FermiNews

Fermi National Accelerator Laboratory

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Photo courtesy of APS

D. Allan Bromley, President of the American Physical Society, speaking at the press conference for the Joint Statement on Scientific Research. He is joined by the presidents of the American Chemical Society, American Mathematical Society and American Astronomical Society.

INSIDE

Science Taking Higher Profile in Capital

Recent initiatives in Washington, D.C. on behalf of research have focused on fundamental science.

by Donald Sena, Office of Public Affairs

Science and research endeavors in the United States, under the strain of budget belt–tightening in recent years, have taken a higher profile in the national debate in 1997, as evidenced by several initiatives taken by lawmakers and policy shapers from both political parties.

In the first three months of the year, a Republican leader in the Senate introduced a bill calling for the doubling of basic science and medical research, a bipartisan coalition of Senators formed the government's first Science and Technology Caucus and 23 organizations encompassing a large spectrum of science and engineering disciplines banded together to call upon the Clinton Administration and the 105th Congress to increase the nation's investment in scientific research and education.

This awareness of science issues emanating from the nation's capital has heartened many of those toiling in the country's laboratories and universities; however, researchers interviewed for this article also said they are closely observing how the rhetoric translates into increased funding as the appropriations process plays out.

"I see these [initiatives] as demonstrations of the underlying support of basic science in the community and in Congress," said Jeffrey

continued on page 8

The Nina, the Pinta and the Monte Carlo

By Judy Jackson, Office of Public Affairs

Why hold the baseball season? asked the Nobel Prize winning physicist. Not that he has anything against baseball. Fermilab's Director Emeritus Leon Lederman was responding to a suggestion that the science of experimental particle physics might turn to high-powered computers as a substitute for high-powered (and high-priced) particle accelerators in advancing the frontiers of understanding the basic structure of the universe.

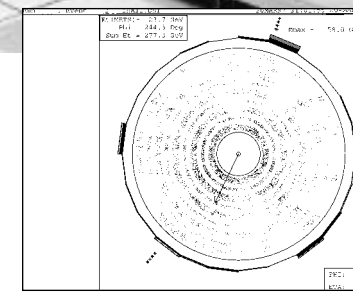
"After all," Lederman said, "we know the players' batting averages and all the other statistics. Why play the games? Why not just model the baseball season with computers?"

But awesomely impractical as a computer prediction of a baseball season would be, Lederman said, "it would be trivial compared to using computers to predict the results of an accelerator research project. This is because baseball is based upon known principles, whereas, in the research, the principles are unknown."

In the major leagues of experimental particle physics, the rising costs of building particle accelerators with enough energy to advance the frontiers of discovery prompt the continuing search for alternative tools for solving the fundamental mysteries at the heart of matter's structure. Aren't there other, cheaper ways to get Mother Nature to spill her secrets? Wouldn't she, for example, talk to a computer? A really, really powerful computer?

The Department of Energy's Gregory Haas, senior technology research specialist in DOE's Office of Computational and Technology Research, put the problem succinctly. "Until we can find new, less expensive techniques to do experiments, high-energy physicists must be willing to find other ways to ask questions," Haas said recently. "I'm suggesting that computers may be a way to carry on research activities into the questions being asked, without the facilities to do the real experiments. What's the high-energy community going to do? They can either ask for lots of money, or do more with computing to keep the field alive."

Photo by Reidar Hahn



Computers like these work station farms at Fermilab's Feynman Computing Center can perform complex theoretical calculations, analyze data and simulate detector events, like the Monte Carlo simulation of a top quark event shown here.

Problem is, said Nobel-Prize winning physicist and Stanford Linear Accelerator Center Director Burton Richter, it won't work.

"The field of particle physics can't advance without experimental data to test the theoretical calculations," Richter said. "If you don't already understand what's happening, you can't ask a computer. You have to do an experiment."

University of Chicago physicist Henry Frisch posed the problem differently.

"Suppose," Frisch said, "that high-speed computers had existed in the time of Columbus. Imagine the scene: Columbus comes to King Ferdinand and Queen Isabella to ask for money for his voyage. Their highnesses hesitate: those ships cost plenty. Then the Court Computer Specialist speaks up. 'Your majesties,' he says, 'let's try another approach. It will save money. It will be much easier. Let's make a computer model of Columbus's voyage!'

"They would have put in all the data that they had at the time," Frisch continued, "They would have made a wonderful model of the world as they knew it, and Columbus would never have found the New World. You can't simulate exploring. There is only one way to explore, and that is to get on a ship—or a particle accelerator—and go there."

CERN theorist Michelangelo Mangano, agreed.

"What I do for a living is to write computer simulations of high-energy collisions," he said. "I develop programs that explain what would happen if a particular theory were true. But my programs cannot tell whether or not that theory IS true. For that we need experiments. We can guess what is beyond our established knowledge. Like Columbus, we may have ideas about what lies over the horizon. But like Columbus, we may be wrong when we actually go there. Columbus expected to find the East Indies, not the New World.

/hat's a lonte arlo?

Monte Carlo, named for famed casino town in naco, is a way of deling reality by igning probabilities to h one of a number of ated events. Each bability gives rise to new nbinations of events with ir own probabilities, ch as each move in a ss game influences sequent moves in the ne.

Think of a tree with ny branches representing ny different possible utions to a problem. ere are too many ssibilities to follow all the nches and explore all the ssibilities using real periments. A Monte Carlo ulates performing many periments by using dom numbers that then respond to a probability each branching point. gh-speed computers and nplex programs can now ate very powerful Monte los.

Using the best available a to refine the babilities allows a Monte lo to make predictions out what will happen in l experiments: whether a ticular theory about the damental structure of tter would give rise to a ectable particle, for mple, and what kind of ector would probably be st effective in detecting particle, if it did exist.

