Plocher, who complained that he wasn't being prepared for graduate study in English because he wasn't being taught how to do archival research.

In her ironic book *Dust*, Carolyn Steedman points out that the historian's authority comes from having been to the archive. What he finds there depends on resources, persistence, and chance. Documents in archives aren't discovered; they're rediscovered. They're not new; they're reemerging, so that they're not data in the sense of experimental results. One can never be sure how representative they are. When I think of archives, I think of Darwin's warning, "the crust of the earth with its embedded remains must not be looked at as a well-filled museum, but as a poor collection made at hazard and at rare intervals." To this random collection we bring our own conflicts, expectations, and experiences, so that "no one historian's archive is ever like another's" (Steedman, *Dust*, 9). In the insistence on archival research, I sensed a quest for purity based on exclusion, a quest to build knowledge reliable because of what it does not contain.

One consequence of the demand for forgotten documents, I could see, was the fierce territorialism in history. One seeks a tightly defined problem, then fights to keep it one's own. Coming from a field in which thousands of people work on a single author, I couldn't understand this drive to annihilate the competition. It's not that literary scholars are morally superior to historians, but with ten thousand people working on Shakespeare, we wouldn't know who to kill first. In the absence of a plan, we say the more, the merrier. When I realized that a single book could involve 15 years of archival research, however, I began to see why scholars thought of scientists as their own, and why others respected their claims. Investing decades on a project and getting scooped could mean the end of a career. To believe that one can be scooped, however, is to believe that there's only one version of the story. Isn't the truth best served when many different scholars approach a scientist, period, or problem, each with his own values and perspective?

When I asked about the appeal of the archive, one senior historian of science spoke to me of the thrill of the hunt. To many historians, she explained, doing original scholarship means doing...
detective work, which leads to the discovery – or rediscovery – of something new. “What’s the news here?” demands the reader who does good history. “Tell me something that I don’t know.”

To me, scholarship has always meant something quite different. I work by reading carefully and describing connections no one has noticed – at least, as far as I can tell. Rather than a detective or a hunter, I see myself as an interpreter and translator, making ideas from one field available to people in another so that they can apply them to their own projects. My books are patchwork quilts in which the scholarship is the selection, placement, and combining. My news is the revelation of relationships rather than the unearthing of new materials, in essence a creative process.

I began to appreciate the way historians think about archives only when Raine Daston appealed to me as a literary scholar. Hagner had reached the scientist in me, but it was only when she explained history as narrative-creation that I realized what was happening. To tell a plausible story from fragments you’ve deciphered, she explained, is a lot harder than building a narrative from published accounts. It is, as Carolyn Steedman puts it, “to conjure a social system from a nutmeg grater” (Steedman, Dust, 18). To prove that one can be an historian, one has to do this at least once, and do it well. It’s a rite of passage I have yet to undergo.

But as Hagner, Plocher, and Daston were trying to tell me, there are better reasons to do archival research. It’s a reality check, and unlike many literary and science studies scholars, I share scientists’ and historians commitment to a real physical world that can be altered by people’s actions. Even if writing history means constructing narratives out of fragments, I want them to approach that reality as closely as possible. At its worst, literary research is purposeless language about language, an endless funhouse of reflected surfaces. HSS members appeal to me because like scientists, they want to know what happened, not what X wrote about what Y thought about what Z heard happened.

In the six years I’ve been a member of HSS, I’ve moved from bewilderment to indignation to curiosity, and the book I’ve written, Müller’s Lab, reflects what I’ve learned. I first saw the project as a study of what a lab is and how the modern laboratory emerged. Instead, it became a multi-perspective narrative study, systematically comparing the way that seven students (Jakob Henle, Theodor Schwann, Emil du Bois-Reymond, Hermann Helmholtz, Rudolf Virchow, Robert Remak, and Ernst Haeckel) represented their teacher, Johannes Müller. In it, I’ve done my best to show how differently the history of a scientist can be written depending on his students’ experiences and agenda. It draws both upon my belief, as a literary scholar, that texts from the past should continually be re-read from new perspectives, and on my conviction as an emerging historian that I have a responsibility to represent the past as accurately as possible. The book benefited from the archival research that I eventually did.

As a former scientist, an English teacher, and a writer of fiction, I see creativity as an essential part of the quest for truth. Interpretive studies play a vital role in the history of science, complementing works that make new archival findings available. I find the writing of scientists as interesting as the writing of novelists and think that Goethe’s Farbenlehre and Darwin’s Origin of Species deserve as many re-readings as Shakespeare’s plays. Doesn’t our knowledge of past science benefit equally from the recovery of forgotten documents and the reevaluation of known documents from new points of view? I like the history of science because it isn’t biochemistry – because I can contribute to it by judging and creating narratives.

Laura Otis is a professor of English at Emory University. Her books include Organic Memory, Membranes, Networking, Literature and Science in the 19th Century: An Anthology, Vacation Stories (an English translation of Ramón y Cajal’s Cuentos de Vacaciones), and Müller’s Lab, just published by Oxford University Press.

1 When we spoke recently, Hagner assured me that he does not think historical research means exclusively archival research. On that occasion, he felt that he needed to use strong terms because I was crippling my project by ignoring the vital role of archival materials.
A Global Bibliography for an International Community of Scholars

I want to respond to one of the Women's Caucus recommendations that was printed in the July 2007 newsletter—item 4.c., which urged the creation of an advisory board for the Isis Bibliography that would increase the coverage of non-Western history of science.

First let me say that it is always a pleasure when people take a direct interest in the bibliography and offer suggestions and comments. This is especially true when I am in complete agreement with the principle of the recommendation. The Women's Caucus supports an agenda that would increase the coverage of non-Western history of science.

First let me say that it is always a pleasure when people take a direct interest in the bibliography and offer suggestions and comments. This is especially true when I am in complete agreement with the principle of the recommendation. The Women's Caucus supports an agenda that would increase the coverage of non-Western history of science.

Second, I contacted individuals in non-Western countries to provide me with citations. Currently, I have three scholars who each year send me citations to significant articles and books from Korea, China, and Taiwan. I will be increasing the number of my contributors over the years and expanding my scope beyond East Asia.

Outside of my work on the Isis Bibliography, I have recently accepted chairmanship of the governing board of the World History of Science Online (WHSO), a project sponsored by IUHPS/DHST whose goal is to create an open Internet Web site where researchers can access primary and secondary source bibliographical information as well as archival locator data related to history of science around the world. (See http://www.dhs-whso.org.) The global scope of this project is quite ambitious. I hope that this project will function on a basic level within a couple of years with a core set data.

One reason this project is particularly valuable is that it addresses a serious problem in our profession—the lack of access by scholars in developing countries to first-rate scholarly work including bibliographical citation data that so many in the West take for granted. The inequality extends even into Europe, where many countries have extremely limited access to HSTM, the online bibliographical database where all of my data goes.

As the bibliographer for HSS, my goals are pragmatic. The push to include more non-Western sources in the Bibliography poses real problems: given a finite amount of time during the year and the burgeoning of publications, I must make hard choices about what I can include. I must not short change the categories of Western science that have been and still are core areas of our discipline, so I am limited in the kind of coverage I can devote to non-Western science. Even as I seek to build the Isis Bibliography by increasing non-Western presence, my overall philosophy is to promote bibliographic work worldwide that will supplement it.

—Stephen P. Weldon

Editor, Isis Current Bibliography

NEWSBRIEF


Lillian Hoddeson has been named the first Thomas Siebel Chair in the History of Science at the University of Illinois.

Taylor & Francis is offering individual HSS members discounted rates on the following journals for 2008: Annuals of Science US $99/GB £60; History and Philosophy of Logic US$72/GB £44; History and Technology US $50/GB £33.

Historical Studies in the Physical and Biological Sciences (HSPS) is changing its title. Historical Studies in the Natural Sciences will be Volume 38 No. 1 and is scheduled for February 2008.

"Hooke's Books: Books that Influenced or were Influenced by Robert Hooke's Micrographia" is a new exhibition at the National Library of Medicine.

Contributors are wanted for the Encyclopedia for American Environmental History. Encyclopedia entries will range from 500 to 3,500 words. Contact Assistant Editor Stephanie Fuglar at eae9@mail.uh.edu.

If you plan to visit the National Archives' Reading Rooms at Kew between fall 2007 and spring 2008, check for renovation's status at http://www.nationalarchives.gov.uk/.


"Early Modern Thought Online" (EMTO database) gives access to about 2000 digitized source texts from early modern philosophy and related disciplines. For further information contact: Stefan.Hessbrueggen-Walter@fernuni-hagen.de.
**NEWS AND INQUIRIES**

**BSHS 60th Anniversary**
The British Society for the History of Science celebrated its 60th anniversary at the Annual Conference in Manchester. Four past presidents took part in a special plenary session addressing the past, present, and future of the Society and the field.

Bill Brock's reminiscence of encountering the BSHS as an enthusiastic young student, while amusing, also indicated the serious work which has since been undertaken to affirm the Society as a broadly inclusive organization, both geographically and demographically. John Brooke considered the changing nature of historical inquiry: the BSHS has been a useful site of disciplinary cross-pollination through developments such as the spatial turn.

David Knight spoke of life as editor of the *British Journal for the History of Science*, while Geoffrey Cantor paid tribute to the central organizing role of the Society's former Executive Secretary, Wing-Commander Geoffrey Bennett, over more than 15 years.

This was not merely an opportunity to discuss the past, however; an audience question from Jeff Hughes, who succeeds Frank James as President in 2008, focused attention on possible futures. Ongoing changes in the Society's organization and role are evident in the array of outreach and education events, and in the revamped newsletter: *Viewpoint's* own commemoration has included interviews with veterans of the 1947 membership, and some fascinating reprints of archive material from around the time of foundation.

