

# F E R M I N E W S

F E R M I L A B

A U.S. DEPARTMENT OF ENERGY LABORATORY



Quiet: Librarians at Work 2

Photo by Reidar Hahn

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## INSIDE:

- 6 Career Building
- 8 Money, Science and History
- 12 Interactions: Why Fundamental Research with Particle Accelerators?



# Quiet:

## Librarians At Work

by Sena Desai

**T**he silence is broken by an occasional subdued cough or the clicking of a printer. All seems calm in Fermilab's library as Sue Hanson, the administrative support assistant, helps people at the front desk; or as Sandra Lee, the librarian, quietly puts books back on shelves. But beneath this calm surface on the third floor of Wilson Hall, the nine people in the Information Resources Department are working tirelessly to put the library on the map as a provider and controller of physics-related information.

Last year, Fermilab's IRD began storing its information and literature in the Stanford Linear Accelerator Center database, the Stanford Public Information Retrieval System. The shift to SPIRES has cut expenses for Fermilab and IRD has become more efficient, evolving into a "virtual library" accessible from anywhere in the world.

In light of the broad capabilities afforded by Internet searching, the role of library services like the IRD may seem defunct. But an untold amount of information cannot be accessed through search engines like Google. Getting to this second level of information requires the expertise and training of a librarian. As more and more information is stored in more and more places on the Web, the role of library services like the IRD becomes even more crucial and complex—they now have to train their people to store information in computer databases rather than bookshelves, and more importantly, train them to find this information when their patrons need it.

Fermilab's IRD has two groups working closely together. While the library group brings outside information to Fermilab, the technical publications group collects information from Fermilab, catalogs it, and archives it for use by the rest of the world.

Until last year, IRD contracted with several outside commercial database systems for storing and accessing its information. Using contractors meant Fermilab did not need experts trained in the working of any particular database system. But it was also more expensive, and with less control over information, than if IRD had owned its database.

Fermilab's Library offers about 10,000 books and subscribes to nearly 120 journals.

**Sounds of silence  
accompany  
INFORMATION  
RESOURCE  
DEPARTMENT'S  
move to the  
top drawer  
of the physics  
cataloging system**

**ON THE WEB:**

**Library Website:**

<http://library.fnal.gov>

**Fermilab SPIRES:**

[www-spires.fnal.gov/spires/hep](http://www-spires.fnal.gov/spires/hep)



Photo by Reidar Hahn

Gathering in the Information Resources Department's library are (from left to right) Celina Paul, Kathryn Duerr, Sue Hanson, Cyndi Rathbun, Heath O'Connell, Rob Atkinson, Jean Slisz, Kevin Williams, and Sandra Lee.

Over the years, many physics laboratories around the world have partnered with SLAC to use SPIRES as their own database. They can enter and access information directly through SPIRES, giving them complete control over their information. When Heath O'Connell took over as IRD's manager last year, Fermilab became the newest partner.

O'Connell, a physicist who managed the SPIRES database at SLAC before coming here, was aware of the good things this database could do for Fermilab. Soon after his arrival here, he worked with SLAC so Fermilab could use the SPIRES database. "I have been interested in adopting the SLAC model to have ownership of our data," he says. "And I have been interested in developing the expertise in people within our library so they understand our database completely."

SPIRES was first conceived because researchers like to bounce papers off their peers for feedback before submitting them to journals. And physicists

around the world have always sent copies of their papers to prime physics locations like SLAC and Fermilab. In 1962, at the request of its first director, W.K.H. Panofsky, SLAC began cataloging information of pre-prints it received. At the time, Stanford was developing a database in which the pre-print information was entered—the earliest version of SPIRES, accessible through Stanford's computing system. But it was only with the advent of the Internet that people from around the world could access SPIRES. When physicists started sending their articles electronically via email, the e-print evolved. The SPIRES database, now housing almost 500,000 articles, motivated the creation of the first site in the country for the World-Wide Web.

The Internet encouraged partnerships between SLAC and other laboratories, making SPIRES a world center for physics information. But there were problems with the huge amount of information coming in.

# Quiet:



Photo by Reidar Hahn

The front desk is the first point of contact.

“People were emailing their papers all over the place,” says O’Connell. “And it was a jumble.”

Paul Ginsparg, a theoretical physicist at Los Alamos National Laboratory, created an archive for storing e-prints, generating a daily list of the newest papers. Later, Ginsparg accepted a professorship at Cornell University and moved himself and the e-print archive there. The Cornell University archive is now a storehouse of full-text e-prints cataloged in SPIRES.

Fermilab now not only hosts SPIRES on its server, but has gone a step ahead—it is also handling all the astrophysics e-prints. “In a sense it was natural that Fermilab should have control of this sub-field of physics because it has a lot of experience and expertise in the area,” says O’Connell.

Since Fermilab took over, the astrophysics papers’ database has expanded. While SLAC cataloged only those astrophysics papers related directly to particle physics, Fermilab’s IRD catalogs a broader range of astrophysics papers. “The presence of a

strong astrophysics community in Fermilab suggests that astrophysics and particle physics are becoming closer together,” says O’Connell.

All this volume has increased the challenges for the IRD group. Kathryn Duerr, the library technician, now spends most of her time entering new astrophysics papers and updating older entries. Celina Paul, the interlibrary resources librarian, is pulling out the 28,000 astrophysics papers already in the archive, making the entries more comprehensive so they are easily accessible through SPIRES. And Kevin Williams, the computer professional, has worked with SLAC to set up SPIRES on the Fermilab server.

Researchers at Fermilab first upload their papers in the technical publications group archive. But before the rest of the world sees the paper, Cyndi Rathbun, the technical information coordinator, sends it out for a patent review and for a peer review. If there are errors, the paper goes back to the author for changes, before it is finally posted on the SPIRES website for all to see.