The more accurate the a from actual periments, the better the nte Carlo can do at dicting what would pen in future periments IF a particular ory were true. But even most powerful Monte lo by itself can never w whether or not a ory is true; only a ect question to nature n experiment—can that. ■

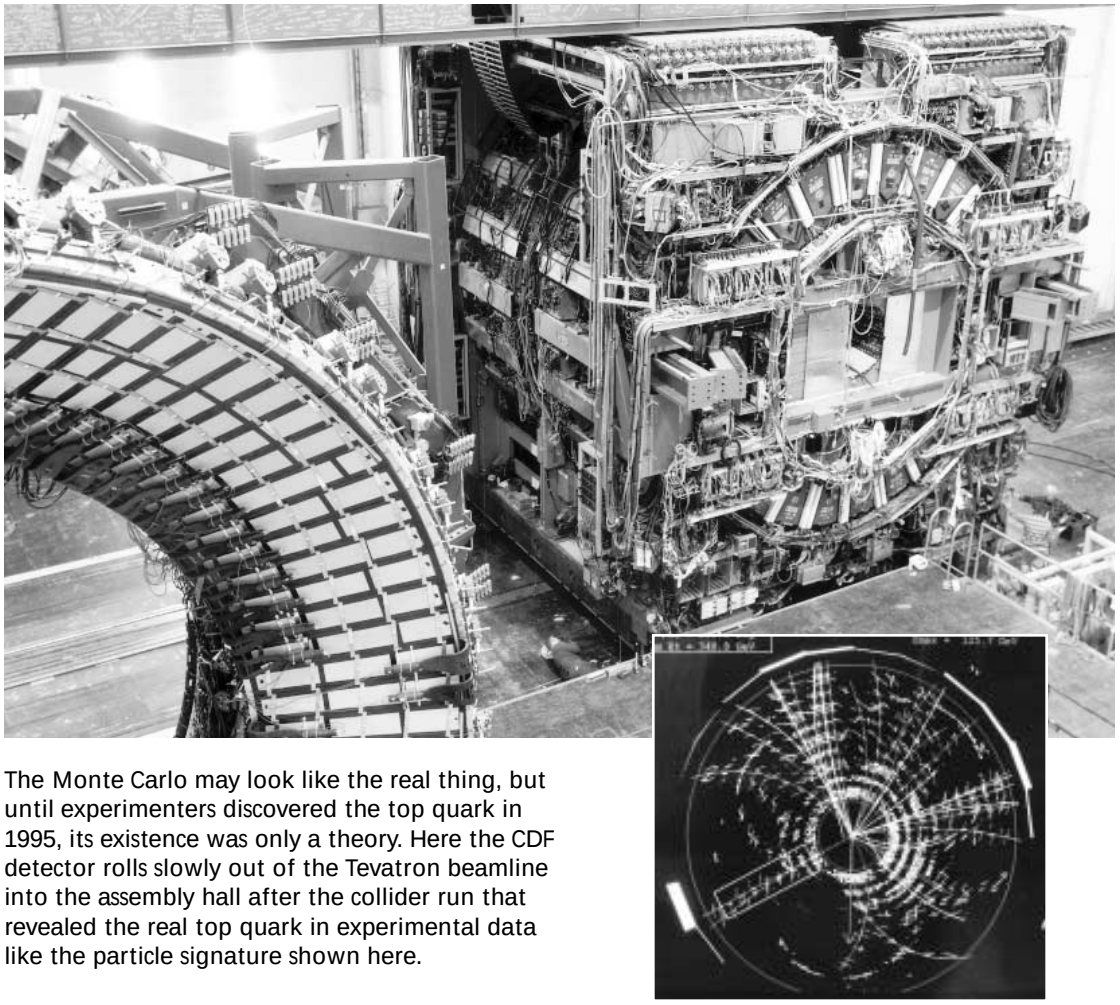


Photo by Reidar Hahn

The Monte Carlo may look like the real thing, but until experimenters discovered the top quark in 1995, its existence was only a theory. Here the CDF detector rolls slowly out of the Tevatron beamline into the assembly hall after the collider run that revealed the real top quark in experimental data like the particle signature shown here.

The progress of science is full of unexpected results that no theory predicted."

"We can have confidence in computer modeling as a substitute for weapons testing in monitoring the nation's nuclear weapons stockpile, for example," Mangano said, "because we already know the physical laws that apply, and because we have been collecting data about real atomic tests for 40 years. We are not venturing into the unknown, but using computers to apply what is already well known."

Fermilab theorist Chris Hill emphasized that computer models of particle physics experiments are always applications of the known laws of physics, not explorations of the undiscovered. "We can't use computers to explore regions where we don't yet know the physical laws," Hill said. "The laws of physics poop out at about 100 GeV. There is only one way, the experimental method, to learn the laws of physics beyond that point."

Particle accelerators such as Fermilab's Tevatron, the world's highest-energy particle accelerator, allow experimenters to explore energy regions beyond the 100 GeV level, including the domain of the recently discovered top quark, whose mass translates to an energy level of about 180 GeV.

"No model predicted the top quark's mass," said Fermilab physicist Alvin Tollestrup, one of the particle's discoverers. "Theoretical models predicted the top quark, but until we saw it, we didn't know. There was no way to know its mass until we found it. This is true for the Higgs boson, and it is true for supersymmetry," Tollestrup added, referring to two theoretically predicted phenomena as yet undiscovered by particle physics experiments.

"In fact," Tollestrup continued, "our main trouble is that there is now so much computing, backed up by so little knowledge, that theories aren't definitive. We have models—we have ten thousand models, but we don't know which, if any, are true. What we need is more facts that we can only get from nature. No amount of sitting and staring at a computer screen will help. The first discovery at the Large Hadron Collider will wipe out thousands of computer-generated papers."

"The top quark is something we knew should be there," theorist Mangano concurred, "but we didn't know exactly where 'there' was. We could simulate what it might look like, but until we found it by accelerator experiments, we did not know. It was possible that we would have found something unexpected." ■

Mike May receives his ROI award from Pat Oleck.

1996 Record of Invention winners

- E. Dijak, Dijak Bolt Alignment Monument.
- E. Haggard and G. Trotter, High Density Electronic Connector Mechanism.
- M. Atac and O. Nalcioglu, Single Fiber Beta Detector for Breast Cancer
- H. Jostlein, Touch/Optical/Capacitive Probe for CMM.
- K. Vaziri, V. Cupps, D. Cossairt, D. Boehnlein and A. Elwyn, Stack Monitor Calibration Method for Airborne Radionuclides.
- A. Mason and V. Rytchenkov, Fiber Optic Repeater.
- C. Lindenmeyer, Cast Connectors for Plastic Optical Fibers.
- D. Anderson and S. Kwan, Enhanced Field Emission from CsI Treated CVD Diamond Surfaces.
- J. Steimel, Radio Frequency Phase Unwinder.
- D. Sorensen and H. Casebolt, Photocell Activated Emergency Light.
- M. May, Elliptical Tube Forming Fixture.
- E. Haggard, Permanent Magnet Magnetizer System.
- C. Lindenmeyer, Plastic Optical Fiber Finisher.
- T. Johnson, Improved Linear Variable Differential Transformer.
- C. Ankenbrandt, Laser–Induced Beam Transfer Process.