**International Polar Year: Making Science Global**
"Making Science Global: Reconsidering the Social and Intellectual Implications of the International Polar and Geophysical Years" is an NSF-supported conference examining the science, society, and culture of the International Polar Years (IPYs) of 1882-83 and 1932-33, and the International Geophysical Year of 1957-58. Additionally, it will examine how historical perspectives might be useful for those involved in the current IPY in 2007-2008. The conference will run from 31 October to 1 November, 2007. The final session of the conference, "Polar History: Perspectives on Globalization in the Geosciences," will be a plenary session of the annual meeting of the History of Science Society. For further information, visit: http://www.nasm.si.edu/makingscienceglobal/.

**PACHS Information at HSS Annual Conference**
The Philadelphia Area Center for History of Science offers residential fellowships for dissertation research on history of science, technology or medicine in the collections of our 11 member institutions. Join PACHS for an information session at the HSS Annual Meeting, Friday, 2 November, 12:30 p.m.

**The University of Edinburgh: New M.Sc. in Science and Technology Policy and Management**
This degree aims to prepare people for positions in policy and management areas dealing with science, technology and innovation, or in other fields where scientific

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**MEMBER NEWS**

Mary Anne Andrei received her Ph.D. in 2006 at the University of Minnesota (under the direction of Sally Gregory Kohlstedt). She now teaches at the University of Virginia and is co-editor of the "Museum History Journal."

Fritz Davis (Florida State University) has published *The Man Who Saved Sea Turtles: Archie Carr and the Origins of Conservation Biology* (Oxford University Press). He also received a University Graduate Teaching Award in April.

Vernon Kissing was promoted to Sr. Associate Librarian at the George A. Smathers Libraries, University of Florida. He is the collection manager for the history of science, as well as environmental sciences, and works closely with the UF History of Science, Technology and Medicine program.

Manfred Laubichler (Arizona State University) has been promoted to full professor and selected as one of the university's Faculty Exemplars. He was also selected as the first Outstanding Young Investigator.

John Lynch, Senior Lecturer in Arizona State University's Honors College, was chosen as the first recipient of the Outstanding Service Award.

Jane Maisenschien (Director of the Center for Biology and Society at Arizona State University) has been appointed a President's Professor for her outstanding contributions to undergraduate education.

Leo B. Slater has been appointed Historian at The Naval Research Laboratory (NRL). He comes to NRL from the Office of NIH History and Museum at the National Institutes of Health (NIH).
and technological issues and strategies are central, such as medical, environment, information or development policy. For more information: http://www.sps.ed.ac.uk/gradschooll taught_degrees/msc_science_of_technology_policy_and_ management.php or contact Stewart Russell at stewart.russell@ed.ac.uk.

Naomi Oreskes with former Vice-President Al Gore (left) and Ken Belitz (Naomi's spouse) of USGS. Gore gave a talk on climate change at the University of California, San Diego on 21 May 2007 where he singled out a 2004 article in Science written by Oreskes. For more info on Gore's talk at UCSD, see http://ucsdnews.ucsd.edu/thisweek/20070529_gore.asp.

History of Science Podcast: The Missing Link
The first episode of "The Missing Link," a 45-minute, monthly podcast that is devoted to the history of science, medicine, and technology, is now available. Created and hosted by Elizabeth Green Musselman, the podcast targets a wide audience and covers topics ranging across the sciences, time periods, and locales. Listen to this new podcast on the history of science, medicine & technology at http://missinglinkpodcast.com, or find "The Missing Link" on iTunes.

CHF Seeks Exhibits For New Gallery Space
The Chemical Heritage Foundation will open new exhibit galleries in August 2008 devoted to the history and heritage of the chemical and molecular sciences. One gallery (2000 sq. ft.) will showcase temporary or rotating exhibits, whose primary audience will be science-minded adults; the secondary audience will include teachers (sometimes with students) and adults working in industrial, technical, medical, and scientific fields. If you plan traveling exhibits that meet CHF's interests, contact Robert Hicks at: rhicks@chemheritage.org.

Wellcome Trust Centre Appoints Three New Academic Staff
Emma Spary will be rebuilding the Centre's work in the 18th century. Guy Attewell will be adding strength to the Centre's growing work on Asian and global medicinal exchanges. William (Bill) MacLehose brings the European medieval period back into the Centre through his work on the history of childhood.

Sol Spiegelman Papers Released
The National Library of Medicine has released an extensive selection from the papers of Sol Spiegelman (1914-1983), a pioneering molecular biologist whose discoveries helped reveal the mechanisms of gene action and laid the foundations of recombinant DNA technology. The papers may be at found on the Library's Profiles in Science Web site. For more information: http://www.nlm.nih.gov/.

NOAA Bicentennial
The National Oceanic and Atmospheric Administration (NOAA) was created in 1970 with the Coasts Survey, National Marine Fisheries Commission, and the National Weather Service forming the new organization's core. Its origins, however, date back to 1807 when Congress and Thomas Jefferson created the Coasts Survey, tasked it to chart the new nation's coasts for both trade and defense purposes.

In 1871 the National Marine Fisheries Commission was created for the "protection and Preservation of the Food Fishes of the Coast of the United States." The National Weather Service origins date to 1814 when the Army Surgeon General ordered all army surgeons to collect weather observations at military posts. "Observer sergeants" of the Army Signal Corps were the first to take synchronous, systematized weather observations that were relayed by telegraph to Washington D.C. In 1890 the agency was assigned to the newly formed Department of Agriculture and renamed The Weather Bureau.

IN MEMORIAM

Joseph Fruton, Eugene Higgins Professor Emeritus of Biochemistry and Senior Research Scholar in the History of Medicine, died 29 July 2007. Fruton was born in Poland in 1912, received his B.A. at Columbia College in 1931, and his Ph.D. from Columbia in 1934. He spent the decade from 1934 to 1945 in chemistry at the Rockefeller Institute for Medical Research, then in 1945 joined the faculty of Yale University as Associate Professor of Physiological Chemistry. In 1957 he became Eugene Higgins Professor of Biochemistry. Dr. Fruton also pursued a formidable research program in the history of chemistry. From 1951 to 1954 he served on the council of the History of Science Society. He was Sarton Lecturer (1976), winner of the Pfizer Award from the HSS in 1973, and the Dexter Award in History of Chemistry from the American Chemical Society in 1993. At Yale, he became Professor of the History of Medicine in 1980, and was emeritus after his retirement in 1982.
When was your program established and how has it developed since its inception?

In 1949 an alumnus of the University, Everett Lee DeGolyer, began a series of gifts of books to the University, and the University in turn agreed to the condition that a faculty member be hired to teach the History of Science. Beginning with an initial gift of 129 volumes, the History of Science Collections had grown to 600 volumes two years later, including a presentation copy of Galileo Galilei's *Sidereus nuncius* (Venice, 1610); Robert Hooke's *Micrographia* (London, 1665); Robert Boyle's *Sceptical Chymist* (London, 1661); Hrabanus Maurus' *Opus de universo* (Strassburg, 1467); Johann Kepler's *Harmonices mundi* (Linz, 1619); Antoine Lavoisier's *Traité élémentaire de chimie* (Paris, 1789); Nicolaus Copernicus' *De revolutionibus* (Nuremberg, 1543); and Isaac Newton's *Philosophiae naturalis principia mathematica* (London, 1687). The first faculty position in the history of science was established in 1954. An additional one was established in 1959, a third in 1964, a fourth and a fifth in 1970. In 1971, a separate department was established, which now includes 11 faculty, with two additional historians of science appointed in the university's Honors College. The program includes specialists in the history of science, technology and medicine, with chronological interests from the medieval ages to the present.

How is the history of science organized at your institution?

Although historians of science were initially appointed in the Department of History, with an oversight committee that reported directly to the President of the University, in 1971 an autonomous department was created, and over the past 36 years, the program has doubled in size. In addition, we have two historians of science who work in the Honors College, and we maintain a close connection the History of Science Collections in the Library, where all faculty and graduate students have studies and work space.

What are the comprehensive exam fields?

In consultation with program committees, students select four distinct doctoral fields: (1) the doctoral field supports his/her dissertation research and may be defined by period, region, and/or theme; (2) the secondary field may be defined by period, region, and/or theme, or it may be a research tools and methods field and is closely related to a student's research interests but in a manner distinct from the doctoral field, thus providing a different thematic focus, methodological/theoretical perspective, or context than the doctoral field; (3) the outside field is typically (but not necessarily) supervised by a faculty member outside of the department and is intended to support the student's research interests by providing a different perspective on or a different context for the student's research topic; and (4) the complementary field and is intended to provide the student with a broader perspective on the history of science than found in his/her three research fields.

What are the faculty, program, and resource strengths?

Our faculty's interests span the history of science from the medieval world to the twentieth century. We are especially strong in four areas:

- medieval and early modern science (Professors Peter Barker, Kathleen Crowther, Steven Livesey, Kerry Magruder, Rienk Vermij)
- natural and social sciences in the modern world, especially biology and ecology, natural history and psychology (Professors Hunter Heyck, Piers Hale, R. Richard Hamerla, Magruder, Suzanne Moon, Marilyn Ogilvie, Katherine Pandora, Sarah Tracy and Stephen Weldon)
- history of technology, and pedagogical applications for technology in history of science (Heyck, Magruder, Moon and Pandora).
- interrelationship between science and religion (Barker, Crowther, Hale, Livesey, Magruder, Vermij, Weldon).

The University also houses the History of Science Collections, which contains more than 92,000 volumes, including 55 incunabula and more than 900 16th-century titles. The Collections' holdings emphasize both the intellectual and social contexts of scientific inquiry, ranging from the works of individual scientists to such supporting materials as textbooks, popular works on science, and journals of scientific societies and academies as well as current publications in the history of science. A generous endowment made by the Andrew W. Mellon Foundation encourages scholars from around the world to use resources in the Collections.

With the School of Library and Information Studies, the department offers a dual-degree program for students planning for a career in librarianship as a science librarian, as a curator of a rare book and manuscript collection in the history of science/health sciences, or as a public historian or archivist in the history of science.

