FERMI NEWS

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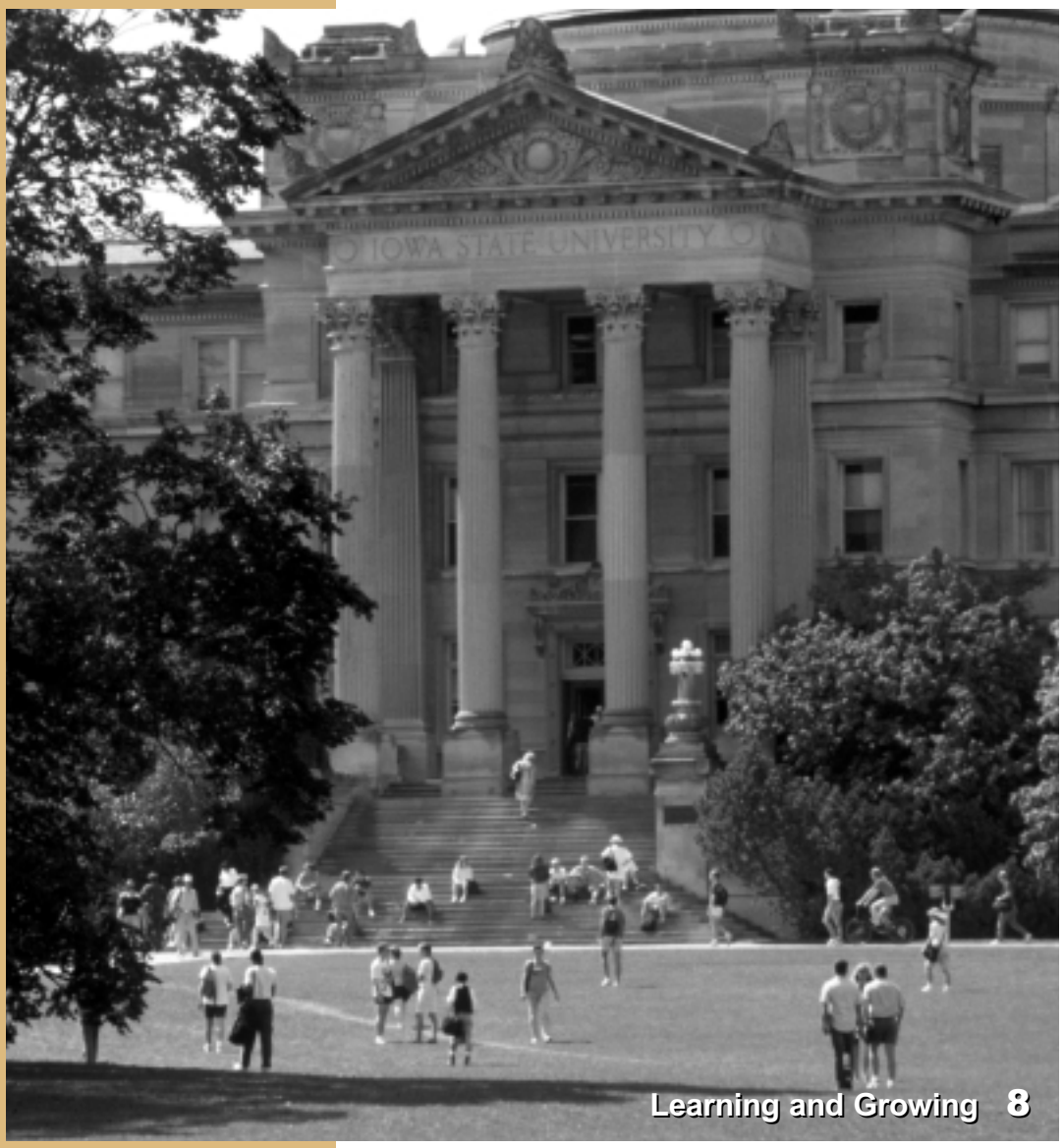

Learning and Growing 8

Photo courtesy Iowa State University

Volume 25
Friday, April 19, 2002
Number 7

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Join the dialogue: This week's question for discussion:

What's *your* response to THE Question?

THE Question

To: Fermilab Public Affairs

Subject: THE Question

I have worked at Fermilab for 12-plus years. Often in conversation I'm asked about Fermilab, and the one question that always comes up is, "What good is the information you're discovering?" So what I'm looking for is examples I can give them. I have heard that the physics we are doing and the results we find are 20 years ahead of their time. Meaning we won't realize what to do with the information for a very long time. Anyway, I'd like your help to answer this one 'special' question.