Photos by Reidar Hahn

John Venard, head of the Office of Research and Technology Applications at Fermilab, with Sharon Lackey and Valeri Rytchenkov.

Ingenuity— Particle Physics Style

The annual Record of Invention awards recognize ideas conceived at Fermilab.

by David Kestenbaum, Harvard University

Inventions are everywhere.

Sure there's the wheel, the printing press, the cotton gin and the transistor, but what about that ballpoint pen? The Hungarian Biro brothers patented it in 1938. Capillary attraction draws the ink down the tube and onto the paper—brilliant. And what about the Dijak Bolt Alignment Monument. What? You've never heard of the Dijak Bolt Alignment Monument? You must have missed Fermi National Accelerator Laboratory's annual Record of Invention Awards Ceremony.

Inventing is a matter of survival at places like Fermilab. Push into new territory and inevitably there are new obstacles. After a while, inventing your way over the latest hurdle becomes instinctive. Sometimes it may even be patentable, in which case employees file a Record of Invention (ROI) with John Venard, head of the Office of Research and Technology Applications at Fermilab. The document describes the invention and establishes a date of conception. That's important because U.S. patents are issued to the party who first conceived of the idea; in many other countries, it goes to the first to file.

"There's also a bit of paper work and bureaucracy involved in filing an ROI," Venard admits, so Fermilab makes sure to honor its pioneers annually.

This year Venard presented the awards to a small crowd dining on tea and cookies at the second floor crossover of Wilson Hall. Inventions, he pointed out, are an important spin-off of fundamental research.

"In addition to doing world class physics, over 750 inventions have come out of the Lab over the years," he said.

So maybe Edward J. Dijak, who received an award for his Dijak Bolt, won't go down in history with Thomas A. Edison. But things like the Dijak bolt, which provides a stable mooring for survey and alignment devices, form the silent foundation for an accelerator that may unlock the mysteries of nature.

Often, as with James Steimel's Radio Frequency Phase Unwinder, it was necessity that mothered invention. Steimel's problem was an electronic signal that was being delayed as it traveled along a cable that crosses the ring.

"You send it from one end of the ring to the other, and by the time it gets to me it's 8 microseconds [8 millionths of a second] late," he said. This meant the signal was arriving out of synch, as if it had slipped in time. Steimel found a simple way to put the signal back in step.

Hans Jostlein, adding to an already impressive list of inventions including a tornado shelter fashioned from a concrete sewer pipe, received an award this year for something a little more delicate. The Fermilab veteran found he could use a small sapphire ball as a high-precision position probe.

"It's kind of a three–in–one thing," Jostlein said. The ball can measure an object's location by coming into contact with it, by acting as a lens, or electronically by virtue of a transparent capacitive coating. The three techniques had never been combined in a single probe.

Does invention come as a flash of insight? Jostlein said no. "I'd been thinking about this for several years," he said, but then at a meeting "the problem became acute." Jostlein sat at his desk for a while, and the idea came to him.

David Anderson and Simon Kwan were looking the other way when invention came to call. They were at work on a new diamond detector that would act as a kind of stopwatch for particles, timing their arrival to better than a billionth of a second. The device failed as a particle detector, but accidentally solved a longstanding problem in field emitter technology, which may one day produce laptop screens that shine as brightly as a television screen.

Invention breeds invention

~ Ralph Waldo Emerson

"By accident, we succeeded at what people have been trying to do for more than a decade," says Anderson. "Technically this counts as a discovery, not an invention."

Anderson warns that current trends toward applied research may force the extinction of these types of discoveries. He began work on this project as part of what was called generic research and development, he said.

"That wouldn't even be permitted at the Lab [now]. Everything is goal oriented. No poets are allowed anymore," Anderson said.

But poetry has a way of surviving, sometimes even thriving, in tough financial times. Mike May's invention, for instance, may help cut the cost of the Recycler Ring. May took a break from the cookies to sketch his creation on a napkin. It looks like a torture device—a giant thumbscrew circa 1400 A.D. In fact, he explained, it's for crushing beampipes. Fermilab was paying $45 per foot for a specially shaped beampipe, where the cross section is an ellipse instead of a circle. May was standing in the IB3 building of the Technical Division where three large hydraulic presses sat unused for much of the time. May looked at them and thought, "Why can't I take round pipe and squish it?" So he devised a forming fixture, an elegant arrangement of springs and bolts designed to guide a pipe's transition from round to elliptical while in the press. May can now make an elliptical pipe in about five minutes. It's accurate to about 15 thousandths of an inch and costs only $4 a foot. May's device successfully manufactured the beampipe for the 8 GeV beamline, and the invention will save Fermilab $400,000 if Lab staff use it for the Recycler Ring, he said.

The ROI award comes with a cash award. Is it $400,000? "Hardly," said May. "I may buy some donuts, however." ■

The Automated Magnet Maker

by Donald Sena, Office of Public Affairs

He had already known he would receive an award for his invention, but it wasn't until Eric Haggard read the March 7 edition of *FermiNews* that the impact of his contribution hit home.

In the Lab's newspaper, the engineer in the Technical Division read that a beam of protons had successfully passed through Fermilab's new 8 GeV line, the world's first permanent magnet beam transfer line.

Eric Haggard (center) receiving his award for the permanent magnet magnetizer. Also pictured are Pat Oleck and Gary Trotter, another ROI winner.

The 8 GeV line will transfer protons from Fermilab's Booster Ring into the Main Injector, the Lab's newest accelerator, which will replace the Main Ring in 1999. The permanent magnets represent a technological breakthrough, as they do not require electricity and accompanying cooling systems, which traditional accelerator magnets do. Bricks of strontium ferrite are simply magnetized and stacked inside each permanent magnet.

Well, not *that* simply.

Haggard designed and built the automated system that magnetizes and measures the magnetic field strength of each brick. The project began in late summer of 1995 and the first magnetized brick, which Haggard now has stuck to his file cabinet, rolled off his machine in late July 1996. The system begins when an operator loads an unmagnetized brick in a fixture; the brick slides into a traditional dipole magnet and gets saturated in a magnetic field. The machine then sends the brick to have its field strength measured; if the strength is correct, operators stack the brick for eventual insertion into a permanent magnet.