The department also is a key resource in the production of tools and publications for the discipline. Stephen Weldon is the Bibliographer for the History of Science Society and is chair of the DHST's World History of Science Online project. Suzanne Moon is Associate Editor of *Technology and Culture*. Katherine Pandora has initiated a blog on science and popular culture that was formally rolled out during the past year (see http://scipop.net/). And Steven Livesey is producing a database of information on medieval commentators on Aristotle's works and Peter Lombard's *Sentences*, published sequentially by Brepols Publishers in their International Encyclopaedia for the Middle Ages-Online, eventually to be released as a relational database.

(Continued on p. 31)
Linnaeus Lives! In Philadelphia!

Karen Reeds recounts how curating *Come into a New World: Linnaeus & America* for the Linnaeus tercentenary at the American Swedish Historical Museum pushed her into the 18th century and brought Linnaeus to a modern audience.

Like the Swedish Museum itself, the exhibition was deeply rooted in the local history of Sweden's little-known colony in the Delaware Valley. At the 2002 New Sweden Conference, a historian from Linnaeus's hometown, Uppsala, casually asked the American Swedish Historical Museum's (ASHM) director, Richard Waldron, what he had planned for the Linnaeus tercentenary. Waldron improvised the promise of an exhibition and then went around the corner and recruited me to be its guest curator. He thought I qualified because I had just given a show-and-tell about early Swedish settlers' uses of American medicinal plants, based on the reports by Linnaeus's emissary, Pehr Kalm; and because three years earlier I had mounted an exhibition about New Jersey's medical heritage that had also touched on Kalm's *Travels into North America*.

What Waldron did not know was that the Kalm talk was new ground for me. I considered myself primarily a historian of pre-Linnaean European botany and medicine, and for decades I had avoided working on Linnaeus or American science. It was time to move up into the 18th century!

Choosing a theme for the exhibition was easy: the museum's name and mission suggested a focus on Linnaeus's connections to North America. Pehr Kalm had served as his professor's most direct, personal link to the New World, and particularly to the Philadelphia region: it was quite possible that Kalm had botanized the raccoon *Sjupp*, made an engaging icon for the show.

The choice was a fruitful one. Although Carolus Linnaeus (1707-1778) was fascinated by the natural history of North America, surprisingly little had been written about this aspect of his work. Philadelphia, as a center of colonial science, was rich in collections that we could use to showcase not only the two-way exchange of information between Linnaeus and his American correspondents, but also the broader implications of Linnaean ideas for America.

Thanks to a "We the People" consultation grant from the National Endowment for the Humanities, we were able to gather Linnaeus experts, historians, biologists, exhibition designers, and museum professionals from Europe and Philadelphia at the museum in 2004 for a weekend of brainstorming about the exhibition and share information about tercentenary plans and archives in Sweden and England. Their generosity, advice, and networks proved invaluable. We were particularly lucky to capture the interest of a world-class design team, Alusiv, Inc., who stuck with the project even after funding problems forced the exhibition to be scaled down drastically.

The NEH meeting helped define the structure of the exhibition. After a brief introduction to Linnaeus's accomplishments, visitors encountered the chaotic state of pre-Linnaean European botany and medicine, and for decades I had avoided working on Linnaeus or American science. It was time to move up into the 18th century!

Choosing a theme for the exhibition was easy: the museum's name and mission suggested a focus on Linnaeus's connections to North America. Pehr Kalm had served as his professor's most direct, personal link to the New World, and particularly to the Philadelphia region: it was quite possible that Kalm had botanized on the land where the museum now stands. A line from Kalm's *Travels about his first moments in America provided the exhibition's title. And*
shocked by the terminology — even in Latin!

Linnaeus's creationist assumptions and Darwin's challenge to them remain live issues in America. The exhibition gave visitors a chance to read the two textbooks at the center of the Pennsylvania court case about teaching Intelligent Design in public schools, along with a copy of Judge John Jones's 2005 decision in Kitzmiller vs. Dover Area School System and a reproduction of the manuscript title page of *Origin of Species*.

Explaining Linnaeus's views about humans in the small space of exhibit labels raised the most difficult issues of interpretation. His religious and scientific conviction that all human beings form a single species reverberated in Jefferson's credo for a new nation: "All men are created equal." At the same time, we could not ignore the fact that Linnaeus's characterization of black Africans and his ranking of them as the last of his four geographic groups of humans were long used as a hateful "scientific" justification of slavery and racism. Few of the scientific racists or his modern critics took note, however, that he put "red" Americans first, ahead of Europeans.

In many ways, mounting this exhibition at a small museum mirrored the experience of Linnaeus, Kalm, and their American colleagues: our work was intensely local but also very much part of a global project.

In many ways, mounting this exhibition at a small museum mirrored the experience of Linnaeus, Kalm, and their American colleagues: our work was intensely local but also very much part of a global project.


For more information contact the American Swedish Historical Museum, 215-389-1776. Or visit http://www.americanswedish.org/

Karen Reeds is the Guest Curator of *Come into a New World: Linnaeus & America* (15 February 2007 to 1 July 2007), American Swedish Historical Museum, Philadelphia. She is a Fellow of the Linnean Society of London, a Visiting Scholar at the University of Pennsylvania, and a member of the Princeton Research Forum and National Coalition of Independent Scholars. She can be contacted at karen.reeds@verizon.net.
Digitizing Linnaeus

Eva Nyström, research editor for the Linnaean correspondence, gives a status report on the project.

The Linnaean correspondence began its work in 1995 with the goal of publishing all available letters to and from Linnaeus. We are producing digitized pictures of the manuscripts (i.e. as facsimiles) together with summaries in English of all letters in Latin and Swedish (since more than 90% of the letters are written in these languages). In the final stage new editions of every letter will be added. Specimens of dried plants, or seeds, enclosed with the letters, will also be digitized and shown in their context. Several previously published transcriptions and translations, now unavailable in the book market, will also be published, which will facilitate research in the editorial history of the correspondence. As well, an inventory of all letters records the names of the correspondents, the dates of the letters, place names of senders and of addressees, and the language of the letter, as well as locations of manuscripts and previous editions. Included are links to files with biographical and bibliographical information. Given Linnaeus’s large network of correspondents, the project constitutes a guide to the scientific culture of the eighteenth century as a whole.

Approximately 5,500 letters are known today, of which about 3,000 are to Linnaeus. Several years after his death, letters to Linnaeus held at his estate were purchased by the English naturalist and physician James Edward Smith, together with Linnaeus’s library, manuscripts and natural-history collections. After Smith’s death, the collection went to the Linnean Society of London. Most preserved letters to Linnaeus belong to this collection. Other letters to him are kept mostly in Swedish archives, but there are also single letters in other foreign archives. As to letters from Linnaeus, about 1,500 are kept in Swedish archives, of which the largest collection belongs to the archives of the Royal Swedish Academy of Sciences. There is also a large collection at the Uppsala University Library and the National Archive in Stockholm. A number of letters from Linnaeus are kept in foreign archives.

Many letters are—as far as we know—lost, mostly letters from Linnaeus himself. As he made no drafts or copies, it is impossible to know how many letters he wrote. Luckily, many extant letters start by mentioning a recently received letter by its date and place name. We think we have the right to suppose no one would include this information if he had not received that particular letter, but if we can’t find it in the archives or published in some contemporary scientific journal or in some other way, we consider this letter a lost letter. We do keep a record so we can estimate how many letters—now lost—are mentioned in the correspondence. From this we presume that the final number of letters to and from Linnaeus might reach 8,000. Finally, Linnaeus did not answer all letters, so the exact balance between letters written by him and to him is unknown.

The letters are written over a period of 50 years from 1728 to 1778. The first known letter from Linnaeus is to one of his first mentors in Sweden, Kilian Stobaeus, Professor of Medicine and Natural History at the University of Lund in Scania, where Linnaeus spent a year as a student from 1727 to 1728. The letter to Stobaeus is written in the summer of 1728. The first known letter to him is from Gottfried Jacob Jaenisch, written in Hamburg 1735, when Linnaeus was on his way to Holland. The last known letter from Linnaeus is to his closest friend Abraham Bäck, physician and president of the Collegium medicum, written in December 1776, almost a year before Linnaeus died. In 1777 there are no letters from Linnaeus at all. He was ill, suffering from at least two strokes, and in the last year of his life it was impossible for him to write, or even speak. The last known letter to him is from the Italian Michelangelo Comi, written in Rome, 8 December 1778, who was apparently unaware of Linnaeus’s death, which had occurred 11 months earlier. Sometimes it is hard to know whether the last letters written to Linnaeus were addressed to him or to his son, Carl Linnaeus the Younger, who not only succeeded him as a professor, but also as a correspondent.

Between the years 1728 and 1778, thousands of letters were exchanged, in rough figures distributed over the decades as follows: in 1728 and 1729 there are only four letters. From the 1730s we have about 300 preserved letters, of which about 250 are from Linnaeus’s time abroad, i.e. 1735-1738. In the

Carl Linnaeus to Giovanni Antonio Scopoli (1723-1788), Italian naturalist and physician, 15 August 1761. The Linnaean correspondence, linnaeus.c18.net, letter L2943.
next decade there is an increase to about 700 letters. In the period 1750-1759 the figure doubles to about 1,500 letters. In the 1600s there is an increase to 1,650, which makes this decade the most dense as to frequency of letters. In the final decade, letters decrease to about 950. Then there are about 400 undated letters, which in most cases, can be placed in their right chronological order.

Linnaeus's correspondence network is often said to be a global one, and of course in many ways it was. It extended from the very north of Sweden to Cape Town in South Africa, from the North-American colonies to China in East Asia, and within the European context from Dublin to Moscow, from Uppsala to Montpellier, Padua and Rome and from Madrid or Paris to Vienna. Linnaeus's network covered not only the learned world as a whole, but also the whole world, which makes it unique. In the great Swiss naturalist Albrecht von Haller's correspondence network for example, which comprises 17,000 letters, not only were there no correspondents from America, Africa, or Asia, but the correspondence itself was concentrated in central Europe. We must keep in mind, though, that most letters to Linnaeus were written in Europe, and that the majority of letters from Africa, Asia, and from the American continent were from his Swedish disciples. At Linnaeus's request, they wrote to him and sent him specimens.