# “The presence of a **STRONG ASTROPHYSICS COMMUNITY** in **FERMILAB** suggests that astrophysics and particle physics are becoming **CLOSER TOGETHER**”

For the first time in the history of physics laboratories, Fermilab is systematically collecting and storing its doctoral theses on its own server. O'Connell says researchers were interested in reading details of other experiments available only as paper copies. Now the full theses are available online.

The book catalogs are still on a commercial database over which Fermilab has little control. But IRD is working on transferring the book catalogs to SPIRES. “At every step there are issues and problems,” says O'Connell. “Not the least of them is getting information out of the commercial database.”

But Rob Atkinson, who has cataloged books at IRD for 11 years, especially enjoys this new challenge because he was a computer science major. “When Heath came last year, he saw my academic background and decided to make use of it,” he says. The existing library catalog is converted to SPIRES using a language called Perl, which Atkinson is mastering so Fermilab's books can soon be in SPIRES.

With the visual media services at SLAC, DESY, Santa Barbara Theoretical Institute, and Jefferson Laboratory among others, Atkinson is also building a database of streaming videos in SPIRES. And Jean Slisz, the web developer, has redesigned the IRD web pages, making them easier to navigate.

Though they now have a lot more on their plates, the IRD group welcomes the changes.

“We are becoming more visible in the physics community under Heath,” says Paul. “Before, we were just Fermilab and did our own thing. But now we are a part of SPIRES and actively providing information to the rest of the physics community.”

Fermilab has always been at the forefront of physics research. It has now entered the 21st century adopting state of the art technologies to store and deliver its research to the world.

“We used to write down everything on paper, then write it again and put it in the database,” says Rathbun. “Now we are doing things electronically in a faster and more efficient way.”

## What your librarians can do for you

### **Heath O'Connell** – *Manager*

O'Connell has brought the SPIRES know-how to Fermilab and spends a lot of time talking to the IRD group, getting them up to speed on SPIRES. “We are all involved in a steep learning curve,” he says.

### **Robert Atkinson** – *Database specialist*

Atkinson is working on moving IRD's database to SPIRES. The old database has a different format than SPIRES and Atkinson is learning a scripting language called Perl that will convert the old database to a SPIRES-friendly format.

### **Kathryn Duerr** – *Library technician*

Duerr does the original entries of the astrophysics papers. She also looks for Fermilab theses not entered in SPIRES and transfers them there. She ships off journals to the bindery in Indiana.

### **Sue Hanson** – *Administrative support assistant*

Hanson is at the checkout counter and is the first point of contact for people. She shelves books and journals once they are returned.

### **Sandra Lee** – *Librarian*

Lee orders books and journals for the library. She puts new books on the display shelf and keeps an updated “new books list.” She also does the department's book-keeping.

### **Celina Paul** – *Interlibrary Resources Librarian*

Paul borrows books from other libraries if people need them and the books are not available at Fermilab. She also loans out Fermilab's books to other libraries. Paul manages the jobs database in SPIRES, a comprehensive listing of jobs for physicists.

### **Cyndi Rathbun** – *Technical information coordinator*

Rathbun helps researchers upload their preprints. She then sends the preprints to Roy Rubenstein, who assigns a peer reviewer, and Bruce Chrisman, for a patent review. Once the paper passes both reviews, it is uploaded in the SPIRES database.

### **Jean Slisz** – *Web developer*

Slisz has redone the IRD webpage so it is easier to navigate. She also helps Atkinson with transferring the library's database to SPIRES.

### **Kevin Williams** – *Computer professional*

Williams provides computer assistance for the department—helping people run their computers and applications. He is helping set up SPIRES on Fermilab's server.



# Career Building

## New Wilson Hall building manager Steve Whiteaker knows the drill from Roads and Grounds up

by Elizabeth Clements

**A**t 16 stories and 238 feet tall, Wilson Hall is home to physicists, administrators, maintenance people; to conferences, arts series performances and, of course, the cafeteria. On any given day the building buzzes with theories about inflation or oscillations or even migration (many Fermilab scientists are avid birdwatchers), but the-behind-the-scenes work of operating the building remains just that—behind the scenes.

Take electricity for example—it is hard to ponder dark matter in the dark. How about elevators? It is hard to maintain “high-energy” if you have to walk up fifteen flights of stairs. And most important of all—heat—because who wants office cryogenics during Chicago winters?

And while you and I may take indoor plumbing, or a roof that doesn’t leak, for granted, Steve Whiteaker, the new Wilson Hall General Building Manager, does not.

On March 31, Whiteaker replaced Kent Collins, who was the Building Manager for more than ten years. Collins is now the new Infrastructure Condition Assessment Coordinator for Fermilab’s Facilities Engineering Services Section.

“The most important thing about being a Building Manager is the ability to communicate with people,” said Dave Nevin, head of FESS. “Wilson Hall has a large number of very diverse people, who all have very important jobs. It is imperative that the building manager be able to communicate effectively with these people. Steve has demonstrated in his previous positions and interactions with people at the lab that he is very good at communicating both verbally and in writing.”

Although Whiteaker may be the new kid on the block in Wilson Hall, he is certainly not a stranger to Fermilab. At the age of 16, he got his first summer job between his junior and senior years of high school, working for the Roads & Grounds Department at Fermilab.

### ON THE WEB:

**Facilities Engineering  
Services Section:**  
[www-FESS.fnal.gov](http://www-FESS.fnal.gov)

## PROFILE IN PHYSICS



Photo by Reidar Hahn

Steve Whiteaker, Wilson Hall's new building manager, began his Fermilab career with a summer job in Roads and Grounds at the age of 16.

"It was a great summer job because you never had to work on nights or weekends. When you're in high school, you can't do much better," said Whiteaker. "Fermilab's summer programs serve a real purpose because they reach out to younger people and open their eyes to all kinds of opportunities. After my first summer at Fermilab, I knew that I always wanted to work here because of the people and the atmosphere. Fermilab is the only place that I have ever worked, and I love it."