Email from a Fermilab employee

Respond online at www.fnal.gov/pub/ferminews/interactions/index.html or send email to ferminews@fnal.gov

by Judy Jackson

"What good is the information you're discovering?"

Generations of particle physicists have grappled with this question, and many have attempted to address it, from various perspectives and with varying success. At a time when *THE* question is gaining insistence in the national dialogue on science policy, it may be useful to take another critical look at the reasons why we do particle physics research and how both we and others perceive its value for our nation and the world.

Understanding the universe for understanding's sake

"What, then," Albert Einstein, asked, "impels us to devise theory after theory? Why do we devise theories at all? The answer is simply: because we enjoy 'comprehending'.... There exists a passion for comprehending, just as there exists a passion for music."

For most particle physicists, this passion for comprehending is surely why they have chosen high-energy physics—for what Einstein called the "joy and amazement at the beauty and grandeur of this world of which man can just form a faint notion…"

Many of Einstein's successors continue to uphold the view that basic science represents human potential and civilization at their highest and best, the kind of endeavor that characterizes a great nation. While particle physics may ultimately contribute to the security and economic well-being of society, this reasoning goes, its true worth lies in the understanding of the ultimate nature of the universe. As Frank Oppenheimer once said, "Understanding is a lot like sex. It's got a practical purpose, but that's not why people do it normally."

Unlike sex, however, the passion for comprehending may not hold the same thrill for other audiences that it has for particle physicists. In a February keynote address to the American Association for the Advancement of Science, Office of Science and Technology Policy Director John Marburger discussed government support for particle physics and astronomy.

"The justification for funding these fields," Marburger said, "rests entirely on the usefulness of the technology needed for the quest, and on the joy we experience in simply knowing how nature works. *(A joy, I am afraid, that is shared fully by a rapidly declining fraction of the population.)"* (Italics added.)

Is the joy of particle physics apparent only to particle *cognoscenti*? In a March 26 story on the beauty of physics, *New York Times* writer Dennis Overbye wrote that while Einstein "maintained that it should be possible to explain scientific principles in words to a child… his followers often argue that words alone cannot convey the glories of physics, that there is a beauty apparent only to the mathematically adept."

If that is true, it may be awhile before the glories of physics take hold in the general population.

Photo by Fred Ullrich

"Joy and amazement at the beauty and grandeur of this world of which man can just form a faint notion." —Albert Einstein

Understanding the universe because it pays off

The results of basic science, however, very often have benefits for society that go beyond the mere joy of understanding. In a 1996 speech, Nobel Prize winner and former Fermilab Director Leon Lederman put it this way:

Photo by Reidar Hahn

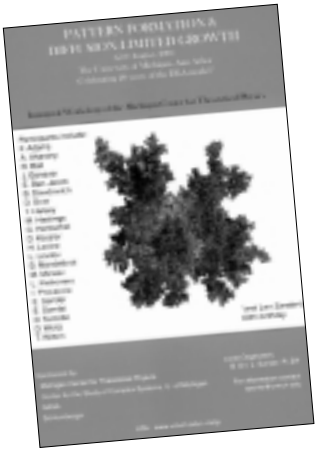
Leon Lederman: "The more exotic, the more abstract the knowledge, the more profound will be its consequences."

"In 1680," Lederman said, "Isaac Newton worked on the abstract problem of gravity and changed the world. In 1820, Michael Faraday discovered a connection between the exotic phenomena of electricity and magnetism, and his discoveries electrified the world. Einstein's 1905 conceptual obsession with space and time led to nuclear energy and the operation of accelerators for knowledge, for cancer therapy and for machines that provide luminescent x-ray photographs of viruses and toxins. In 1897, the 'useless' electron was discovered. In 1977, Fermilab discovered the bottom quark and in 1995, the top quark was found. The lessons of history are clear—the more exotic, the more abstract the knowledge, the more profound will be its consequences."

The down side of the usefulness of particle physics to society is the unpredictability of the payoff. By definition, the applications of basic science are unknown—if we could predict them, it would be applied science, and those who stood to benefit would fund it. But basic science is inherently risky. Who knows how or when its results will bear fruit, or whom they will benefit?

INTERACTIONS

Communicating particle physics in the 21st century



Does all science come down to particles? Not necessarily. "More is different," say many solid-state physicists.