In order of frequency, most of the letters to Linnaeus from European countries came from German (Göttingen most frequently) and Dutch cities and towns (Leiden most frequently, followed by Amsterdam) with about 400 letters each. From French (Montpellier most frequently, then Paris) and British cities and towns (London most frequently) there are about 300 letters each. Next in order of frequency come other Nordic countries, Russia, Italy, Austria and Central Europe, Spain, Portugal, and Switzerland. From the American continent, Asia, and Africa there are about 50 letters each. There are also many letters with no place-name at all, though most of these can be located. All in all, the foreign correspondence dominated. The number of registered correspondents, slightly more than 600, including institutions such as scientific societies, also amount to more foreigners than Swedes, fully 400.

The project aims to have most of the summaries published in the end of this year. Little by little the digitized images from archives and libraries, for example the Linnean society of London, will reach the site. The project will continue also next year.

Contact Eva Nystrom at eva.nystrom@idehist.uu.se.
Secretary of the Swedish Linnaeus Society http://www.linnaeus.se.

For further information please visit the project's Web site: http://www.linnaeus.clicnet.

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The inherent unknowability of what would happen if we tried to tinker with the immensely complex planetary climate system is one reason why climate engineering has until recently been spoken of only sotto voce in the scientific community.

As alarm over global warming spreads, a radical idea is gaining momentum. Forget cuts in greenhouse-gas emissions, some scientists argue. Find a technological fix. Bounce sunlight back into space by pumping reflective nanoparticles into the atmosphere. Launch mirrors into orbit around the earth. Create a “planetary thermostat.” But what sounds like science fiction is actually an old story. For more than a century, scientists, soldiers, and charlatans have hatched schemes to manipulate the weather and climate. Like them, today’s aspiring climate engineers wildly exaggerate what is possible, and they scarcely consider political, military, and ethical implications of attempting to manage the world’s climate— with potential consequences far greater than any their predecessors were ever likely to face.

Beyond the security checkpoint at the National Aeronautics and Space Administration’s Ames Research Center at the southern end of San Francisco Bay, a small group gathered in November [2006] for a conference on the innocuous topic of “managing solar radiation.” The real subject was much bigger: how to save the planet from the effects of global warming. There was little talk among the two dozen scientists and other specialists about carbon taxes, alternative energy sources, or the other usual remedies. Many of the scientists were impatient with such schemes. Some were simply contemptuous of calls for international cooperation and the policies and lifestyle changes needed to curb greenhouse-gas emissions; others had concluded that the world’s politicians and bureaucrats are not up to the job of agreeing on such reforms or that global warming will come more rapidly, and with more catastrophic consequences, than many models predict. Now, they believe, it is time to consider radical measures: a technological quick fix for global warming.

“Mitigation is not happening and is not going to happen,” physicist Lowell Wood declared at the NASA conference. Wood, the star of the gathering, spent four decades at the University of California’s Lawrence Livermore National Laboratory, where he served as one of the Pentagon’s chief weapon designers and threat analysts. (He reportedly enjoys the “Dr. Evil” nickname bestowed by his critics.) The time has come, he said, for “an intelligent elimination of undesired heat from the biosphere by technical ways and means,” which, he asserted, could be achieved for a tiny fraction of the cost of “the bureaucratic suppression of CO₂.” His engineering approach, he boasted, would provide “instant climatic gratification.”

Wood advanced several ideas to “fix” the earth’s climate, including building up Arctic sea ice to make it function like a planetary air conditioner to “suck heat in from the mid latitude heat bath.” A “surprisingly practical” way of achieving this, he said, would be to use large artillery pieces to shoot as much as a million tons of highly reflective sulfate aerosols or specially engineered nanoparticles into the Arctic stratosphere to deflect the sun’s rays. Delivering up to a million tons of material via artillery would require a constant bombardment— basically declaring war on the stratosphere. Alternatively, a fleet of B-747 “crop dusters” could deliver the particles by flying continuously around the Arctic Circle. Or a 25-kilometer-long sky hose could be tethered to a military superblimp high above the planet’s surface to pump reflective particles into the atmosphere.

Far-fetched as Wood’s ideas may sound, his weren’t the only Rube Goldberg proposals aired at the meeting. Even as they joked about a NASA staffer’s apology for her inability to control the temperature in the meeting room, others detailed their
own schemes for manipulating earth’s climate. Astronomer J. Roger Angel suggested placing a huge fleet of mirrors in orbit to divert incoming solar radiation, at a cost of “only” several trillion dollars. Atmospheric scientist John Latham and engineer Stephen Salter hawked their idea of making marine clouds thicker and more reflective by whipping ocean water into a froth with giant pumps and eggbeaters. Most frightening was the science-fiction writer and astrophysicist Gregory Benford’s announcement that he wanted to “cut through red tape and demonstrate what could be done” by finding private sponsors for his plan to inject diatromaceous earth— the chalk-like substance used in filtration systems and cat litter— into the Arctic stratosphere. He, like his fellow geoengineers, was largely silent on the possible unintended consequences of his plan.

The inherent unknowability of what would happen if we tried to tinker with the immensely complex planetary climate system is one reason why climate engineering has until recently been spoken of only sotto voce in the scientific community. Imagine, for example, that Wood’s scheme to thicken the Arctic icecap did somehow become possible. While most of the world may want to maintain or increase polar sea ice, Russia and some other nations have historically desired an ice-free Arctic ocean, which would liberate shipping and open potentially vast oil and mineral deposits for exploitation. And an engineered Arctic ice sheet would likely produce shorter growing seasons and harsher winters in Alaska, Siberia, Greenland, and elsewhere, and could generate super winter storms in the midlatitudes. Yet Wood calls his brainstorm a plan for “global climate stabilization,” and hopes to create a sort of “planetary thermostat” to regulate the global climate.

Who would control such a “thermostat,” making life-altering decisions for the planet’s billions? What is to prevent other nations from undertaking unilateral climate modification? The United States has no monopoly on such dreams. In November 2005, for example, Yuri Izrael, head of the Moscow-based Institute of Global Climate and Ecology Studies, wrote to Russian president Vladimir Putin to make the case for immediately burning massive amounts of sulfur in the stratosphere to lower the earth’s temperature “a degree or two” — a correction greater than the total warming since preindustrial times.

Despite the large, unanswered questions about the implications of playing God with the elements, climate engineering is now being widely discussed in the scientific community and is taken seriously within the U.S. government. The Bush administration has recommended the addition of this “important strategy” to an upcoming report of the Intergovernmental Panel on Climate Change, the UN-sponsored organization whose February study seemed to persuade even the Bush White House to take global warming more seriously. And climate engineering’s advocates are not confined to the small group that met in California. Last year, for example, Paul J.Crutzen, an atmospheric chemist and Nobel laureate, proposed a scheme similar to Wood’s, and there is a long paper trail of climate and weather modification studies by the Pentagon and other government agencies.

Three stories (there are many more) capture the recurring pathologies of weather and climate control schemes. The first involves 19th-century proposals by the U.S. government’s first meteorologist to make artificial rain and relieve drought conditions in the American West. The second begins in 1946 with promising discoveries in cloud seeding that rapidly devolved into exaggerated claims and attempts by cold warriors to weaponize the technique in the jungles of Vietnam. And then there is the tale of how computer modeling raised hopes for perfect forecasting and ultimate control of weather and climate—hopes that continue to inform and encourage present-day planetary engineers.

James Pollard Espy (1785–1860), the first meteorologist employed by the U.S. government, was a frontier schoolmaster and lawyer until he moved to Philadelphia in 1817. Espy viewed the atmosphere as a giant heat engine. According to his thermal theory of storms, all atmospheric disturbances, including thunderstorms, hurricanes, and winter storms, are driven by “steam power.” Heated by the sun, a column of air rises, allowing the surrounding air to rush in. As the heated air ascends, it cools and its moisture condenses, releasing its latent heat (this is the “steam”) and producing rain, hail, or snow. The thermal theory is now an accepted part of meteorology, and for this discovery Espy is well regarded in the history of science.

His stature has been diminished, however, by his unbridled enthusiasm for rainmaking. Espy suggested cutting and burning vast tracts of forest to create huge columns of heated air, believing this would generate clouds and trigger precipitation. “Magnificent Humbug” was one contemporary assessment of this scheme. Espy came to be known derisively as the “Storm King,” but he was not deterred.

Seeking a larger stage for his storm studies and rainmaking
proposals, Espy moved in 1842 to Washington, D.C., where he was funded by the Navy and employed as the “national meteorologist” by the Army Medical Department. This position afforded him access to the meteorological reports of surgeons at Army posts around the country. He also collaborated with Joseph Henry at the Smithsonian Institution to establish and maintain a national network of volunteer weather observers.

The year Espy moved to Washington, the popular magazine writer Eliza Leslie published a short story in Godey's Lady's Book called “The Rain King, or, A Glance at the Next Century,” a fanciful account of rainmaking set in 1942 in Philadelphia, in which Espy's great-great-grand-nephew offers weather for the Delaware Valley on demand. Various factions vie for the weather they desire. Three hundred washerwomen petition the Rain King for fine weather forever, while cabmen and umbrella makers want perpetual rain. An equal number of applications come from both the fair- and foul-weather camps, until the balance is tipped by a late fall, or perhaps eliminate clouds at airports that might cause dangerous icing conditions, thus, in the words of the story's headline, “Opening Vista of Moisture Control by Man.” The Boston Globe headline read “Snowstorm Manufactured.”

From this moment on, in the press and before the meteorological community, Langmuir expounded his sensational vision of large-scale weather control, including redirecting hurricanes and changing the arid Southwest into fertile farmland. His first paper on the subject used familiar military terminology to explain how a small amount of “nucleating” agent such as dry ice, silver iodide, or even water could cause a “chain reaction” in cumulus clouds that potentially could release as much energy as an atomic bomb, but without radioactive fallout. The Department of Defense took due note. It would take an intense interest in the military possibilities of weather modification in the years ahead.