Whiteaker graduated from a high school class of thirty people in the small town of Newark, Illinois. He started working full time for the Roads & Grounds Department in 1988 and was part of

the pesticides program for eight years. For the past three years, Whiteaker worked for the sign department, which is a Roads & Grounds computerized graphics program.

"In Roads & Grounds, everything is about working as a team," said Whiteaker. "The same thing holds true for being a good Building Manager. I learned on my first day that you couldn't do all the things that a building manager has to do without an extremely long list of people. If you want to truly interview the Building Manager, you should have about thirty other people in here. To say that it is all me just wouldn't be true."

At the age of 32, Whiteaker is not only adapting to the new role of Building Manager, but in June, he will also have the new role of Dad. When Whiteaker is not at Fermilab or in a natural childbirth class with his wife, he is taking night classes toward his college degree.

"In another eight years, the degree will be mine," Whiteaker said with smile. "Looking back on it, I would have liked to have gone to college, but I just wasn't ready after high school. I am at the age now when I want to have a college degree. This is the time in my life when I have to decide where I am going."

But Whiteaker has already set a steady course.

"Steve was a stand-out star at Roads & Grounds, and he is going to do a wonderful job as building manager," said Collins, who will be making the rounds with Whiteaker for introductions over the next couple of weeks. "He has the people skills, the motivation, and after being at Fermilab for so many years, he has the background."

Nevin could not agree more.

"Steve is an up-and-comer," he said. "This is just another stop in what will be a very exciting career for him." ❄

# AAAS

## SCI TECH POLICY

# Money, Science and History

Budget realities and future concerns are the center of attention at AAAS Colloquium on Science and Technology Policy

### ON THE WEB:

American Association for the Advancement of Science:  
[www.aaas.org](http://www.aaas.org)

by Mike Perricone

**W**ASHINGTON, D.C.—Big science in America celebrates its bicentennial this year with commemorations of the Corps of Discovery, commissioned by President Thomas Jefferson in 1803 to explore the new Northwest Territory of the \$15-million, 800,000-square-mile Louisiana Purchase.

Jefferson, and Capts. Merriwether Lewis and William Clark, also participated in the first major cost overrun in big science in America. The President requested \$2,500 to finance the expedition. Its final cost was around \$38,000—although bringing with it an incalculable wealth of knowledge that is still a focus of attention.

But at least one other aspect of big science was very different in those days, as Kei Koizumi told the 28th Colloquium on Science and Technology of the American Association for the Advancement of Science on April 10.

"President Jefferson requested the funding, and a week later Congress approved it," said Koizumi, who conducts the annual analysis of the Federal Budget for AAAS.

A stark contrast with the current budget process and specifically the budget for FY2003, which Congress recently passed about midway through the fiscal year. With tax cuts, deepening deficits and uncertain costs for the war in Iraq, the budget demands what Koizumi called "tough priority choices," primarily with constraints on domestic discretionary spending.

Science and technology share in the constraints. Koizumi reported that funding for non-defense research and development would increase by one-tenth of one percent. Areas that have counted on substantial annual increases are seeing a slowdown. The National Science Foundation, currently the beneficiary of an authorization bill to double its funding over five years, fell about \$900 million short of what the doubling track would have mandated. The National Institutes of Health has a 2.7 percent increase that represents a drop-off from double-digit increases now that its five-year doubling track has expired.



Kei Koizumi



Elias Zerhouni

NIH Director Elias Zerhouni explained that the overall 2.7% increase included 7% specifically marked for research—and the recent funding trend gave that figure additional impact.

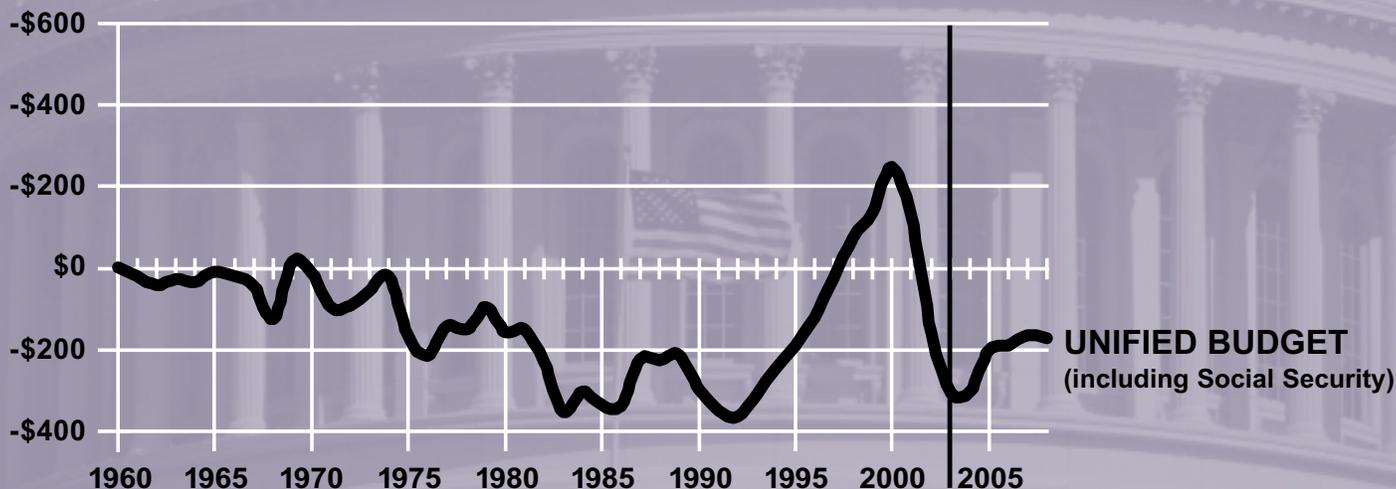
"NIH is in marked transition from the 15 percent increase of FY03," Zerhouni said. "But when your base has been doubled, seven percent is like 14 percent before the doubling."