Perhaps the best-known application of fundamental physics came from the development of the atomic bomb in the Manhattan Project in World War II. Throughout the cold war, support for high-energy physics stayed strong—just in case, many believe, the nation needed a new Manhattan Project. Today, the case for a connection between particle physics and security appears less compelling. Despite high-level warnings of the potential impact on national security, federal funding for the physical sciences continues to fall.

"Defense Department Agency Severs Its Ties to an Elite Panel of Scientists," read the headline in a March 23 *New York Times* story by James Glanz on the end of a decades-long relationship between the Defense Advanced Research Projects Agency, or DARPA, and a group known as Jason, an "advisory panel of elite scientists," including some of the nation's best-known particle physicists. The story quoted the Defense Department on the reason for the change: "…a spokeswoman said the move was in fact a reflection of Jason's inability to adjust its priorities to a post-cold-war world, where the physical sciences are no longer as important as information and computer sciences to the nation's security."

The universe on a T-shirt

Boston University theorist Ken Lane is frustrated that particle physics is a hard sell compared to, say, research on the human genome.

"I don't get it," Lane said recently. "Particle physics is the most fascinating science that there is. And I'll tell you one thing: there was physics long before there was DNA, and long after there isn't any more DNA there will still be physics."

Perhaps only a physicist would find that a comforting thought.

While Lane's invidious comparison of physics and DNA may be faulted for a certain lack of political correctness, his frustration reflects a long-held view that particle physics has a unique place among the sciences, namely that when you get down to it, particle physics is the basis for them all.

"In science's great chain of being," wrote George Johnson in a December 4 *New York Times* article, '"New Contenders For a Theory of Everything," "the particle physicists place themselves with the angels, looking down from the heavenly spheres on the chemists, biologists, geologists, meteorologists—those who are applying, not discovering, nature's most fundamental laws. Everything, after all, is made from subatomic particles. Once you have a concise theory explaining how they work, the rest should just be filigree."

The ultimate goal of particle physics, the "grand unification" of all the particle and forces, will, the joke goes, reduce the complexity of the universe to a single law that can fit on the back of a T-shirt. *("I discovered grand unification and all I got was this lousy T-shirt"?)*

But this reductionist perspective, the view that, ultimately, it all comes down to particles, may be in trouble. Perhaps, say other scientists, it's more complicated than that. Complex systems don't necessarily reduce to the interactions of fundamental particles, according to some solid-state physicists. In the words of Nobel Prize winner Philip Anderson, "More is different."

For at least some scientists, a simple theory of everything may simply be irrelevant. In Marburger's words to the AAAS audience, science is "finally within reach of a new frontier, the frontier of complexity."

Particle physics and the fabric of science

High Energy Physics Advisory Panel Chair Fred Gilman recently emphasized the interconnectedness of science in a letter accompanying HEPAP's Long-Range Plan for the Future of High-Energy Physics.

"One cannot tell where the next scientific or technical breakthrough will occur," Gilman wrote, "or what combination of fields it will depend upon….An effort to revitalize the physical sciences is needed not only because of their intrinsic importance, but because of the coupling of progress across the sciences."

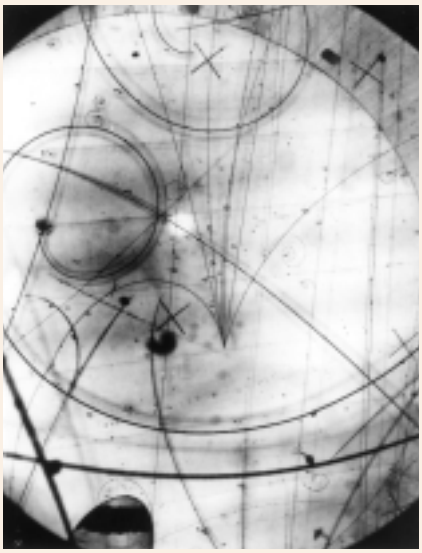
As an example of such connections, particle physicists like to cite former NIH director Harold Varmus's 2000 statement that today's spectacular advances in medical science would not have occurred without the previous work of high-energy physicists, chemists and other basic scientists.

Particle physicists tend to find Varmus's argument convincing—but not everyone responds that way. David Kramer, of *Science and Government Report*, reported on the release of HEPAP's Long Range Plan in SGR's February 15 issue.

"As further justification for their existence," Kramer wrote, "the panel resorted to what are fast becoming the hackneyed words of former National Institutes of Health Director Harold Varmus—that the physical sciences form the basis for many of the advances made in biomedicine."

The case for particle physics as biology's best friend may need freshening up.