Weather modification technology seemed of such great potential, especially to military aviation, that Vannevar Bush, a friend of Langmuir's who had served as head of the Office of Scientific Research and Development during World War II, brought the issue to the attention of Secretary of Defense George C. Marshall and General Omar Bradley, chairman of the Joint Chiefs of Staff. The Pentagon immediately convened a committee to study the development of a Cold War weather weapon. It was hoped that cloud seeding could be used surreptitiously to release the violence of the atmosphere against an enemy, tame the winds in the service of an all-weather air force, or, on a larger scale, perhaps disrupt (or improve) the agricultural economy of nations and alter the global climate for strategic purposes.

Howard T. Orville, President Dwight D. Eisenhower's weather adviser, published an influential 1954 article in Collier's that included a variety of scenarios for using weather as a weapon of warfare. Planes would drop hundreds of balloons containing seeding crystals into the jet stream. Downstream, when the fuses on the balloons exploded, the crystals would fall into the clouds, initiating rain and miring enemy operations. The Army Ordnance Corps was investigating another technique: loading silver iodide and carbon dioxide into 50-caliber tracer bullets that pilots could fire into clouds. Speculative and wildly optimistic ideas such as these from official sources, together with threats that the Soviets were aggressively pursuing weather control, triggered what Newsweek called "a weather race with the Russians," and helped fuel the rapid expansion of meteorological research in all areas, including the creation of the National Center for Atmospheric Research, which was established in 1960.

At a time when the US was already weakened by the Watergate crisis, the Soviet Union caused considerable embarrassment to the Ford administration by bringing the issue of weather modification as a weapon of war to the attention of the United Nations.

Just over 100 years after Espy arrived in Washington, another seminal episode in the history of weather and climate control commenced at the General Electric Research Laboratory in Schenectady, New York. On a warm, humid day in 1946, a laboratory technician named Vincent Schaefer dropped some dry ice into a home freezer unit he was using as a cloud chamber. To his surprise, he saw the moisture in his breath instantly transform into millions of tiny ice crystals. He had generated the ice cloud from “supercooled” water droplets.

On November 14, 1946, Schaefer rented an airplane and dropped six pounds of dry ice pellets into a cold cloud over Mount Greylock in the nearby Berkshire, creating ice crystals and streaks of snow along a three-mile path. According to Schaefer's laboratory notebook, “It seemed as though [the cloud] almost exploded, the effect was so widespread and rapid.” Schaefer's boss was Nobel laureate Irving Langmuir, a chemist who had worked on generating military smoke screens and de-icing aircraft in World War II—and who did not lack for media savvy. Langmuir watched the experiment from the control tower of the airport, and he was on the phone to the press before Schaefer landed. According to an article in The New York Times the next day, “A single pellet of dry ice, about the size of a pea... might produce enough ice nuclei to develop several tons of snow,” or perhaps eliminate clouds at airports that might cause dangerous icing conditions, thus, in the words of the story's headline, “Opening Vista of Moisture Control by Man.” The Boston Globe headline read “Snowstorm Manufactured.”
Weather warfare took a macro-pathological turn between 1967 and ’72 in the jungles over North and South Vietnam, Laos, and Cambodia. Using technology developed at the naval weapons testing center at China Lake, California, to seed clouds by means of silver iodide flares, the military conducted secret operations intended, among other goals, to “reduce trafficability” along portions of the Ho Chi Minh Trail, which Hanoi used to move men and material to South Vietnam. Operating out of Udorn Air Base, Thailand, without the knowledge of the Thai government or almost anyone else, but with the full and enthusiastic support of presidents Lyndon B. Johnson and Richard M. Nixon, the Air Weather Service flew more than 2,600 cloud seeding sorties and expended 47,000 silver iodide flares over a period of approximately five years at an annual cost of some $3.6 million. The covert operation had several names, including “POPEYE” and “Intermediary-Compatriot.”


Operation POPEYE, made public as it was at the end of the Nixon era, was dubbed the “Watergate of weather warfare.” Some defended the use of environmental weapons, arguing that they were more “humane” than nuclear weapons. Others suggested that inducing rainfall to reduce trafficability was preferable to dropping napalm. As one wag put it, “Make mud, not war.” At a congressional briefing in 1974, military officials downplayed the impact of Operation POPEYE, since the most that could be claimed were 10 percent increases in local rainfall, and even that result was “unverifiable.”

At a time when the United States was already weakened by the Watergate crisis, the Soviet Union caused considerable embarrassment to the Ford administration by bringing the issue of weather modification as a weapon of war to the attention of the United Nations. The UN Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD) was eventually ratified by nearly 70 nations, including the United States. Ironically, it entered into force in 1978, when the Lao People’s Democratic Republic, where the American military had used weather modification technology in war only six years earlier, became the 20th signatory.

The language of the ENMOD Convention may become relevant to future weather and climate engineering, especially if such efforts are conducted unilaterally or if harm befalls a nation or region. The convention targets those techniques having “widespread, longlasting or severe effects as the means of destruction, damage, or injury to any other State Party.” It uses the term “environmental modification” to mean “any technique for changing – through the deliberate manipulation of natural processes – the dynamics, composition, or structure of the Earth, including its biota, lithosphere, hydrosphere, and atmosphere, or of outer space.”

A vision of perfect forecasting ultimately leading to weather and climate control was present at the birth of modern computing, well before the GE cloud seeding experiments. In 1945 Vladimir Zworykin, an RCA engineer noted for his early work in television technology, promoted the idea that electronic computers could be used to process and analyze vast amounts of meteorological data, issue timely and highly accurate forecasts, study the sensitivity of weather systems to alterations of surface conditions and energy inputs, and eventually intervene in and control the weather and climate.

Zworykin imagined that a perfectly accurate machine forecast combined with a paramilitary rapid deployment force literally to pour oil on troubled ocean waters or even set fires or detonate bombs might someday provide the capacity to disrupt storms before they formed, deflect them from populated areas, and otherwise control the weather.

In a 1962 speech to meteorologists, “On the Possibilities of Weather Control,” Harry Wexler, the MIT-trained head of meteorological research at the U.S. Weather Bureau, reported on his analysis of early computer climate models and additional possibilities opened up by the space age. Reminding his audience that humankind was modifying the weather and climate "whether we know it or not" by changing the composition of the earth’s atmosphere, Wexler demonstrated how the United States or the Soviet Union, perhaps with hostile intent, could alter the earth’s climate in a number of ways. Either nation could cool it by several degrees using a dust ring launched into orbit, for example, or warm it using ice crystals lofted into the polar atmosphere by the explosion of hydrogen bombs.

And while most practicing atmospheric chemists today believe that the discovery of ozone-destroying reactions dates to the early 1970s, Wexler sketched out a scenario for destroying the ozone layer using chlorine or bromine in his 1962 speech.

“The subject of weather and climate control is now becoming respectable to talk about,” Wexler claimed. But if weather control’s “respectability” was not in question, its attainability – even using computers, satellites, and 100-megaton bombs – certainly was.

In 1965, the President’s Science Advisory Committee warned in a report called Restoring the Quality of Our Environment that increases in atmospheric carbon dioxide due to the burning of fossil fuels would modify the earth’s heat balance to such an extent that harmful changes in climate could occur. This report is now widely cited as the first official statement on “global warming.” But the committee also recommended geoengineering options. “The possibilities of deliberately bringing about countervailing climatic changes… need to be thoroughly explored,” it said.

After the embarrassment of the 1978 ENMOD Convention,
federal funding for weather modification research and development dried up, although freelance rainmakers continued to ply their trade in the American West with state and local funding. Until recently, a 1991 National Academy of Sciences report, Policy Implications of Greenhouse Warming, was the only serious document in decades to advocate climate control. But the level of urgency and the number of proposals have increased dramatically since the turn of the new century.

In September 2001, the U.S. Climate Change Technology Program quietly held an invitational conference, “Response Options to Rapid or Severe Climate Change.” Sponsored by a White House that was officially skeptical about global warming, the meeting gave new status to the control fantasies of the climate engineers. According to one participant, “If they had broadcast that meeting live to people in Europe, there would have been riots.”

Two years later, the Pentagon released a controversial report titled An Abrupt Climate Change Scenario and Its Implications for United States National Security. The report explained how global warming might lead to rapid and catastrophic global cooling through mechanisms such as the slowing of North Atlantic deep-water circulation — and recommended that the government “explore geoengineering options that control the climate.” Noting that it is easier to warm than to cool the climate, the report suggested that it might be possible to add various gases, such as hydrofluorocarbons, to the atmosphere to offset the effects of cooling. Such actions would be studied carefully, of course, given their potential to exacerbate conflict among nations.

With greater gravitas, but no less speculation, the National Research Council issued a study, Critical Issues in Weather Modification Research, in 2003. It cited looming social and environmental challenges such as water shortages and drought, property damage and loss of life from severe storms, and the threat of “inadvertent” climate change as justifications for investing in major new national and international programs in weather modification research. Although the NRC study included an acknowledgment that there is “no convincing scientific proof of the efficacy of intentional weather modification efforts,” its authors nonetheless argued that there should be “a renewed commitment” to research in the field of intentional and unintentional weather modification.

The appeal of a quick and seemingly painless technological “fix” for the global climate dilemma should not be underestimated. The more practical such dreams appear, the less likely the world’s citizens and political leaders are to take on the difficult and painful task of changing the destiny that global climate models foretell.

These issues are not new. Yet thanks to remarkable advances in science and technology, from satellite sensors to enormously sophisticated global climate models, the fantasies of the weather and climate engineers have only grown. Now it is possible to tinker with scenarios in computer climate models — manipulating the solar inputs, for example, to demonstrate that artificially increased solar reflectivity will generate a cooling trend in the model.

There are signs among the geoengineers of an overconfidence in technology as a solution of first resort. Many appear to possess a too-literal belief in progress that produces an anything-is-possible mentality, abetted by a basic misunderstanding of the nature of today’s climate models. The global climate system is a “massive, staggering beast,” as oceanographer Wallace Broecker describes it, with no simple set of controlling parameters. We are more than a long way from understanding how it works, much less the precise prediction and practical “control” of global climate.