Zerhouni cited examples of the stimulating effects of Federal investment. The number of NIH grants increased by 40 percent; the number of applications for grants increased by nearly 40 percent from 24,000 to 33,000; the average amount of Competing Research Grants grew from \$255,000 in 1998 to \$370,000 in 2003. As a consequence, medical schools have invested heavily in expanding: Zerhouni pointed to an additional 18 million square feet of space in medical school facilities, with increases in Ph.D. faculty ranging from an estimated 18,000 to 27,000.

He also cited dramatic health benefits, using heart disease as an illustration. Zerhouni said that flat-flat budgeting between 1965 and 2000 would have projected statistically to 1.3 million heart disease deaths in 2000. Instead, heart disease caused 514,000 actual deaths in 2000, or a possible 815,000 lives saved as a correlation to increased spending.

## Federal Budget Deficit (or Surplus) FY 1960-2008

in billions of CONSTANT FY 2003 dollars (President's proposals)



Graph courtesy AAAS

Following a linear climb through the 1990s toward a surplus, the Federal Budget is experiencing a deficit forcing tough priority choices in domestic discretionary spending

"If the funding curve flattens," Zerhouni said, "it means we need more investment."

Funding wasn't the only constraint on the Colloquium's collective consciousness. The international nature of science, and the challenges posed by security restrictions, served as a continuing theme in panel discussions and plenary sessions. John Marburger, director of the Office of Science and Technology Policy, and science advisor to the President, devoted his entire keynote speech to the backlog in processing visas for foreign students and scientists (see accompanying story). That constraint is being felt throughout the scientific and academic communities.

Ray Orbach, Director of the Office of Science at the Department of Energy, gave his personal view that mending the strains on international collaboration is "critical to maintaining the international nature of science." The Office of Science is the nation's third-largest supporter of basic research, and the primary support for high-energy physics.

"There are no boundaries in science. No country controls science," Orbach said. "Science represents an international program of immense value to the entire world...I've been trying to explain to other assistant secretaries that foreign scientists aren't

here just to sample our science. In many cases they are running our science, they are running projects, they are in charge of detectors. It would be tragic if there is interference [from the current strains] with the function of science."



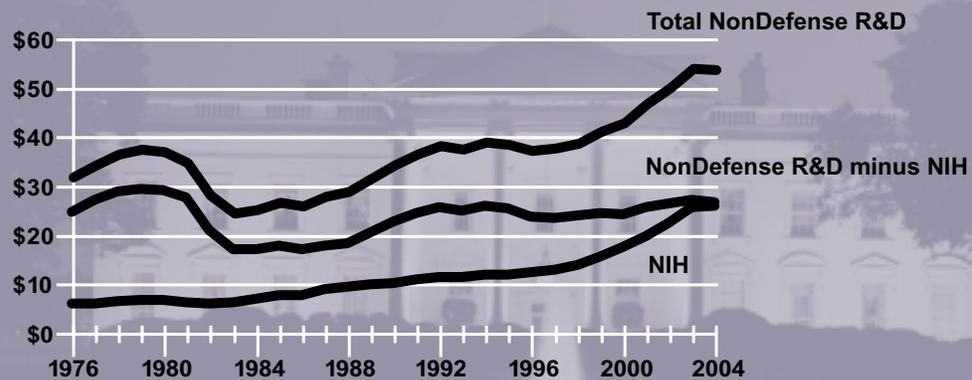
Ray Orbach

A look back at the Corps of Discovery confirms the importance of international collaboration from the outset of American big science. On their journey, Lewis and Clark enlisted the aid of French-Canadian trapper Toussaint Charbonneau as a translator with Native American tribes. Charbonneau also brought an indispensable contributor to the expedition: his wife, Sacagawea, the Native American woman who guided the Corps of Discovery through the uncharted lands.

As a woman and a Native American, Sacagawea would also be regarded today as representing segments of the population that are under-represented in American science. To Shirley Jackson, president of Rensselaer Polytechnic Institute and president-elect of AAAS, those under-represented segments of the population offer a valuable talent pool for the future—and perhaps a necessary talent pool.

## Selected Trends in NonDefense R&D FY 1976-2004

in billions of CONSTANT FY 2003 dollars



Graph courtesy AAAS

When NIH funding is subtracted from the total, nondefense research and development funding has remained essentially flat since 1976.

Jackson noted that while scientists and engineers make up just five percent of the U.S. workforce, they have had a profound impact over the last 50 years in America's health, income, standard of living and ability to offer assistance to the world. She also noted that this "cohort" of scientists and engineers, who have propelled the impact, is now close to retirement—an issue especially prominent, she said, in the National Aeronautics and Space Administration. But she feels the issue is not being adequately addressed, and she pointed with concern to static or declining enrollments in engineering and the physical sciences by U.S. students.

"And I should know—I run a technological university," Jackson said.

Foreign scientists and students are filling the gaps, but Jackson pointed to important changes: more foreigners are returning home, with jobs moving overseas and with Third World economies improving; and restrictions on immigration are particularly affecting the sciences and engineering. She cited RPI's historical links to students from Malaysia—a link that is now endangered.



Shirley Jackson

## Marburger on visas: "We have to make [the system] work."



WASHINGTON, D.C.—John Marburger, director of the Office of Science and Technology Policy and science advisor to the President, underscored the impact of the visa backlog on foreign students and scientists by making it the sole subject of his keynote address to the AAAS Colloquium on Science and Technology Policy.

"We're looking for needles in haystacks, and we have to go through lot of hay," he said. "The system is not set up for it, but we know we have to make it work."