While saying it was satisfying to be a part of the development, Haggard quickly sidestepped the credit. Seeing the magnets work in the 8 GeV line is "great. The physicists who designed these magnets have something to be proud of," said Haggard.

The seven–year veteran of Fermilab now has turned his skills and attention to a similar automated system and a new deadline. He said he has until June to design and build a system that will manufacture permanent magnets for the Recycler Ring.

Watch *FermiNews* for details—Haggard certainly will. ■

An assembled permanent magnet being tested to see if it meets design specifications.

Photos by Reidar Hahn

Each digital linear tape of the type shown here holds the data for about half a night's observing on the mountain in New Mexico.

Data come in pixels, but

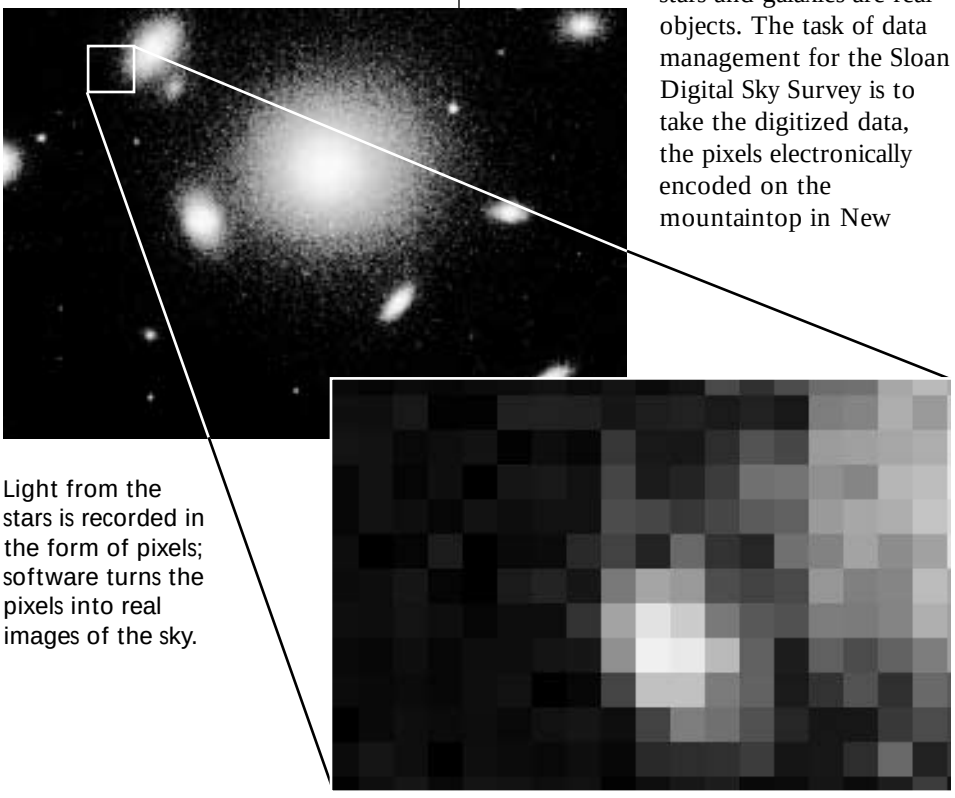
The Sky Is Made of Stars

Fermilab scientists will make major contributions to the task of processing the data from the Sloan Digital Sky Survey.

By Judy Jackson, Office of Public Affairs

On a clear, dark night, light that has traveled through space for a billion years touches a mountaintop in southern New Mexico. At that moment, photons that left their source when algae were the only life on earth enter the Sloan Digital Sky Survey's 2.5 meter telescope and yield to the telescope's sophisticated instrumentation the cargo of information they have carried across the universe. They cease to exist as photons, but the data within them live on as pixels, tiny packages of electronic information from each tiny point in the sky, recorded as digital signals on magnetic tape.

But the sky is not made of pixels; stars and galaxies are real objects. The task of data management for the Sloan Digital Sky Survey is to take the digitized data, the pixels electronically encoded on the mountaintop in New Mexico, and turn them into real information about real things. Astronomers process the digitized data to produce information that they can use to identify and measure the properties of stars and galaxies. They must be able to find, distinguish, and measure the brightness of celestial objects from the imaging pixel data, and then collect these stars and galaxies and quasars into a catalog.



Light from the stars is recorded in the form of pixels; software turns the pixels into real images of the sky.

Computing experts describe the project as something like creating the Manhattan phone book—for the heavens. Each star is like a person in the phone book, with a name and address. There is even a Yellow Pages in the celestial directory: a section containing a smaller number of entries for which the Survey will provide still more information—their spectra. For these objects, digitized data yield information about their velocity as they move away from the Earth, from which we can calculate how far away they are.

Scientists must initially process the data very quickly—within about a week—because Sky Survey astronomers need the information in order to configure their telescope's instrumentation for best use of the instrument during the next dark phase of the moon. If too much time goes by, the target objects will set, as the season passes.