Assume, for just a moment, that climate control were technically possible. Who would be given the authority to manage it? Who would have the wisdom to dispense drought, severe winters, or the effects of storms to some so that the rest of the planet could prosper? At what cost, economically, aesthetically, and in our moral relationship to nature, would we manipulate the climate?

When Roger Angel was asked at the NASA meeting last November how he intended to get the massive amount of material required for his space mirrors into orbit, he dryly suggested a modern cannon of the kind originally proposed for the Strategic Defense Initiative: a giant electric rail gun firing a ton or so of material into space roughly every five minutes. Asked where such a device might be located, he suggested a high mountaintop on the Equator.

I was immediately reminded of Jules Verne’s 1889 novel The Purchase of the North Pole. For two cents per acre, a group of American investors gains rights to the vast and incredibly lucrative coal and mineral deposits under the North Pole. To mine the region, they propose to melt the polar ice. Initially the project captures the public imagination, as the backers promise that their scheme will improve the climate everywhere by reducing extremes of cold and heat, making the earth a terrestrial heaven. But when it is revealed that the investors are retired Civil War artillerymen who intend to change the inclination of the earth’s axis by building and firing the world’s largest cannon, public enthusiasm gives way to fears that tidal waves generated by the explosion will kill millions. In secrecy and haste, the protagonists proceed with their plan, building the cannon on Mount Kilimanjaro. The plot falls only when an error in calculation renders the massive shot ineffective.

Verne concludes, “The world’s inhabitants could thus sleep in peace.” Perhaps he spoke too soon.

James R. Fleming is professor of science, technology, and society at Colby College. In 2006-07 he was a public policy scholar at the Woodrow Wilson International Center for Scholars and held the Roger Revelle Fellowship in Global Stewardship from the American Association for the Advancement of Science. His books include Meteorology in America, 1800-1870 (1990), Historical Perspectives on Climate Change (1998), and The Callendar Effect: The Life and Work of Guy Stewart Callendar (2007).

Adapted from “The Climate Engineers: Playing God to Save the Planet,” Wilson Quarterly (Spring 2007), 46-60.
Out of the 189 artists, scholars and scientists chosen to receive the 2007 Guggenheim Memorial Foundation Fellowships, eight are working on projects with connections to the history of science. Four were profiled last issue and three are profiled this issue.

Peter Pesic, Tutor and Musician-in-Residence, St. John's College, Santa Fe, New Mexico, is working on a project titled “Interactions between music and natural philosophy.”

Connections between music and natural philosophy go far back, reaching past the disciplinary boundaries later erected between them. My project aims to find new ways to bridge these boundaries in the larger context of the musical dialogue between “ancients” and “moderns” announced by Vincenzo Galilei (father of Galileo) along with other contemporary dialogues animating natural philosophy, theology, and mathematics. This new approach to the history and philosophy of music also reflects on the nature, origins, and destiny of modern science. I would like to delineate this dialogue between music and natural philosophy, ancient and modern, in a serious book directed to the educated general reader but also poised on the scholarly edge of discovery, with full notes to guide further study and a new approach to making musical examples more readily accessible for the reader to hear directly.

The Western tradition began with music like the Gregorian chant, whose exalted impassivity reflects the “music of the spheres,” whose serene beauty transcends transient human passions. Yet ancient writers already recognized another strain of musical practice that stirred the passions through careful choice of musical mode. Intrigued by accounts of the expressive power of ancient tragic drama, Vincenzo Galilei and others called for a new music devoted to gaining power over the soul through evoking and moving the passions. In response, what we call opera emerged. Claudio Monteverdi’s L’Orfeo (1624) begins with La Musica herself proclaiming her power “to move even the iciest mind,” which Orpheus used to subdue the world, though his own passionate heart could not withstand his own powers.

Though the ancient natural philosophers contemplated the ideal order and beauty of the cosmos, the “new philosophy” of Bacon and Descartes sought power over nature. This quest for power rather than beauty haunts modern science and music. Music sought ever-expanding expressivity through harmonic ambiguity and dissonance in ways comparable to the new philosophy. What Aristotle considered the immovable Earth began to be understood as movable; likewise, the new music moved the icy, immovable soul. Monteverdi’s Orfeo did not merely use individual musical modes (in the way Plato identified martial or sensuous modes) but gained his power by changing the mode, using unstable chords that can function differently in two different keys at once, hence move between them and thereby move the soul. This theme showed its later potentialities when unstable isotopes mediated the alchemical transmutation of elements.

Yet power is problematic. The ever-heightened expressivity of late Romantic music finally collapsed because the dynamic of passion feeds on instability. Any single affect leads to boredom unless revived by a contrasting affect, which repeated and taken to the extreme can finally lead to satiation or emotional overload. Passion exhausts itself, “consumed by what it was nourished by”; passionlessness remains. Thus, many twentieth century composers turned away from Romantic to medieval models. The potent projects of science and music turn on the dialogue between power and beauty, now inextricably intertwined and so fatefully unfolding.

A. Mark Smith is Curators’ Professor of History at the University of Missouri, Columbia. He has spent the last twenty-odd years working on a critical edition of Alhacen’s De aspectibus and is nearing the end of that project.

The purpose of this fellowship is to allow me a year's
GUGGENHEIM FELLOWSHIPS

research leave to begin work on the last phase of a long-term project to critically edit Alhacen’s *De aspectibus*, the medieval Latin version of Ibn al-Haytham’s *Kitab al-Manazir*. Consisting of seven books, the *De aspectibus* ("On Visual Appearances") is subdivided into three main topical segments: the first dealing with the physical, physiological, and psychological grounds of visual perception (books 1-3), the second with the formation, perception, and misperception of mirror images (books 4-6), and the last with perception and misperception in refracting media. It is this last topical segment that I’ll be dealing with during the upcoming academic year.

Thanks primarily to David Lindberg, most of us are aware that Alhacen’s *De aspectibus* was the key source for the study of optics between the mid-thirteenth and early seventeenth century, when Kepler transformed that study with his theory of retinal imaging. Friedrich Risner took a major step in this transformation with the publication in 1572 of his *Opticae Theatrae*, which included the editor princeps of Alhacen’s treatise.

Risner’s edition was crucially significant because it made the *De aspectibus* far more accessible than it had been. This it did in two ways. First, and most obvious, it made more copies available to a wider audience than was possible in manuscript form. Second, by importing certain key editorial changes, Risner made it more easily readable. Not only did he publish it in a clear Roman font with few abbreviations, but he broke it into digestible theorematic chunks, adding his own enunciations to forewarn the reader about what was to be demonstrated in each of those chunks.

As a result, Risner made the *De aspectibus* easier to assimilate, but he also made it easier to read selectively according to specific topics. Why, after all, slog through the entire treatise when your sole concern is the analysis of concave spherical mirrors? Why not focus on those, and only those propositions dealing with that subject? And why not let the enunciations guide you to those propositions that seem particularly relevant to your specific interest?

The problem with this piecemeal approach, which has determined how the *De aspectibus* has been read and interpreted since the late sixteenth century, is that it traduces Alhacen’s original intent in writing the treatise. He meant it to be read as an extended essay bound together from beginning to end by a complex web of logical interconnections. To read it selectively according to particular topical or theorematic segments is to break that web and, along with it, the all-important systematic links that bind the treatise into an extraordinarily elegant whole.

That, in a nutshell, is why I’ve devoted most of my career to editing the *De aspectibus* from the manuscripts: to restore it, insofar as feasible, to the form in which it was actually read during the Middle Ages and Renaissance. Rereading the *De aspectibus* in that form will, I think, force some subtle but significant revisions in the current understanding of Alhacen’s role in the development of Keplerian and post-Keplerian optics.

Dava Sobel, a science writer who has written for the New York Times, Audubon, Discover, Life and The New Yorker, has also written books in the history of science, including Galileo’s Daughter and Longitude.

What the Guggenheim Foundation succinctly labels “Copernicus” in my grant description is actually a play about the events leading up to the publication of De Revolutionibus. As readers of this Newsletter no doubt know, much inherent drama surrounds De Rev, including the fact that Copernicus, according to the contemporary account of his closest friend, died on the very day the finished pages reached his hands, on 24 May 1543.

The writing of De Rev occupied Copernicus for more than three decades, and yet, as he admitted in his dedication to Pope Paul III, “The scorn which I had to fear on account of the novelty and unconventionality of my opinion almost induced me to abandon the work I had undertaken.”

In 1539, however, he was apparently pushed to publish by a surprise visit from a brilliant young stranger, Georg Joachim Rheticus, who traveled from Luther’s Wittenberg to the northernmost Catholic diocese of Poland expressly to question Copernicus about the heliocentric hypothesis. In just a few days—or perhaps only a matter of hours (no one really knows)—he convinced Copernicus to return to work on De Rev.

“That must have been some conversation,” I remember thinking to myself upon first reading of their encounter in Arthur Koestler’s The Sleepwalkers. The situation immediately suggested the plot for a play, although at that time, thirty-odd years ago, I lacked the courage to attempt writing one.

Heartened by the enthusiastic reception of my own recent books, and re-inspired by Owen Gingerich’s The Book Nobody Read, I started work in 2006 on a play called “And the Sun Stood Still.”

My play was commissioned by the Manhattan Theatre Club with funds from the Alfred P. Sloan Foundation (both enthusiastic boosters of science on stage). The willingness of the Gug-
Johannes Dantiscus. When I publish
the original manuscript of De Rev at the
Jagiellonian Library in Krakow. This was
a rare and wonderful experience – com-
parable to viewing a total solar eclipse,
in that it lasted only a few minutes, and
something normally invisible came to
light: a hole in the page where Copemitus
drew his Sun-centered cosmos (the natural
consequence of using a pair of compasses
to establish eight concentric circles).

My fondest wish for this project,
as with any of my articles or books, is
to offer a moment of crucial scientific
insight to an audience generally consid­
ered unreceptive to science.