Marburger stressed that "the Administration values the contribution foreign scientists and students make to the nation's scientific enterprise, to our economy, and to the

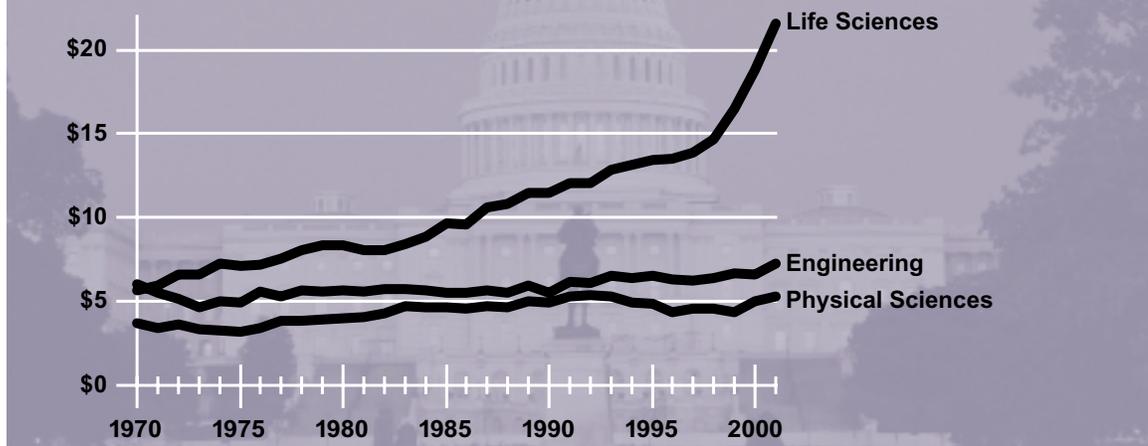
appreciation of American values throughout the world." He pointed to similar language at the beginning of Homeland Security Presidential Directive 2 (HSPD2), issued by President Bush on Oct. 29, 2001. He also admitted that the directive's strong language on ending the "abuse" of student visas "left many of us struggling to make that consistent with the opening statements."

Marburger acknowledged that increased scrutiny has led to a small but significant rise in visa rejections, in two primary categories: "failure to establish intent to return to the home country," and "application does not comply with [Immigration Service] requirements." He added that no other categories come "within an order of magnitude" as causes for rejection.

Rejections in the second category can hinge on something as simple as filling out forms carelessly, Marburger said. But establishing intent to return is critical, because the legal burden of proof is on the applicant to demonstrate ties that would result in leaving the U.S. when the visa expires.

## Trends in Federal Research by Discipline FY 1970-2001

obligations in billions of CONSTANT FY 2002 dollars



Graph courtesy AAAS

While the life sciences have experienced a steady growth in funding since 1970, the physical sciences and engineering have experienced only slight increases.

“We had 29 students recently who could not get their visas in time to enroll as freshmen,” Jackson said. “Now they’re looking toward Canada and Australia.”

If the coming shortage cannot be addressed adequately from outside the country, Jackson said it could be addressed from within by what she called an “affirmative opportunity” to build the workforce. She asserted that if women, minorities and people with disabilities held jobs in science and technology in proportion to their percentage of the population, there would be no shortage to address. But she also noted that U.S. high schools

are consistently near the bottom of international rankings in science and math.

“The effort can’t begin at the college classroom door,” Jackson said. “By then, it’s too late.”

The changes Jackson believes are necessary would require a shift toward long-term thinking and planning. As the NIH has shown, even a slight shift, to a five-year strategy, can have unanticipated benefits. Just as, two hundred years later, we still have things to learn from the Corps of Discovery.

“If you’re investing in science and technology with short-term hopes,” said Zerhouni, “then you’re not investing well.”

Marburger admitted some might consider this policy contradictory to stated official intentions of attracting the most talented students and scientists from abroad. But he added: “Student visas are not immigrant visas or temporary worker visas, and applicants should be aware of this.”

Applicants for visas report waiting 90 days or more for a process that formerly took less than 30 days, effectively ruling out short-term plans to attend science conferences or meetings. Marburger asserted that the backlog stemmed not from the small increase in rejections, but from the large increase in cases screened for possible terrorist ties or for possible intent to evade laws on exporting technology or sensitive information.

The data on terrorism screening is classified, Marburger said, but he presented compelling numbers in the other category. In 2000, Marburger said, only 1,000 cases were reviewed on the basis of export sensitivity. There were 2,500 reviews in 2001, and 14,000 reviews in 2002. He said that both the State

Department and the Federal Bureau of Investigation are now devoting full-time staffers to clear up the backlog, although there are at least 1,000 cases in the system at any given time.

Marburger said he has directed OSTP to make the visa backlog a priority. He cited a coordinated effort among OSTP and six offices and agencies last fall, clearing out nearly 10,000 backlogged visa applications. He also said it was important for universities and other institutions to provide specific data on how they are being affected. Marburger urged academic institutions to take three helpful steps: provide information on the visa process, to urge applicants to fill out forms carefully, and “to be honest about what the system is trying to accomplish.”

“The backlogs result from screening applicants more rigorously,” Marburger said, “not from policies to exclude applicants.”

—Mike Perricone

**BIG**  
science

has always had

**BIG**  
payoffs

often with

**BIG**  
surprises

Respond online at  
[www.fnal.gov/pub/ferminews/  
interactions/index.html](http://www.fnal.gov/pub/ferminews/interactions/index.html)  
or send email to  
[ferminews@fnal.gov](mailto:ferminews@fnal.gov)

# Fundamental Research with Particle Accelerators:

by Paul Söding

**I**t is often—and rightly—questioned whether society really can and should pay for such large, expensive facilities as the accelerators used in particle physics research.