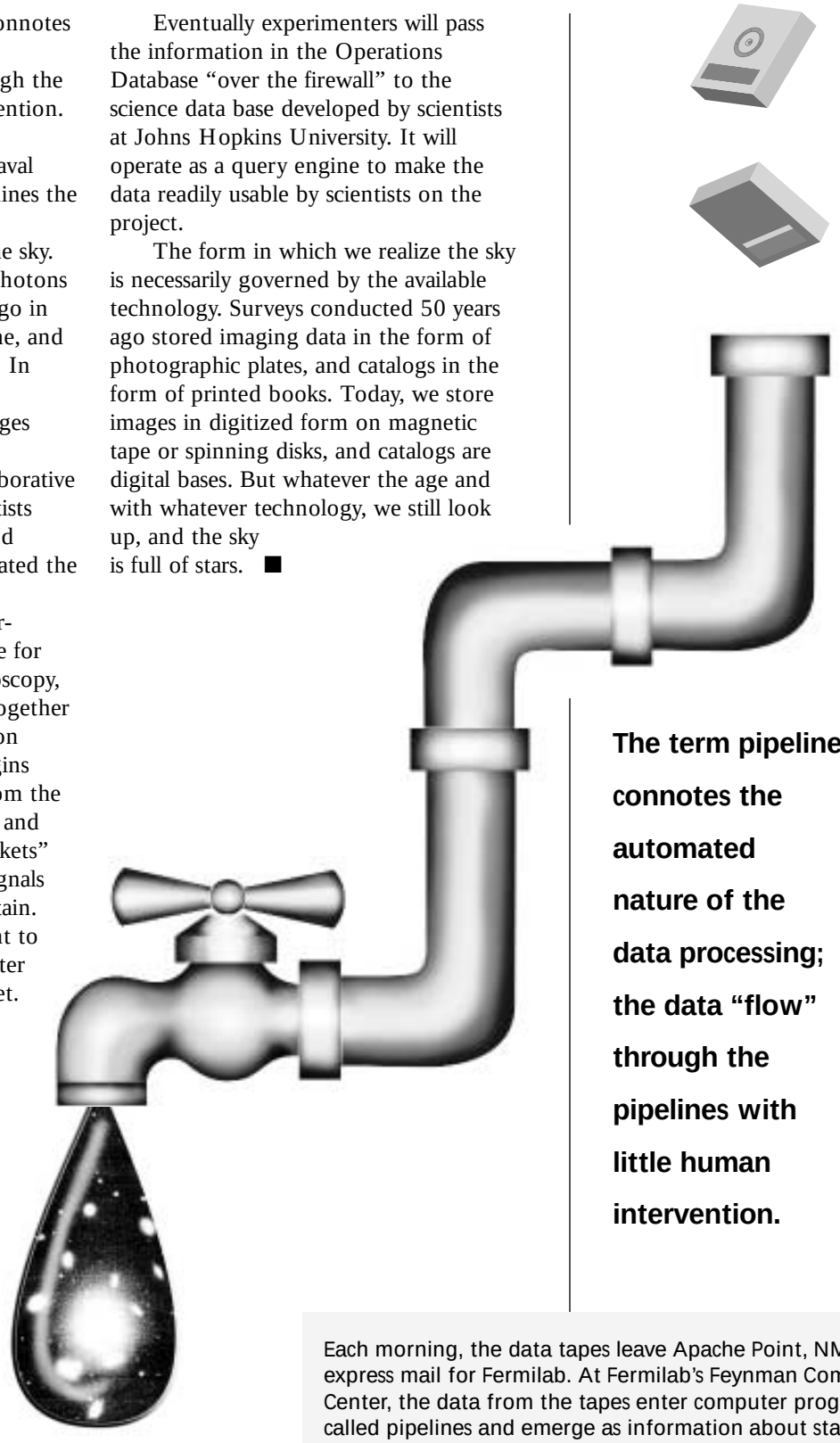
Scientists at Fermilab are leading the effort to develop what the Sky Survey calls data-processing pipelines. A pipeline is a computer program that processes the digitized data in order to extract from it certain types of

information. The term pipeline connotes the automated nature of the data processing; the data "flow" through the pipelines with little human intervention. The astrometric pipeline, built by computer scientists at the U.S. Naval Observatory, for example, determines the precise absolute two-dimensional position of stars and galaxies in the sky. In this case, digitized data from photons reaching the 2.5 meter telescope go in one end of the astrometric pipeline, and star positions come out the other. In between, along the length of the pipeline, is the software that changes pixels into real information.

The data pipelines are a collaborative effort. Princeton University scientists built the photometric pipeline; and University of Chicago experts created the spectroscopic pipeline. Fermilab's contributions include the monitor-telescope pipeline and the pipeline for selection of candidates for spectroscopy, as well as bringing the pipelines together into a working system. Information processing for the Sky Survey begins with data acquisition. Photons from the stars hit the telescope's detectors, and CCDs collect them. Charge "buckets" are then converted to digitized signals and written to tape on the mountain. The data travel from Apache Point to Fermilab via express mail—it's faster and cheaper than over the Internet. The tapes go to Fermilab's Feynman Computing Center and thence into the various pipelines: spectrographic data into the spectrographic pipeline; monitor data into the monitor pipeline, and imaging data into the astrometric, photometric, target selection and two other pipelines. Out of the pipelines comes information about the stars, galaxies and quasars, for inclusion in the Operations Database, written at Fermilab and at the Naval Observatory, which collates the information to keep the Sky Survey running.

Eventually experimenters will pass the information in the Operations Database "over the firewall" to the science data base developed by scientists at Johns Hopkins University. It will operate as a query engine to make the data readily usable by scientists on the project.

The form in which we realize the sky is necessarily governed by the available technology. Surveys conducted 50 years ago stored imaging data in the form of photographic plates, and catalogs in the form of printed books. Today, we store images in digitized form on magnetic tape or spinning disks, and catalogs are digital bases. But whatever the age and with whatever technology, we still look up, and the sky is full of stars. ■



The term pipeline connotes the automated nature of the data processing; the data "flow" through the pipelines with little human intervention.

Each morning, the data tapes leave Apache Point, NM by express mail for Fermilab. At Fermilab's Feynman Computing Center, the data from the tapes enter computer programs called pipelines and emerge as information about stars, galaxies and quasars.

Science in the Capital

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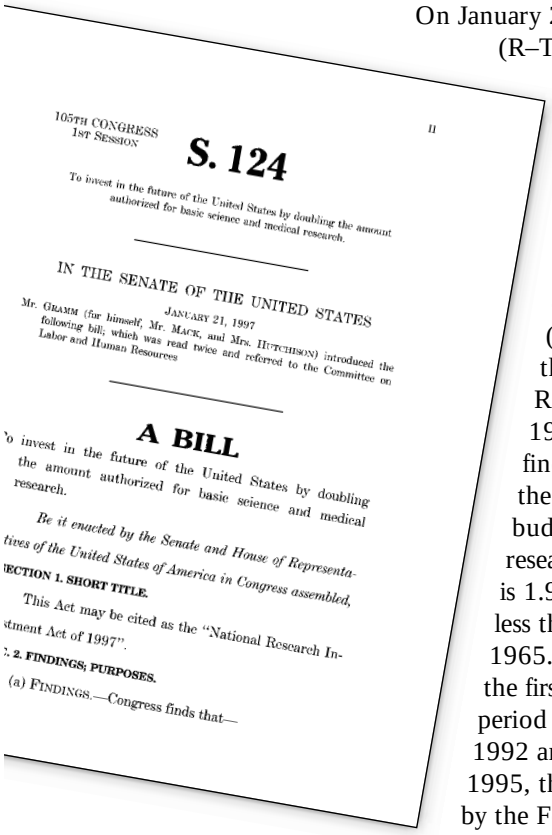
Appel, a Fermilab scientist. "Nevertheless, with funds still tight, decisions are made every day that could drastically affect our efforts...there is a clear need to keep the story of our successes known."