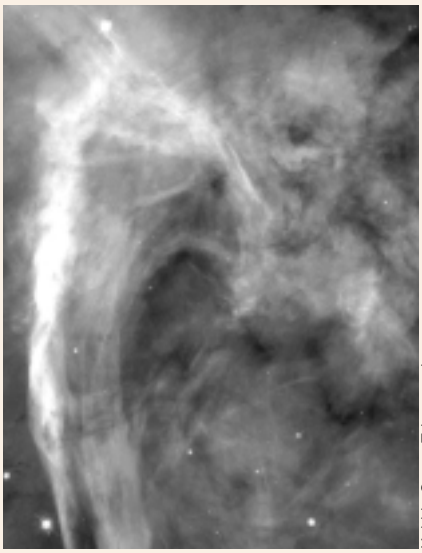
TRACKS vs. CLOUDS



Fermilab photo

"From time to time, the discoveries of new particles and new symmetries in nature have made headlines, but they never fascinated the public the way supernovas, black holes, and pulsars did. The theoretical basis of particle physics is less visualizable than the astronomical action of gravity, even when gravity is dressed in its sophisticated garb of general relativity. And the flower-like bursts of tracks in particle detectors are more abstract and less emotionally compelling than the breathtaking photographs of dust clouds, say, illuminated by a nearby supernova."

—Jack Marburger, Director, Office of Science and Technology Policy



Hubble Space Telescope image

THE WORLD NEEDS ACCELERATOR TECHNOLOGY

Accelerators are tools for particle physics research, and accelerator R&D takes place almost exclusively at high-energy physics laboratories. Yet accelerator technology winds up in the service of fields far from particle physics: medical diagnosis and treatment, biological and biomedical research, materials science, industrial processes and even art authentication—the Louvre has its own particle accelerator. At the height of the anthrax scare last year, the Post Office considered using accelerators to sterilize mail.

Photo by Jenny Mullins

Accelerator technology starts in particle physics but has applications far afield.

Accelerator technology is a valuable contribution of high-energy physics to society's health, prosperity and well-being; and without the stimulus of particle physics research, accelerator R&D would very likely stop. Nevertheless, accelerator R&D alone cannot sustain the enterprise of particle physics research.

PHYSICS WITHOUT BORDERS

Particle physics is a thoroughly international science. For decades, the scale of accelerators has given particle physicists no choice but to carry out experiments in huge international collaborations at a handful of national laboratories. Born of scientific necessity, these collaborations take on new significance in the post-September 11 world as beacons for open, free, scientific exchange for men and women of all nations and across all borders. They offer an inspiring model for international cooperation at a time when the world seems more than ever fraught with international terror and strife.

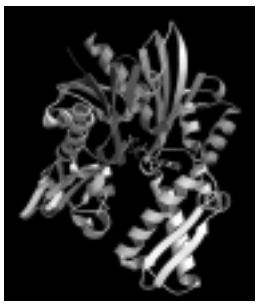
Yet the international nature of particle physics raises difficult issues. Some form of global accelerator network is a logical, indeed a necessary, step in order to share both costs and benefits of the world's next great accelerator, most agree. The technical challenges of such a world laboratory, they also agree, are solvable.

"If physics issues had forced us to put accelerators into space," DESY Director Albrecht Wagner is fond of saying, "we would have solved these issues long ago."

But the accelerator itself must be built *somewhere*. The choice of a site in one country versus another inevitably raises political, economic and social issues that will be far more challenging to resolve.

MESSAGE TO THE WORLD

As particle physicists consider how to communicate the nature and value of their science in a way that reaches key audiences beyond their own ranks, they will need their own clear sense of the purpose of their field. Perhaps even more important will be a keen appreciation of how others see high-energy physics and its value and meaning for the world.



Synchrotron light sources use accelerator technology to create detailed images of biological molecules, such as this Human Heat Shock Protein 70, imaged at Argonne National Laboratory's Advanced Photon Source.

THE LARGER VIEW

Fermilab postdoc Nicole Bell explores an award-winning pathway

by Mike Perricone

Gaining a larger view of the world is always challenging, though not always as suspenseful as the first time you sit in a car with the steering wheel on the wrong side and try to drive on the wrong side of the road.

"My passenger kept shouting, 'You're too close! Watch out for the parked cars!'" said Nicole Bell, accustomed to driving on the left, with the steering wheel on the right, in her native Australia. "But I didn't hit anything, and pretty soon it seemed like the normal thing to do."