Although the dialogue necessarily
arises from my own imagination, it is
based on fact and incorporates quo­ta­
tions from the writings of Copernicus, Rheticus, Tiedemann Giese, and
Johannes Dantiscus. When I publish
"And the Sun Stood Still," I will in­
clude copious historical notes.

I expect to complete the play by
December 2007. By then the Man­
hattan Theatre Club will have de­
cided whether to exercise its option to
produce a "world premiere." I sincerely
hope that happens, but I also dream of
productions by university theater de­
partments, as part of interdisciplinary
efforts with students of astronomy and
history of science.

Although "A New Theory" utilized a Newtonian notion of gravity,
the scientific theories and examples that supported its argument came
from chemistry and natural history – not primarily natural philosophy.
Focusing on material transformations, effluvial inundations, terrestrial ex­
halations and magnetic pulses, Wright

treats the earth as an organism.

Avoiding chronological timescales, he
suggests that the earth’s life consists of
some 12 stages in which it is repe­
eted transformed by water and fire, a
cosmological periodization common
at the time and echoing the Bible and
natural histories like Buffon’s Histoire
naturelle (1749). The hand-drawn
diagram of the earth’s structure in
Plate IX represents one of the stages in
which there is “The Universal con­
flagration or final Dissolution of the
Earth by Fire.” Although it is a simple
composition, Wright’s training as a
draftsman and architect is apparent.
The concentric circles of the earth’s
inner core were drawn with a compass,
while the volcanoes and aerial effluvia
were drawn free hand. The different
shades were achieved via the use of
cross hatching and stippling points
made in both ink and graphite.

Wright was keenly aware of how
to market a book. By the time he pub­
lished An Original Theory of the Uni­
verse, Newtonian natural theology had
established itself as a popular literary
genre. This work, with its appeals to
Georgian tropes of order, mathematical
certitude, and a high price tag, was
written for an upper class-readership.
But "A New Theory" was different.

Whereas his earlier publications gave a
macroscopic narrative of astronomical
order, his later work turns to the rela­
tively microscopic issue of the earth’s
formation and eventual transforma­
tion. Though the other side of the
same cosmological coin, it had little
relevance for an upmarket audience
interested in natural analogues of the
social order and which usually knew
little about the material theories used
to explain volcanoes, tides and miner­
als. To popularize his ideas, Wright,
therefore, had to turn to a different
medium. Scholars of the time, urban
and provincial alike, often wrote up
complicated discussions of natural
phenomena as manuscript ‘books’ and
‘pamphlets’ for circulation amongst
friends, colleagues, students and for­

eign correspondents. Although
the circulation routes of such
texts in the north of England
have yet to be determined,
Wright’s correspondence lists
show that he had assembled an
extensive network of former
students and intellectual
interlocutors – many of whom
were women – and who formed
the most likely audience for “A
New Theory.”

Matthew D. Eddy
Lecturer in the History of
Science and Culture
Durham University
CONFERENCE COMMENTARY

To Come: 3 Societies in Oxford

Following the previous joint meetings of the British Society for the History of Science, the Canadian Society for the History and Philosophy of Science and the History of Science Society over the past 20 years in Manchester (1988), Toronto (1992), Edinburgh (1996), St. Louis (2000) and Halifax, Nova Scotia (2004), it is again the turn of the BSHS to host the meeting next year. It will be held from 4-6 July at Keble College, Oxford. Oxford is easily reached from North America, being only a short bus ride from London’s Heathrow Airport.

Keble College is one of the largest Oxford colleges, founded in 1870. Set in attractive surroundings, the College has modern conference facilities, combining lecture theatre, seminar rooms, dining and accommodation (en suite) in a very compact area. Partly because of the close proximity to everything needed for a successful conference, the College has been able to offer us a package which includes accommodation, teas and coffees, all meals as well as the meeting rooms. It will only be drinks in the Oxford pubs that delegates will have to pay extra for!

The overall theme of the conference is ‘Connecting Disciplines’. This broad theme aims to encourage participants to respond to the diverse meanings it has for historians of science, technology and medicine and their colleagues in the wider scholarly community.

Oxford has much to offer. Keble is located close to the heart of the city and is directly opposite the University Museum, where Wilberforce, Huxley, and Hooker discussed Darwin in 1860. The Museum itself houses one of the finest natural history collections in the world. Nearby is the Museum of the History of Science which, aside from the importance of its collections (including the recently acquired objects relating to the early history of radio), will play host to a program of outreach events, an area where the BSHS has been particularly active over the past few years.

Opposite the Museum of the History of Science is the Sheldonian Theatre and the Bodleian Library, one of the great libraries of the world. Among its collections are the papers of Ada Lovelace, Mary Somerville, Dorothy Hodgkin, John Kendrew, the Marconi Company as well as those of many other scientists, engineers, and physicians.

An extensive social program is being developed by the local organizers, which will include the opportunity for delegates to explore the city, including its extensive links with the history of science. Details of the meeting will be posted on the Web sites of the three societies as they become available. The deadline for submitting a session or abstract is 3 December 2007 and enquiries about the conference can be made via 3socs2008@bshs.org.uk.

I look forward to welcoming you to Oxford next July for the sixth joint meeting of our societies, for what promises to be an exciting conference.

Frank James, President, BSHS

Networking in Science and Technology: The Gender Perspective

Celebrating its 25th anniversary, the Commission on Women in Science, held its third topical conference on "Networking in Science and Technology: The Gender Perspective" on the Greek island of Syros from 6-9 July 2007. The Commission has held several interstitial special meetings between the regular meetings of the International Union of History and Philosophy of Science/Division of History of Science and Technology.

Over 40 people participated in the discussion of papers that reflected on the ways in which formal and informal networks operated, influenced the lives of individual and groups of women, and advocated for change. Topics ranged from the impact of women's access to the internet in Africa and India to accounts of international networks that operated to save European Jewish women between the world wars. The vocabulary of "networking" is highly malleable. During opening and closing commentary, the group wrestled with the need to provide greater definition that might assist comparative studies while balancing the realities of a phenomenon that could be formal or informal, highly focused or a consortium of like-minded people, gender specific or not, long term or with singular or immediate goals.

The coordinators of the 2007 conference were Annette B. Vogt (Max Planck Institute for the History of Science), President of the Commission, and Maria Renterzi (National Technical University of Athens), Secretary.

The Commission will sponsor a symposium at the next IUHPS/DHST meeting to be held in Budapest from 26-31 July 2009. Information can be found at http://www.conferences.hu/ichst09.

BSHS Conference

This year’s conference of the British Society for the History of Science took place in Manchester between 28 June and 1 July 2007. It was hosted by the University of Manchester and coordinated by staff at the Centre for the History of Science, Technology and Medicine. James Sumner
deserves particular thanks. The conference, which marked the 60th anniversary of the Society's foundation, attracted 200 delegates. The overwhelming sense of optimism, due in large part to the presence and performance of the postgraduate and postdoctoral communities, more than survived the Mancunian inundations which, on at least one occasion, threatened to drown out the proceedings.

A packed schedule, with nearly 100 conventional papers, was complemented by less conventional but no less enjoyable events. Although the core aim of the Society will always be to foster the history of science 'proper', history of medicine was rightly prominent in Manchester, a fact which reflected the interests of CHSTM staff and students, and there were excellent sessions on the history of veterinary surgery (notably, its professionalization) and on the interactions between humans and animals (lemmings included). The contemporary history of computing also figured strongly, emphasizing Manchester’s growing reputation in that field. British interest in ‘literature and science’ and studies of popularization were also well represented. Beyond that, it was interesting to note a resurgence of work in the history, and cultural history, of chemistry and greater warmth expressed between historians and philosophers of science (not solely due to the intellectual diplomacy of Hasok Chang). An excellent panel on science in India showed that it has become possible to transcend colonial, and post-colonial, perspectives.

must have . . . recently published titles in the history and philosophy of science, medicine, and technology.

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Participants used their free anniversary umbrellas liberally during the wonderfully scripted ‘urban walk’ which took them, via Manchester’s industrial and pedagogic heritage sites, to the Museum of Science and Industry (MMSI). In amongst the engines, Frank issued copious thanks and announced the winner of the Outreach committee’s ‘image’ competition: an embarrassed but still vocal Joe Cain.

— Ben Marsden
University of Aberdeen
Several fellowships at the Chemical Heritage Foundation (CHF), an independent research center in Philadelphia, are offered to scholars through CHF’s Beckman Center for the History of Chemistry and the Center for Contemporary History and Policy for the academic year 2008–2009. The research collections at CHF, where the chosen fellows will be in residence throughout their fellowship period, range chronologically from the fifteenth century to the present and include 10,000 rare books, significant archival holdings, thousands of images, and a large artifact and fine arts collection, supported by over 100,000 reference volumes and journals. Within the collections there are many areas of special strength, including: alchemy, mining & metallurgy, dyeing and bleaching, balneology, gunpowder and pyrotechnics, gas-lighting, books of secrets, inorganic and organic chemistry, biochemistry, food chemistry, and pharmaceuticals. Recipients of all fellowships are expected to participate in and make a contribution to CHF’s intellectual life.

To be eligible for all but the Third-Party fellowships, applicants must either have a Ph.D. or equivalent or be a doctoral candidate at the dissertation stage. Their research projects must be in an area of the history of chemical and molecular sciences, technologies, and industries, broadly construed.

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Applications must include: (1) A cover sheet indicating which type of fellowship (long-term, short-term, Gore, Société, or Ullyot) you are applying for and the number of months of support required along with the following information: name; mailing address to be used for future correspondence; telephone and fax numbers; e-mail address; institution name and present rank; date Ph.D. received or expected; citizenship status & need for a visa, if applicable.; and title of project. (2) A research proposal of no more than 1,000 words addressing the relevance of CHF resources, how the work advances scholarship, and how the outcome might be published. (3) A C.V. of no more than three pages in length. The applicant must also arrange for two letters of reference to be sent directly to CHF and postmarked by the deadline.