Senate Bill



105TH CONGRESS
1ST SESSION

S. 124

II

To invest in the future of the United States by doubling the amount authorized for basic science and medical research.

IN THE SENATE OF THE UNITED STATES

JANUARY 21, 1997

Mr. GRAMM (for himself, Mr. MACK, and Mrs. HUTCHISON) introduced the following bill; which was read twice and referred to the Committee on Labor and Human Resources

A BILL

To invest in the future of the United States by doubling the amount authorized for basic science and medical research.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the "National Research Investment Act of 1997".

SEC. 2. FINDINGS; PURPOSES.

(a) FINDINGS.—Congress finds that—

On January 21, Senator Phil Gramm (R–Tex.) introduced an authorization bill that proposes to double the federal investment in basic science and medical research over a 10 year period. Senators Connie Mack (R-Fla.), Kay Bailey Hutchison (R–Tex.) and Conrad Burns (R–Mont.) have cosponsored the bill, known as the "National Research Investment Act of 1997." The bill listed among its findings that "for fiscal year 1997, the percentage of the Federal budget allocated for nondefense research and development activities is 1.9 percent, which is 67 percent less than the percentage in fiscal year 1965." The bill also states that "for the first time in 25 years, during the period beginning with fiscal year 1992 and ending with fiscal year 1995, the amount of funds expended by the Federal Government on research (expressed in real dollars) declined each year..." A congressional aide for Gramm said in a recent interview that these issues, along with other factors, prompted the Senator to write the bill.

"If we as a country do not restore the high priority once afforded science and technology in the federal budget and increase federal investment in research, it will be impossible to maintain the United States' position as the technological leader of the world. Since 1970, Japan and Germany have spent a larger share of their GDP on research and development relative to the U.S. We can no longer afford to fall behind. Expanding the nation's commitment to research in basic science and medicine is a critically important investment in the future of our nation," said Gramm in a March 7 statement, reprinted in the American Institute of Physics' Bulletin of Science Policy News.

Senator Gramm (R–Texas) has written S.124, a bill that proposes to double the spending on basic science and medical research over 10 years.

Gramm's aide added that his office has received favorable response from lawmakers for the bill, which he expects will translate into more cosponsors in the Senate. The aide said the office is preparing a "Dear Colleague" letter for the other senators in order to garner more support for the initiative. He stressed that an appropriations bill and an accompanying initiative in the House of Representatives will be essential for Gramm's proposal to become reality.

House Action

While there is no bill in the House of Representatives that goes to the length of the Gramm action, House Science Committee members have a proposal to raise the funding levels for science and research.

On March 20, House Science Committee Chairman James Sensenbrenner (R–Wis.) released the committee's "Views and Estimates" report, which called for a three percent increase in the proposed FY1998 expenditures for research and development over FY1997 levels. Every House committee submits a "Views and Estimates" report each year to the House Budget Committee, which uses the reports to frame the final budget resolution. The Science Committee's report also detailed criteria that science programs must meet to receive funding authorization. The first criterion states that "Federal Research and Development should focus on essential programs that are long–term, high risk, non–commercial, cutting edge, well–managed, and have a great potential for scientific discovery; funding for programs that do not meet this standard should be eliminated or decreased to reduce budget demands for new

Photo courtesy of APS

The March 4 press conference for the Joint Statement on Scientific Research.

initiatives." The Committee's proposal was signed by a majority of Republican and Democratic members.

In the release, Sensenbrenner said, "The federal government has and should continue to play a vital role in promoting and supporting our scientific endeavors as a nation. I remain convinced that maintaining our nation's scientific base will return dividends to our knowledge and economy for many years to come."

The Science Committee's ranking Democrat, George Brown (D–Calif.), also has a plan for increased science funding. Brown, a longtime supporter of science, has released an economic plan that proposes to balance the budget by 2002, while allowing for a five percent annual increase in federal research and development funds in that time. An aide for the minority on the Science Committee said the proposal will be introduced on the House floor when the budget resolution comes up. The aide said the plan has no cosponsors yet, but "we are shopping it around right now."

New Science Caucus

Another recent development on Capitol Hill is the formation of the Senate Science and Technology Caucus, which was founded by Senators Bill Frist (R–Tenn.), who is a heart transplant surgeon by trade; Joseph Lieberman (D–Conn.); Pete Domenici (R–N.M.) and Jay Rockefeller (D–W.V.). The caucus is a "bipartisan group of Senators interested in promoting progress and innovation in the United States by advancing science and technology issues." The caucus held its first roundtable discussion on February 11. That discussion included the four Senators and 10 representatives from national laboratories, universities and commercial laboratories. Frist, in a media release, said the discussion both exposed common ideas about science and technology and addressed areas that need the government's attention.

"One of the most pressing problems facing our nation today is our ability to compete globally in medicine, science, technology and space," Frist said after the roundtable discussion. "Not only are we at risk of losing our competitive edge, we are at risk of losing our standard of living and strong national defense. We must have a bipartisan effort to make science and technology one of the nation's highest priorities."

Science Bonding

As government representatives take steps to increase funding for science, the nation's science, engineering and mathematical societies recently banded together to show collective support for increased federal dollars for science and research. On March 4, 23 organizations issued a Joint Statement on Scientific Research, which called for a seven percent increase in research budgets for FY1998 (see the full text of the statement on page 10). Many government officials, as well as a growing number of scientists, have stressed the need for science to speak for common goals with a bipartisan voice. They have said that playing basic science against applied science, for example, or Republicans against Democrats is the wrong way to proceed and would hurt everything under the science and research umbrella.

Photo by Lara Zullo

Rep. George Brown (D–Calif.) has a plan to increase federal spending on science and research by five percent annually.

"The 23 societies whose presidents are endorsing the Joint Statement...have been drawn together out of our common concern that the federal investment in science has been shrinking for the last four years after decades of growth," said D. Allan Bromley, president of the American Physical Society, in a statement at the press conference on March 4. "Should this downward trend continue, the leadership that the United States has enjoyed in science and technology over the last half of the twentieth century will be in very real jeopardy..."