Having met the driving challenge, Bell quickly settled into her daily routine as a postdoc at Fermilab: arriving early from her apartment in nearby Naperville, reading research papers, doing calculations, going to talks, working late, working weekends like other postdocs around the lab, trying to match the months to the correct seasons in the northern hemisphere, winning awards…

The first award came in February, less than six months after Bell joined Fermilab's Theoretical Astrophysics Group, her first research appointment after receiving her Ph.D. from the University of Melbourne in Australia. She received the 2001 Bragg Gold Medal in Physics, awarded by the Australian Institute of Physics for the best physics Ph.D. thesis ("Neutrino Oscillations and the Early Universe") at an Australian University.

In March, Bell was among the second-place winners in the Young Researchers Competition, sponsored by the John Templeton Foundation, during the "Science and Ultimate Reality" symposium held March 15-18 near Princeton, New Jersey. The symposium was held to celebrate the 90th birthday of physicist John Archibald Wheeler.

"Wheeler worked with Niels Bohr, his students included Richard Feynman, he gave black holes their name, and that's the short list," said Bell. "He had a hand in so many things, from general relativity to quantum mechanics. There were many famous people giving talks throughout the conference. It was thrilling to give a talk at a conference attended by people such as Wheeler, Freeman Dyson, Wojciech Zurek, Juan Maldacena, Andrei Linde and Lisa Randall."

On the Web:

Nicole Bell's home page
home.fnal.gov/~nfb

Fermilab Theoretical Astrophysics
www-astro-theory.fnal.gov

Science and Ultimate Reality
www.metanexus.net/ultimate_reality

Bragg Gold Medal, Australian Institute of Physics
http://www.aip.org.au/medals/bragg.html

Bell led off the presentations by the 15 finalists in the international competition for researchers born during or after January 1970 (at 26, she was one of the youngest of the finalists). Her talk ("Coherence, Decoherence and Oscillating Neutrinos—From Quantum Zeno to Getting in Sync") was based on work begun during her Ph.D. at Melbourne with advisor Ray Volkas and collaborator Ray Sawyer. She explored the role of neutrinos in the early universe—under conditions where the matter density is so high that collisions of neutrinos with other particles disturb ("decohere") neutrino oscillations. The link to "ultimate reality:" Decoherence is the process where quantum systems lose their "quantum-ness." It plays a fundamental role in the emergence of classical reality from an underlying quantum world.

"The Quantum Zeno Effect is the freezing of the evolution of a system that undergoes rapid system-environment interactions," she explained. "It's a 'watched pot never boils' effect. In the early universe, the collisions of the neutrinos can lead to this sort of freezing—the neutrino oscillations are inhibited. The Zeno effect arises when the two neutrino flavors interact with the environment differently—for example, active flavors as opposed to sterile flavors. In a sense, the environment 'measures' the neutrino flavor."

But then it all changed.

"If the environment is 'blind' to the flavor of the neutrino, this Zeno freezing does not occur," Bell continued. "However, there is an analogous effect: synchronization (or 'motional narrowing'). Usually, neutrinos of different energies oscillate at different frequencies, but rapid 'flavor blind' collisions can cause all energy modes to oscillate in a synchronized fashion. An example would be mu and tau neutrino oscillations in an environment of electrons."

Bell was one of seven second-place finishers, each receiving awards of $5,000; two first-place finishers each won $7,500. The symposium received extensive coverage in *The New York Times*, among other major news and science publications.

"This award is a well-deserved recognition of Nicole's excellent work on novel aspects of neutrino oscillations in many-particle systems," said John Beacom, Fermilab theoretical astrophysicist and David Schramm Research Fellow, who had encouraged her to enter the competition. "Her work demonstrates the exciting interplay that connects ongoing results from neutrino oscillation experiments to important questions about the early universe."

Photo by Jenny Mullins

To Nicole Bell, physics is "the most fundamental of the sciences. We're trying to answer really big questions."

Bell, Beacom and Fermilab postdoc Kev Abazajian recently completed a paper on the role of neutrino oscillations in setting a limit on the lepton number of the universe.

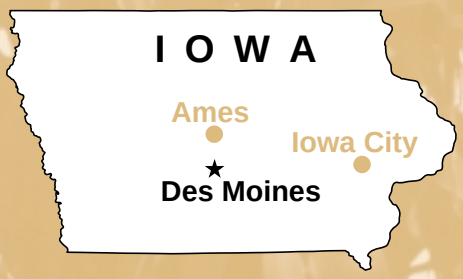
"This is vital in using Big Bang Nucleosynthesis [origin of the first chemical elements] to constrain neutrino properties, and vice versa," she explained.