History shows that large-scale scientific equipment is by no means a recent phenomenon. As far back as the 16th century, the Danish crown provided the astronomer Tycho Brahe with an entire island, as well as almost unlimited financial aid and human resources, to establish a large astronomical observatory. Brahe was then able to measure the positions of the planets and stars with unprecedented accuracy. In the hands of the ingenious Johannes Kepler, Brahe's results paved the way not only for modern-day astronomy and cosmology—sciences concerned solely with the search for truth and understanding—but also for the field of mechanics founded by Galileo Galilei and Isaac Newton. They in turn laid the groundwork for a field of applied science that defines our modern world. Without Galileo and Newton, there would be no cars and no airplanes today—in fact, none of the technology from which we now benefit would exist.

Large-scale equipment is required in many fields of science. The exploration of our planet by expeditions with big sailing ships in centuries past exemplifies well what motivates major research enterprises: pushing back scientific frontiers, the fascination of the unpredictable, and the conviction that costs, efforts and risks involved are all eventually worth it for society.



Aerial view of the DESY research center in the western part of Hamburg, Germany.

Photo courtesy DESY

# Why?

It is sometimes lamented that research equipment is becoming ever larger and more expensive, that experiments are taking longer, and that research is carried out more and more in the style of an industrial project. This is, however, not due to megalomania on the part of the researchers but to scientific progress. We can now probe more deeply into the structure of matter, reach previously inaccessible parts of the cosmos, and tackle increasingly complex issues. The laws of nature leave us no other choice but to use large-scale instruments and facilities as well as the most advanced technology. This is particularly obvious in astronomy, which requires increasingly large and sophisticated telescopes to peer into the farthest regions of the cosmos. The results continually give us new and surprising insights into our world as we probe farther and farther into the depths of space and time. Instruments such as the Cosmic Microwave Background Explorer and the Hubble Space Telescope have led to a revolution in our view of the universe. In elementary particle research, the deeper we probe the innermost layers of matter, and the more we learn about the basic laws and interrelations in nature's functioning, the greater the resources we need—in terms of ideas, instruments and effort. In particular, we require increasingly powerful “microscopes”—the particle accelerators.

What benefits can we expect from this type of research? The effort and resources that mankind has invested in studying nature have always proved to be worthwhile in the end. Tycho Brahe's huge astronomy project is an excellent example. We do not yet know how the insight gained from particle research will eventually rank against other human achievements. One fact, however, we can already state for sure: Invented, developed and built to find out just what holds the world together, various types of particle accelerators are already



Superconducting accelerator structures of niobium, called resonators, are components of TESLA, the proposed future linear accelerator.

proving their usefulness in a multitude of applications. From the diagnosis and treatment of illnesses to the generation of synchrotron radiation and neutrons for research into wide-ranging disciplines, these tools benefit many fields—from physics and chemistry to geology, materials science, biology, medicine, archaeology and even criminology. The full potential for accelerator applications might be so expansive that only future generations will know how to exploit them.