At the same press conference, several government representatives released their own statements as to the action by the societies. Senator Lieberman, according to another AIP policy bulletin, took the opportunity to capture the optimism generated by the atmosphere in Washington concerning a renewed interest in science and research. Specifically, Lieberman noted Senator Gramm's bill and the FY 1998 budget President Clinton released in February that increased the science and technology programs funding by about three percent on average, which Lieberman called "significant" given the pressure for increased fiscal responsibility and calls for a balanced budget.

"I believe the optimism of the present moment comes primarily because of some troubling facts, which have convinced members of both parties that something more must be done to stimulate good research and development...," said Lieberman. "If you believe as I do that our current prosperity, intellectual leadership in science and medicine and the growth of entire new industries are directly linked to investments made thirty years ago, then you have got to ask where will this country be thirty years from now?"

Senator Bill Frist (R–Tenn.) is a founding member of the Senate Science and Technology Caucus.

oint Statement on cientific Research

"As the federal government develops its spending ans for Fiscal Year 1998, we call upon the President ıd Members of Congress to renew the nation's storical commitment to scientific research and lucation by providing the requisite funding for the deral agencies charged with these responsibilities. Our ll is based upon two fundamental principles that are ell accepted by policy makers in both political parties.

The federal investment in scientific research is vital four national goals: our economic competitiveness, ır medical health, our national security and our ıality of life.

Scientific disciplines are interdependent; therefore, a ımprehensive approach to science funding provides e greatest opportunity for reaching these goals.

We strongly believe that for our nation to meet the allenges of the next century, agencies charged with rrying out scientific research and education require creases in their respective research budgets of percent for Fiscal Year 1998. These agencies include, nong others, the NSF, NIH, DOE, DOD, and ASA. The increases we call for strike a balance etween the current fiscal pressures and the need to vest in activities that enable long-term economic owth and productivity. Such increases would only ırtially restore the inflationary losses that most of ese agencies suffered during the last few years.

Prudent planning argues for strengthening the spective activities of major research agencies, as eady recognized in pending legislation. o constrain still further federal spending on their ientific programs would jeopardize the future ell-being of our nation."

his statement was endorsed by the Presidents r the equivalent officer) of:

nerican Association of Physicists in Medicine
nerican Astronomical Society
nerican Chemical Society
nerican Geological Institute
nerican Geophysical Union
nerican Institute of Biological Sciences
nerican Institute of Physics
ıe American Institute of Professional Geologists
nerican Mathematical Society
ıe American Physical Society
nerican Society of Engineering Education
sociation for Women in Mathematics
sociation for Women in Science
tronomical Society of the Pacific
ouncil on Undergraduate Research
ıgineering Deans Council
deration of Materials Societies
ological Society of America
ıe Institute of Electrical and Electronics Engineers, Inc.
aterials Research Society
athematical Association of America
otical Society of America
ciety for Industrial and Applied Mathematics

CALENDAR

APRIL 10

Wellness Works, "Estate Planning" in 1 West, Noon–1 p.m. Simple but sophisticated estate planning for everyday people. You don't have to be rich to plan like the rich and famous! Learn how you can protect your assets, remain in control, avoid probate expenses and reduce or eliminate estate taxes. Make sure that your assets are there for you or your loved ones. This workshop covers all the basics: wills, trusts, power of attorney, health care directives and federal estate taxes. Presentation given by Teresa Nuccio, Attorney at Law.

APRIL 12

Tornado and Severe Storm Seminar, 1 p.m. and 7 p.m. Ramsey Auditorium.
For more information call (630) 840-2247.

APRIL 15

Wellness Works, Blood Pressure Screening, Users Office, 11:30 a.m. —1 p.m.

APRIL 20

Afternoon barn dance at the Village Barn from 2—5 p.m. The dance features live music by The Blind Tigers and calling by Paul Watkins. The dances are contras, squares, and circle dances. All dances are taught, and people of all ages and experience levels are welcome. You don't need to come with a partner. Admission is $5. Children under 12 are free. The barn dance is sponsored by the Fermilab Folk Club. For more information, call Lynn Garren, x2061, or Dave Harding, x2971.

APRIL 24

Take Your Daughters and Sons To Work Day - Arbor Day. Can you help? Volunteer your time to help make this day something to remember for the children of Fermilab. Send email to ferminews@fnal.gov.

ONGOING

English lessons, Thursdays 10–noon in the Users Center, call Janet Antonio, (630) 769-6518. NALWO coffee mornings, Thursdays 10 a.m. in the Users' Center, call Selitha Raja, (630) 305-7769. In the Village Barn, international folk dancing, Thursdays 7:30–10 p.m., call Mady, (630) 584-0825; Scottish country dancing Tuesdays 7–9:30 p.m., call Doug, x8194.

Chez Léon

MENU

Lunch served from
11:30 a.m. to 1 p.m.
$8 / person
Dinner served at 7 p.m.
$20 / person

For reservations call x4512
Cakes for Special Occasions
Dietary Restrictions
Contact Tita, x3524

Lunch
Wednesday
April 9

Cheese and Pinto Bean
Quesadillas
with Salsa Fresca
Jicama and Romaine Salad
with Cumin Vinaigrette
Coffee Mocha Mousse

Dinner
Thursday
April 10

Grilled Calamari
with Lemon Garlic Dressing
Grilled Beef Tenderloin
with Morels
Glazed Carrots
and Asparagus
Strawberry Shortcake

Lunch
Wednesday
April 16

Cornmeal-Crusted Trout
with Almond Butter
Pea Pods, Potato and
Green Onion Sauté
Papaya, Banana and
Kiwi Fruit Salad

Dinner
Thursday
April 17

Spicy Mussels Steamed
in White Wine
Herb-Roasted Leg of Lamb
Steamed Red Potatoes
Vegetable of the Season
Gateau Breton with Berries

Updates

March 13— March 25

ACCELERATOR

After a long stretch of reliable running with good intensity, the accelerator developed a vacuum leak on March 13, according to Bob Mau, head of accelerator operations. Accelerator staff replaced three Tevatron magnets, which meant Mau's team needed about one week to warm those magnets, replace them, check them for leaks and cool them again. After beam began running again on March 20, the accelerator developed another vacuum leak in the rf area on March 21, which was due to a bad ion pump. After that repair, beam ran reliably over the weekend of March 22–23 in the area of 2.5 x 10^{13}, before the planned shutdown that began at 4 a.m. on March 24. Mau also said an experiment in PWest requested to run at 5 x 10^{12} for four shifts, which the accelerator crew achieved before shutting down.