Bell applied for the postdoctoral position at Fermilab because she was drawn by the access to both cosmology and particle physics and the chance to work with a wide range of researchers.

"To me, physics is the most fundamental of the sciences," she said. "We're trying to answer really big questions."

They're the kinds of questions that lead to a larger view of the world.

UNIVERSITY PROFILES



Cover photo: Beardshear Hall, the central administration building of Iowa State University.

Learning and GROWING

Iowa universities extend the state's educational heritage to work at Fermilab

by Mike Perricone

Corn and soybeans top Iowa's list of homegrown commodities, but physicists represent a solid investment in Hawkeye State futures. The University of Iowa and Iowa State University share a presence at Fermilab reflecting the state's historic priorities of public education and growth.

Agriculture and education have been strongly linked throughout Iowa's history. Iowa State University traces its antecedents back to the State Agricultural Society in Fairfield in 1853, conducting agricultural research and statewide agricultural education programs. The State Agricultural College and Model Farm was established in 1858, and it became one of the country's first land-grant colleges as the Iowa State College of Agriculture and Mechanic Arts in Ames.

The Federal land-grant program, under legislation sponsored by Rep. Justin Morrill of Vermont and signed by President Lincoln in 1862, provided each state with a grant of public lands. Proceeds from the sale of the lands would be used to "teach such branches of learning as are related to agricultural and mechanic arts."

Photo courtesy Iowa State University

George Washington Carver

George Washington Carver could stand as a symbol for the far-reaching benefits of public education and the land-grant program.

In 1891, Carver became the first African American to enroll at the Iowa State College. He soon became Iowa State's first African American faculty member, before Booker T. Washington invited him to join the faculty of Alabama's Tuskegee Institute in 1896. While at Tuskegee, Carver not only revolutionized southern farming with his research, he also brought with him the Iowa State extension concept, creating "movable schools" to bring both scientific and practical knowledge to farmers throughout the south.

But even before the land-grant program, Iowans had demonstrated their commitment to public and equal-opportunity education.

Photos courtesy University of Iowa

Photo by Reidar Hahn

The University of Iowa (clockwise, from top left): The Iowa River divides the east and west sides of campus. Aerial view of the Iowa Advanced Technology Laboratories. The Old Capital building stands at the heart of campus. Iowa researchers at Fermilab (from left): Ugur Akgun; Yasar Onel, professor of physics and astronomy; Alexi Mestvirishvili.

The University of Iowa was founded in February 1847, just 59 days after Iowa achieved statehood. It was the first U.S. public university to admit men and women on an equal basis, and it was the world's first university to accept creative work in theater, writing, music and art on an equal basis with academic research.

When the state capital was moved to Des Moines in 1857, the Old Capitol building became the first permanent home of the University in Iowa City. Nearly two-thirds of the current University of Iowa enrollment (nearly 29,000 total) are Iowa natives, and Iowa City is consistently ranked among the best places to live in the U.S. Despite ranking 30th in population (at 2.9 million, just slightly larger than the city of Chicago), with one of the country's lower population densities, Iowa has three state universities, 62 public and private colleges and 28 community colleges.

Some University of Iowa "firsts" drive home the historic primacy of education and equal opportunity:

- The Medical Department held its first sessions in 1870, and with eight women in its original class, it was America's first co-educational medical school.
- The University created the nation's first permanent college-level department of education in 1872.
- The first woman to graduate from the University's Law Department, Mary B. Wilkinson, in 1873, was possibly the first woman to earn a law degree in America. The law school, which moved to Iowa City from Des Moines, was the first in the U.S. to be established west of the Mississippi.
- The son of the first black American ambassador, Alexander Clark, Jr., became the first African American in the Iowa Law Department—and possibly in the U.S.—to earn a law degree, in 1879.

It's a history of achievement that sets the highest standards for the future.

Pixels and fuzzy carbon

At Fermilab, graduate students from the University of Iowa are looking forward to a few more degrees of their own. They're working on data from the SELEX (Segmented Large X baryon Spectrometer) fixed target experiment, studying charm baryons.

"SELEX is winding down, and the first full round of Ph.D.s has been completed," said Charles Newsom, associate professor of physics and astronomy. "Students are beginning to look at that data for the next round of degrees, and at Iowa we expect to have another two or three Ph.D.s."