Photo courtesy DESY

# Large-scale scientific equipment IS BY NO MEANS A RECENT PHENOMENON

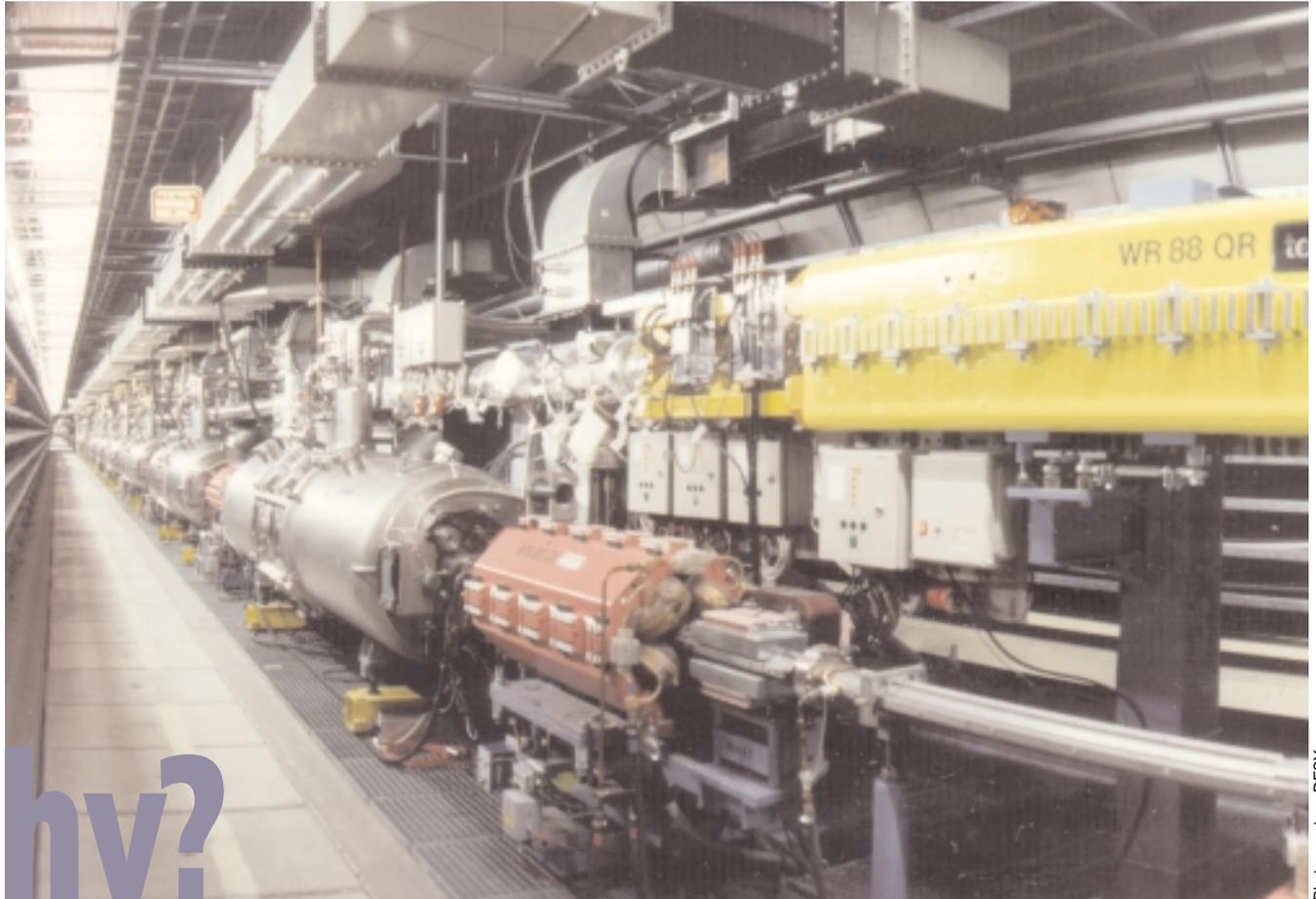


Photo courtesy DESY

# Why?

DESY's particle physics research is currently conducted at the Hadron-Electron Ring Accelerator (HERA), a 6.3-kilometer circumference accelerator.



Paul Söding (left) received the German Federal Cross of Merit, First Class, from German Federation President Johannes Rau in September, 2002. Söding was honored for his research in elementary particle physics, and for his dedication in reuniting science and scientists from the old and new German federal states.

Also, the abundance of new technologies that particle physicists have developed for their experiments have proved beneficial in many ways, in medical diagnosis and beyond. In the form of the World Wide Web, new technologies growing from particle physics have even brought about a revolution in the global networking of information and knowledge.

Experience has shown that it is impossible to predict the entire extent of knowledge, innovation and value that will arise from a given research project. But it has become apparent time and again that the development of an innovative, large-scale research instrument is likely to set an important milestone along the path of progress in scientific insight and the search for truth. Major advances in the basic sciences, and the discovery and exploitation of new areas of research, have often been closely connected with the creation of new, specific instruments.

The large accelerators for elementary particle research represent such new instruments. They are helping us to probe deeply into the heart of matter. The complex, dynamic structure of quarks, antiquarks and gluons that make up the innermost part of our matter is revealed with increasing clarity, enhancing our understanding of the structure of matter. This involves more than just being familiar with the functions of and the interactions between the smallest particles. It also includes comprehending why nature is the way it is—and why it is only the way it is. Particle accelerators are indispensable in the pursuit of this quest. They will guarantee us much excitement in learning what new insights and surprises are waiting around the corner, on the great journey of discovery into the deep secrets of matter. ❄

—Paul Söding was the *Deutsches Elektronen Synchrotron Director of Research* from 1982 to 1991, and served as *head of DESY Zeuthen* from 1992 to 1998.

## FERMILAB ARTS, LECTURE AND FILM SERIES

To purchase tickets for Arts and Lecture Series events, or for further information or telephone reservations, call 630-840-ARTS weekdays between 9 a.m. and 4 p.m. Phone reservations are held for five working days, but will be released for sale if not paid for within that time. Will-Call tickets may be picked up, or available tickets purchased, at the lobby box office on the night of the performance beginning at 7 p.m. When coming to this event, only the Pine Street entrance to Fermilab will be open. **Film Series:** All shows are Friday nights at 8 p.m. in Ramsey Auditorium. Tickets are \$4 for adults, \$1 for children (under 12), and \$2 for Fermilab students, and are sold only at the door. Please join us for refreshments and discussion after the film. For more information, check out our web page at [www.fnal.gov/culture](http://www.fnal.gov/culture).



### ARTS SERIES Orquesta Aragon May 10, 2003

Founded 60 years ago, Orquesta Aragon is recognized as the premiere charanga group in Cuban Music. In keeping with the charanga-style, Orquesta Aragon is a 13 piece band that does not feature a brass-section, but rather vocals, flute, and violins on top of a rhythm section of piano, bass, congas, timbales, bongo and clave.

Tickets - \$26 (\$13 ages 18 and under)

### FILM SERIES Friday, May 9, 2003 Mulholland Drive

USA (2001), 145 min. Dir: David Lynch.

Lynch's atmospheric film noir intertwines the stories of Betty (Naomi Watts), a perky Hollywood hopeful, and Rita (Laura Harring), amnesiac from a car accident along Mulholland Drive, with strange and macabre doings in the world behind the scenes of showbiz.

## CALENDAR/LAB NOTES

### MAY 5 - MAY 8: FERMILAB FRIENDS FOR SCIENCE EDUCATION

■ Scholarship/Membership Drive, WH Atrium, 11:30am - 1:30pm. FFSE provides Scholarships so that students, teachers, and families can attend sponsored activities & programs. Won't you help? Your membership dues, donations, and purchases support Science Education! Visit us each day; Mon & Wed: Hands-on Activities; Tues: Investigate Water Critters; Thurs: Figure with Fermi. For more info, see <http://www.ed.fnal.gov/ffse/>

Website for Fermilab events: <http://www.fnal.gov/faw/events.html>

### VIRTUAL ASK-A-SCIENTIST May 6, 2003

■ The next Virtual Ask-a-Scientist will be on Tuesday, May 6 from 7-9 p.m. Central Time. Bruce Baller and Chris White, both of the MINOS experiment will answer questions live online. For more information, go to <http://www.fnal.gov/pub/inquiring/virtual/index.html>

### MAY 29, 2003

■ NALWO invites all Fermilab women, visitors, and guests to the annual Spring Tea hosted by Ms. Beth Witherell at Site 29; 10am - Noon. Please bring a favorite dessert or appetizer to share.

<http://www.fnal.gov/orgs/nalwo/03529Tinvite.htm>. For additional information please contact Sue, x5059 or [mendel@fnal.gov](mailto:mendel@fnal.gov)

### WELLNESS WORKS PRESENTS BROWN BAG SEMINARS

Thursday, May 8, 2003  
Noon to 1 p.m., Wilson Hall/One West

■ "Meditation: Getting Back to You," Virginia McDonough LCSW, of The Healing Arts at Park Place.