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CHF also offers grants to cover travel expenses for short-term (1 to 4 weeks) research in our Othmer Library of Chemical History and historical archives and instrument and art collections. Applicants must reside more than 75 miles from Philadelphia to be eligible. To apply submit a C.V., a one-page statement of the research project and the applicability of CHF's resources, a budget estimate, and one letter of reference (sent directly from the source to CHF). Grants are usually $750/week and are intended to help defray the costs of travel and lodging. Proposals are reviewed upon receipt; there is no deadline. See our Web site or contact travelgrants@chemheritage.org for details.

Send inquiries and applications to:
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315 Chestnut Street, Philadelphia, PA 19106-2702
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Upcoming Conferences


Trust in Science Interdisciplinary Workshop. Toronto, 15-16 October 2007. E-mail: sinamendo@queensu.ca.


IV International Meeting on the History of Medicine. 21-23 October 2007, Florence, Italy. E-mail: m.pandolfi@unifi.toscana.it.

Remembering the Space Age. 22-23 October 2007, Washington D.C. E-mail: steven.j.dick@nasa.gov.

Nature Matters: Materiality and the More-than-Human in Cultural Studies. 25-28 October 2007, Toronto, Ontario. E-mail: essandj@yorku.ca or mshalus@yorku.ca.


Imagining Outer Space, 1900-2000. 6-9 February 2008, Universitat Bielefeld, Germany.


International Network for the History of Hospitals Fifth International Conference Hospitals and Communities. 1 April 2009, Barcelona, Spain.
The CHF Beckman Center Visiting Scholar Program: http://www.chemheritage.org or e-mail: travel-grants@chemheritage.org.

The H. Richard Tyler Award for research at the AAN Rare Books Collection at the Bernard Becker Medical Library in St. Louis, MO. Applications: http://www.aan.com/awards.

The University of Oklahoma: The Andrew W. Mellon Travel Fellowship Program. E-mail: kmagrud@ou.edu or mgilvis@ou.edu. Applications due 1 February 2008. http://www.lib.ou.edu/erc/history/sci/mellon.asp.

Grants in Aid for History of Modern Physics. Apply to: Spencer Weart, Center for History of Physics, American Institute of Physics. E-mail: sw@alp.org. Deadlines: 15 April, 15 September, 1 November, and 15 December 2007.

INA Grant-in-Aid Program for research at the Vanderbilt University Medical Center Archives, Nashville, Tennessee. Deadlines: 1 March, 1 June, 1 September, and 1 December. Send applications to: INA Grant-in-Aid Program, c/o CINP Central Office, 1608 17th Avenue South, Nashville, TN, 37212.


The Partington Prize is awarded every three years for an original and unpublished essay by a young scholar on any aspect of the history of alchemy or chemistry. Deadline 31 December 2007. http://www.ambiox.org.


The Bakken Library and Museum in Minneapolis offers Visiting Research Fellowships and Research Travel Grants. The next deadline is February 15, 2008. E-mail ihrig@thebakken.org. Web site: http://www.thebakken.org.


California Institute of Technology Grants-in-Aid. Applications reviewed: 1 January, 1 April, 1 July, and 1 October each year. http://archves.caltech.edu.


The California Institute of Technology and the Francis Bacon Foundation requests nominations for the Francis Bacon Award in the history of science, the history of technology, or historically-engaged philosophy of science. Contact Lisa Keppe at (626) 395-3690 for details.
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<td>B</td>
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<td>Museum Training, Experience</td>
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<td>Other specific training</td>
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**Advertising Media:**

- AHA Perspectives
- SHOT Newsletter
- Chronicle of Higher Education
- HTML Newsletter and/or website
- H-Net
- AAHLM Newsletter
- Other
- No reply

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**30 History of Science Society Newsletter October 2007**
**HSS Employment Survey 2007**

The primary goal of the Women’s Caucus in sponsoring the Annual Employment Survey is to help safeguard the rights of women, as well as the rights of all HSS members in their searches for employment and professional development. Secondary goals include giving job seekers and graduate students a better sense of the current job market, and helping potential employers of historians of science to plan future searches. The following report details the results of the 2006–2007 survey of 13 institutions—job listings in HPSTM were announced in Fall 2006 and Spring 2007—and the survey of applicants.

This year we sent out 106 surveys. Of the 38 usable surveys we received, a total of 32 hires were reported (17 permanent and 21 temporary) — four institutions skipped the question, and two indicated that the position went unfilled due to a disparity in qualifications and the search committee’s inability to reach a consensus. Of the 32 hires eight were at the assistant professor level (three females and five males); one male was hired at associate professor level; one male at the full professor level; one female as visiting faculty; one female and one male at the temporary level; three males as lecturers; 11 at the post-doc level (two females and four males — four chose not to indicate gender), and five as “other” (one female and two males were indicated). Of the 38 respondents only thirteen institutions indicated the gender of their applicant pool: 162 female and 329 male applicants.

Respondents are given the option of indicating one of four categories to describe the position they advertised. Of the 38 job searches, 26 respondents indicated History (and/or Philosophy) of Science, Technology, and/or Medicine (HPSTM) as the primary area of expertise desired; one respondent indicated HPSTM as a desired secondary or supporting area of expertise; 10 respondents indicated that HPSTM was one of several possible areas of expertise; and one indicated that HPSTM was not a factor in their search.

As in past years, there were few comments regarding the quality of the applicant pool. Those who did respond praised the considerable number of “excellent” applicants. However, one respondent indicated a desire for HPSTM graduate programs to include an applied ethics component. One respondent was surprised that applicants for their post-doc position were, in general, four to six years post-degree. Another indicated a willingness to create more positions in HPSTM, but had experienced resistance from administrators in their particular institution who do not see the relevance of the discipline to career-oriented undergraduate majors.

Survey respondents from this year’s applicant pool indicated a general frustration with search committees that did not provide timely information regarding applicant status. Two female applicants revealed that at some point during the interview process they had been asked personal questions regarding marital status and number of children.

One survey respondent expressed concern that “This survey clearly shows an academic bias,” and urged “the Society to remember that the largest single employer of historians in the US is the federal government.” In response, I would revise the statement to say that the largest employer of historians outside of academia is the federal government. Nevertheless, this point is well taken—applicants might consider looking outside of academia for possible employment opportunities. In fact, applicants indicated the major web sources for obtaining information about job listings in the history of science were HSS, SHOT, H-Net, and AHA, and only one respondent indicated that he had used an alternative Web site—Global Museum.

I would like to take this opportunity to thank Cornelia Lambert for her excellent work on the last three employment surveys.

Please send questions or comments regarding the survey to Mary Anne Andrei, Corcoran Department of History, University of Virginia, PO Box 400180, Charlottesville, VA 22904 or ma_andrei@virginia.edu

— Mary Anne Andrei, University of Virginia

**Program Profile**

*continued from p. 11*

What are some recent dissertations that have been produced by graduating students?

- Perez, Kimberly, “Fancy and Imagination: Cultivating Sympathy and Envisioning the Natural World for the Modern Child” (2006)
- Tredwell, Katherine, “The Exact Sciences in Lutheran Germany and Tudor England” (2005)
- Heidazadeh, Tofigh, “Theories of Comets to the Age of Laplace” (2004)
- Magruder, Kerry, “Theories of the Earth from Descartes to Cuvier: Natural Order and Historical Contingency in a Contested Textual Tradition” (2000)

Current students are completing dissertations on Newtonian theology, the biblical view of science in Antebellum America, modern biology and ecology, and the earth sciences.

Please provide an anecdote that personalizes or gives a human face to history of science at your institution.

When Duane H.D. Roller arrived at the University of Oklahoma, one of the first things on his agenda was to write Mr. DeGolyer to inquire about the annotated 1632 edition of Galileo’s *Dialogue*, the first book that he had given to the University of Oklahoma. In response to Roller’s questions, DeGolyer explained that he had paid $1,000 for the book (and had probably been cheated because he had purchased it from a none-too-trustworthy Roman bookseller), and that he did not know whether the changes in the book were actually made by Galileo. The only way to be sure, he explained, would be to have the writing authenticated by an expert in Galileo’s writing, Stillman Drake. Drake came to the University of Oklahoma, where he pronounced the handwriting genuine and vastly increased the value of the Collection.

The program’s alumnae include three distinguished women: Clara Sue Kidwell (Ph.D. 1970), currently Director of the American Indian Center at the University of North Carolina at Chapel Hill, and formerly Assistant Director of Cultural Resources at the National Museum of the American Indian, Smithsonian Institution, and Director of the University of Oklahoma’s Native American Studies Program; Marilyn B. Ogilvie (Ph.D. 1973), current Curator of the University of Oklahoma History of Science Collections; and Liba Taub (Ph.D. 1987), Curator of the Whipple Museum of the History of Science, Cambridge, England.
Thomas Wright (1711-86) was born in Byers Green, Co. Durham and received his primary education in Bishop Auckland, Gateshead and Sunderland. An autodidactic polymath, he went on to become a tutor to the aristocracy and successful author of works on natural philosophy, mathematics, gardening, and architecture. In 1742 he was offered a post at the Imperial Academy at St. Petersburg (which he declined) and in 1750 he published his most popular book, An Original Theory of the Universe, which is primarily remembered for its description of the Milky Way and for the impact that its ideas had upon the philosopher Immanuel Kant. Yet over the course of his career he produced hundreds of pages of letters, notes, and drawings — many of which were turned into pamphlets, paper tools, engraved diagrams, study guides and wall charts.

"A New Theory of the Earth" is a manuscript book written sometime around 1773. Wright drew many of the book's ideas from the canon of texts employed by humanists across Europe during the early modern period and the Enlightenment. First taught in households, parish schools and academies, then in universities, this canon included the Bible along with various classical, patristic and Renaissance works and incorporated a select group of new books associated with the Scientific Revolution. It allowed Wright to cite Copernicus, Kepler and Newton in one sentence; then Ptolemy, Eusebius, Origen and Agricola in the next.

Continued on p. 23