Fermilab photo

Iowa graduate students are working on earning Ph.D.'s from data generated by SELEX, the fixed target experiment at Fermilab that carried out high statistics studies of charm baryons.

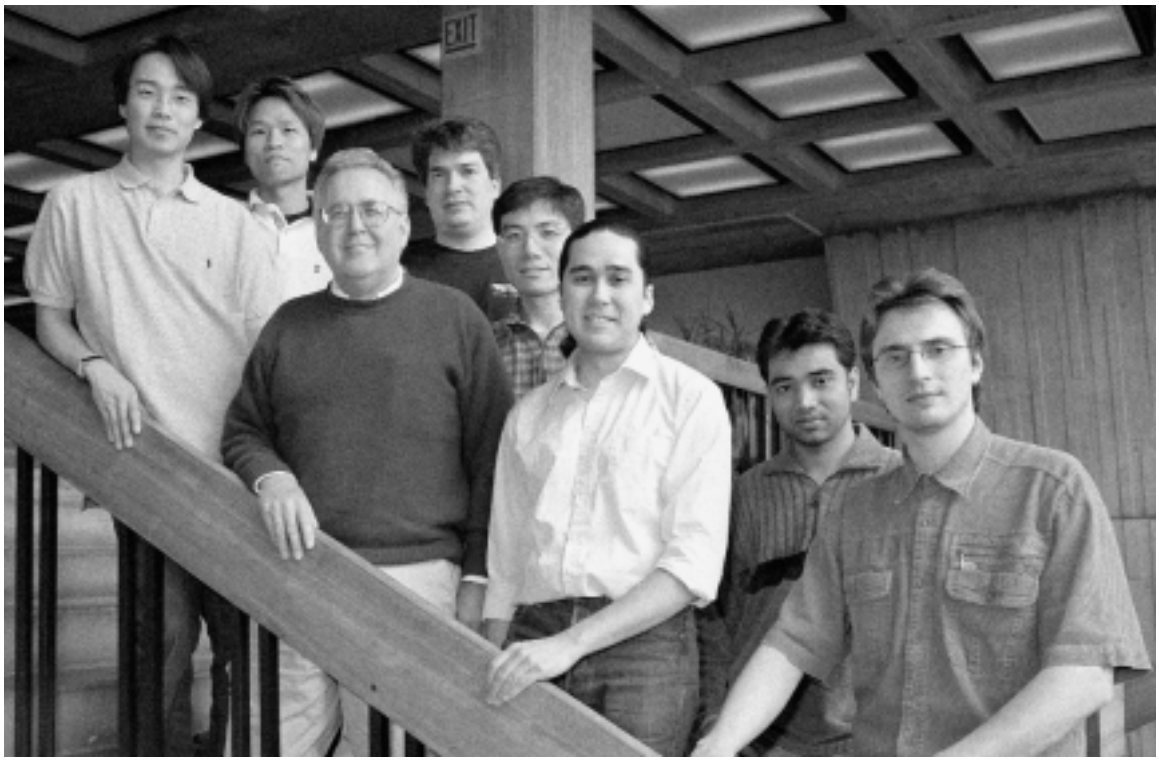
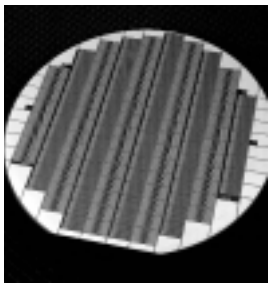


Photo by Reidar Hahn

Iowa State at Fermilab (from left): Sehwook Lee (Korea University), Jaewon Park (Korea University), John Hauptman, Andrew Green, John Zhou, John Krane, Sandeep Giri, Oleksiy Atramentov.

The Iowa group is a strong contributor in silicon systems, working on development of radiation-hard pixel detectors for BTeV (B physics at the Tevatron) and other experiments at Fermilab, and for CERN, the European Particle Physics Laboratory in Switzerland. When the pixel detectors were placed in the test beam, Newsom said the Iowa group wrote an analysis so quickly after information was released by the data acquisition system, "it almost seemed like an online analysis program."



Bump-bonded pixel detectors

The Iowa group is also working on something called "fuzzy carbon," a material for use in close proximity with the colliding beam.

"It's a high-radiation environment, and you need to minimize the material used," Newsom said. "The criteria for building mechanical structures in this region are: the material must be very strong but essentially have no mass, and it must be an electrical insulator but a good thermal conductor. Obviously, these are all conflicting requirements. We've gone to technology that's very much like velvet, with large numbers of parallel fibers of carbon. We've been at the forefront of this development, and it's a lot of fun."