LUNCH SERVED FROM  
11:30 A.M. TO 1 P.M.  
\$10/PERSON

DINNER SERVED AT 7 P.M.  
\$23/PERSON

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FOR RESERVATIONS, CALL X4512  
CAKES FOR SPECIAL OCCASIONS  
DIETARY RESTRICTIONS  
CONTACT TITA, X3524  
[HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML](http://www.fnal.gov/faw/events/menus.html)

LUNCH  
WEDNESDAY, APRIL 30  
*Spicy Rice Noodles  
with Shrimp, Peanuts and Vegetables  
Mango and Papaya Slices  
with Lime*

DINNER  
THURSDAY, MAY 1  
*Booked*

LUNCH  
WEDNESDAY, MAY 7  
*Curried Turkey Salad  
with Cashews  
On wild Greens  
Cantaloupe  
with Berries*

DINNER  
THURSDAY, MAY 8  
*Grilled Vegetable Salad  
with Pistachio Vinaigrette  
Swordfish with Island Salsa  
Vegetable of the Season  
Pineapple Ginger Flan*

## F E R M I N E R W M S

F E R M I L A B  
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**The deadline for the Friday, May 9,  
2003 issue is Tuesday, April 29, 2003.**

Please send classified ads and story ideas  
by mail to the Public Affairs Office, MS 206,  
Fermilab, P.O. Box 500, Batavia, IL 60510,  
or by e-mail to [ferminews@fnal.gov](mailto:ferminews@fnal.gov).

Letters from readers are welcome.  
Please include your name and daytime  
phone number.

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## CLASSIFIEDS

### FOR SALE

- '01 P.T. Cruiser, 7,500 miles, all options. Never seen bad weather. Inferno Red with gray interior. Absolutely like new. Make an offer. Contact 815-498-4517.
- '98 Honda Prelude, 65 K miles, auto-transmission, CD, premium sound, \$ 12,800 o.b.o. Contact 630-840-3377 or rykalin@fnal.gov
- '92 Toyota Corolla, 111K miles, asking \$1,500 o.b.o. Contact 630-840-6314 or usubov@fnal.gov
- '72 Honda 350CB motorcycle - great starter bike with new tires, rebuilt carbs, windshield. Asking \$300 o.b.o. Contact 630-781-8800 for information.
- Fiberglass camper aap. From 1988 Chevy shortbed. Blue, 3 sliding windows, 2 lights. Exc. condition, mostly stored indoors. \$75 o.b.o Contact Mark 630-840-4472 or ruschman@fnal.gov
- Restored 1937 wood and canvas Old Town 16-foot sailing canoe, model OTCA 16, \$2,500. Contact 630-840-6416.
- 24" electric wall Oven, electric cook top, kitchen cabinets and sink. Contact Rich at 630-840-3880 or 630-690-1691.

- FE Olds trumpet, 4-1/2 years old, used 3-1/2 years, excellent condition, \$400 o.b.o. (\$750 brand new). Contact 630-505-0276
- Pair of Gemini speakers, 320 Watt, 15" woofers, 7 x 4 midrange, 3 Motorola tweeters, \$150/pair. Contact 630-505-0276
- Marvin interior French doors with glass panels, 30" wide by 79-1/4" tall, one right hinge, one left hinge. DOORS ONLY, \$150 o.b.o. Contact 630-505-0276
- Noritake Cumberland formal dishes. 8 place settings (dinner, salad, bread/butter, cup, saucer) cream and sugar with lid, salt and pepper. Perfect condition, \$300. Contact Nancy 630-879-1271 after 5:30 p.m., or email ncywrd@yahoo.com.
- Set of Sheepskin Seat Covers and Cargo Floor Mat for BMW X5, \$225. Contact Roberto 630-840-6771
- Hide-a-bed couch and loveseat, good shape, cloth light brown. \$150 o.b.o. Contact Tony at 630-840-6527
- Sofa and loveseat. Pictures can be found at <http://home.earthlink.net/~rneswold/forsale>. Asking \$400 for both o.b.o. Contact Rich at 630-840-3454.
- Bike 26" Female 10 speed Murray Montero all Terrain pink & gray \$40. Contact Ken at 630-840-4225.

### SYMPHONY TICKETS

- Tickets for a performance of the Evanston Township High School (ETHS) Symphony Orchestra on April 30, 8 p.m., at Symphony Center in Chicago. Price range \$20 to \$35 (\$10 for children 12 and younger). Contact Hank at 630-840-8105 or e-mail glass@fnal.gov.

### TIMESHARE FOR SALE/RENT

- Timeshare, 1-bdrm suite, 1 week in odd yrs. Asking \$7,000 to buy or \$950 to rent. Contact Mark at 630-466-2184.

### VACATION HOME FOR RENT

- Looking for a vacation spot for this summer? Lakefront home in Northern Wisconsin, close to Minocqua available to rent weekly or for the weekend. 4 bedrooms, 2 baths, sleeps 8-12 people, perfect for large family vacations. Contact 630-907-2565 or dkeiner@fnal.gov.

### SERVICES AVAILABLE

- Excavating dirt/gravel, trenching, mowing, handyman & other small jobs done. Excavator rental: \$150/day or \$75/half-day. Contact Steve 815-726-0442 or leave message.
- Furniture refinishing and restoration. Pick-up and delivery services available. Contact 630-554-5547.

## MILESTONES

### AWARDED

■ To postdoctoral researcher Sebastian Jester (ID 13669N), of Fermilab's Experimental Astrophysics Group: the Otto Hahn Medal, from the Max Planck Society. The medal is awarded annually to recent PhDs, along with a stipend for research abroad at an institution of the recipient's choosing.

### BORN

■ First baby bison of the season at Fermilab, on April 15.



Photos by Reidar Hahn

<http://www.fnal.gov/pub/ferminews/>



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