FIXED-TARGET

Collaborators provided this update on fixed-target experiments.

E799 / E832 KTeV "The initial phase of the KTeV rare decay running (E799) is complete, and we are very excited with the quality of the data. During the one-week shutdown we made small improvements to the detector and switched the detector configuration back to E832 mode, where we will continue the precision study of kaon decays that we started last fall. We are looking forward to a long and productive phase of E832 running," said Bob Tschirhart of Fermilab.

E866 NuSea "On March 24, E866 finished measuring the asymmetry of the sea of antiquarks in the proton. We will be reporting our first results in the next few weeks. We are now changing our target configuration in order to study more properties of dimuon production in 800 GeV collisions," said Chuck Brown of Fermilab.

E835 Charmonium "E835 has taken over 60 pb^{-1} of integrated luminosity up to now. During the shutdown we will do a more careful analysis of the data we took and study our systematics. We also plan to install a new electromagnetic calorimeter to increase our acceptance in the forward region," said George Zioulas from the University of California at Irvine.

E862 Antihydrogen "We don't have much new to say; when the machine runs, we're taking data," said Dave Christian of Fermilab.

E815 NuTeV "Since there hasn't been much beam, we've been working on analysis and are now all caught up with our first–pass DSTs. We've made significant improvements in our beam Monte Carlo after finding a few infelicities in the code. The experiment came back up smoothly after the outage and we're awaiting the return of beam," said Bob Bernstein of Fermilab.

E872 Donut "We completed the installation of the lead shielding surrounding our emulsion target box just in time for the return of beam on Thursday, 3/20. The high–intensity exposure of the test emulsion was concluded without any problems. The time was also used for trigger studies at high intensity. The lead shield makes a good neutrino target," said Vittorio Paolone from the University of Pittsburgh.

E781 SELEX "E781 showed the first charm peaks from the experiment at last Monday's all-experimenters' meeting. The analysis is still very preliminary, but the data shown so far has very good mass resolution and good signal-to-background ratio for a hadroproduction result. The emphasis of E781 is on charm baryons. These early data support the experiment's expectation that using a hyperon beam will give enhanced charm baryon yield. However, lots more work is required to have definite results on yields," said Jim Russ of Carnegie-Mellon University.

E831 FOCUS "FOCUS has recently passed the five–times E687 mark in integrated charm, putting us halfway towards our goal of ten times E687 statistics. During the two March shutdowns we've been making good use of our time. We're installing a small wire chamber just upstream of our radiator, improving the Target Silicon readout, and replacing RPC gaps, which were drawing more current than we would like. Several other smaller problems are being worked on for other detectors. We look forward to a long period of stable running when beam returns," said Eric Vaandering from the University of Colorado.

E871 HyperCP "The shutdown time has been spent fixing a ground fault in one of our spectrometer magnets, surveying the apparatus, repairing bad electronics, making minor improvements to the spectrometer, working on off-line analysis, and catching up on some sleep," said Craig Dukes from the University of Virginia.

CLASSIFIEDS

FOR SALE

■ '94 Mercury Couger RX7 Bostonian package, V-8, P.B., P.S., P.W., sun roof, partial leather interior, fully loaded, only 25k miles, worth $18,000 asking $15,300 obo, call Tom X-3366.

■ '77 MGB, maroon w/black convertible top. Crane ignition, Weber carb, headers. Great summer car. $2300 obo. Call Rick Colombo, x8225 or colombo@fnal.gov.

■ Craftsman 10" radial arm saw, like new condition, $300. Digital Readout for elevation and rip positions, miter and bevel angles. Enclosed mobile stand and carbide blade included. Mike Shea, x4412, shea@fnal.gov.

■ 16 ft. Fiberglass DuoMarine Boat needs work, hardware already removed and rough sanding completed, $100 obo. Atomic Arc 195 Salomon 547 Sport Bindings, size 12 US or 13 EU Trappeur 2000 boots also have ski and boot bag $150 obo. PC's IBM 5150 with monitor, Compaq Deskpro with Monitor and a Compaq Tech PC w/ built in monochrome monitor and an external video port. Call for details, make an offer. Terry, x4572 or skweres@fnal.gov.

■ Alden single seat rowing shell, white deck and hull, 1994. Includes boat stands and instruction video, $1200. Call Maureen, x2977 or kerwin@fnal.gov.

■ Hotpoint electric stove white $150. Call Robin, x3235.

■ Two children's bikes, like new. Girls 20" is pink/black. Boys 16" w/training wheels is blue. Asking $30 each. Call (630) 892-4849.

LAB NOTE

FILM DEVELOPING

As of April 1, there will be a slight increase in film developing prices. Please use the new envelopes (sample posted at the drop box). As of March 31, the old envelopes will not be honored. Questions? Call the Recreation Office, x2548 or x5427.

MILESTONES

RETIRED

Paul Cliff, ID # 3134, on April 11, from the Beams Division/BS Proton SRC Linac Department.

LETTER TO THE EDITOR

I believe there may be an error in one of the articles in today's (3/21) *FermiNews* identifying Patty McBride as "the first woman" to chair the UEC; my recollection is that Jean Slaughter from Yale held that title some years ago.

~Mike Tartaglia

Ed: Correct, Jean Slaughter chaired the UEC back in 1987-88.

Photo: V. Richard Haro © 1993 New York Newsday

Fermilab to Host Awadagin Pratt

The Fermilab Arts Series is proud to host Awadagin Pratt on April 19. The pianist will perform music by Franck, Beethoven, Schubert, Brahms, Bach, Chopin, and Rachmaninoff.

Awadagin Pratt's musically distinctive and intensely involving performances have thrilled and engaged audiences across the country. Winner of a 1994 Avery Fisher Career Grant and the 1992 Naumburg International Piano Competition, Mr. Pratt has performed in recitals in New York, Boston, Washington, D.C., Chicago, Pittsburgh and Los Angeles. Fermilab welcomes this outstanding young pianist to Ramsey Auditorium on Saturday, April 19 at 8:00 p.m.

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Please send your article submissions, classified advertisements and ideas to the Public Affairs Office, MS 206 or E-mail: ferminews@fnal.gov

FermiNews welcomes letters from readers. Please include your name and daytime phone number.

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