CP VIOLATION, QCD AND QUARKNET

In Theoretical Physics, Iowa State University's German Valencia and Fabrizzio Gabbiani are working on CP violation in baryon systems and b-meson systems. Valencia recently published an article in the Particle Data Group's Review of Particle Physics. David Atwood has contributed a section to *The Higgs Hunters' Guide* (J.F. Gunion, et al., Addison Wesley, Reading, Mass.).

At DZero, John Krane is co-convener of the collaboration's QCD (quantum chromodynamics) group, and spoke at a recent calorimeter conference at Cal Tech. John Hauptman, professor of physics and astronomy, is spending an entire year with the DZero collaboration, shepherding his own diverse group that includes undergraduate physics majors, graduate students, a student or two referred from another Iowa school, a growing connection with students from Korea University—almost anyone he can sign up.

Hauptman has also worked closely with QuarkNet, the program coordinated by Fermilab's Education Office for mentoring high school students and teachers, giving them first-hand experience with experiments at Fermilab, Stanford Linear Accelerator Center and CERN. Also not

The IOWA STATE – SEOUL Connection

Iowa State's John Hauptman and DZero co-spokesperson John Womersley are applying for grants from the National Science Foundation and from KOSEF, the national science foundation of Korea, to gain support for Korean students to come to Fermilab, and for young DZero physicists to travel to Korea. The proposals came about in large part because a former Korean graduate student made a promise and kept it.

"My very first Ph.D. student was Sung K. Park from Korea University in Seoul," Hauptman said. "Park told me very early in our association that he was going to build a high-energy physics lab in Korea. No such thing existed at the time. But he actually went back and built the Korea Detector Laboratory (KODEL), where they are now building hundreds and hundreds of square meters of muon chambers. They are an enormous factory, and they are big players in the muon system at CMS [Compact Muon Solenoid detector being built for the Large Hadron Collider at CERN]."

The Hauptman-Park association has grown into an unofficial connection between the Iowa State group and students from Korea. Park also joined the DZero collaboration, and three of his students are currently involved with luminosity projects at DZero, as well as with communications software linking the detector to accelerators and to subsystems.

The Korea Detector Laboratory has a major responsibility for R&D and construction of the Resistive Plate Chambers (RPC) at the forward region of CMS to detect muons produced by proton-proton collisions. Prototype chambers for the double gap RPC, the read-out electronics, and the data acquisition system have been constructed. In addition, Monte-Carlo simulations are optimizing the performance of the chamber operation and the data transformation.

RPC prototype at Korea Detector Laboratory. Image courtesy KODEL

surprisingly, working off his QuarkNet experiences, Hauptman has some new approaches he'd like to try in working with students.

"I hope to make a proposal for funding that would be unrestricted, that is, I could take in anyone to work on a project," he said. "For example, my undergraduate physics majors, Mark Kane and Tom Plagge. Or a high school student, I'd like to be able to do that. A high school junior or senior can already do things with the Web that I can't do, so they're immediately useful. Undergraduate physics majors already know enough to do a lot of things: for example, putting together lots of cables and high voltage equipment for CMS [Compact Muon Solenoid Detector for the Large Hadron Collider at CERN]. The calorimeter we're working on will be the first equipment to be dropped into the pit in Interaction Region 5 at CERN. I really want a high school student, and maybe an undergraduate physics major, working with me for a summer at CERN. They can drag cables, plug things in, run tests, get the monitoring and control software going. They can do all of this."

But sometimes Hauptman gets a surprise, as he did the summer he received a call from a teacher friend in Iowa.

"He said there was this really bright kid in town, his parents didn't know what to do with him, and was there anything I could do," Hauptman recalled. "He turned out to be a 4th grade boy. He was a shy little kid, but I talked to him and set him at ease. The first thing I gave him was an old floppy drive to take apart, and then I gave him an old hard drive to take apart. Then I gave him an old 186 PC to work on. It was a big, old, ugly thing, but he just loved it. He had a great summer. He got to hobnob with students like Oleksiy Atramentov and Mark Kane, and he got to hang around with the big guys."

It had to be a uniquely memorable growing experience, but then, Iowa is all about growing—and learning.

Iowa State photo

A student passes the Campanile on the Iowa State campus. The 10-bell carillon chime installed in the Campanile in 1899 was the first scientifically-tuned bell chime outside England. The carillon has 50 bells today.

On the Web:

University of Iowa
http://www.uiowa.edu/

Iowa State University
http://www.iastate.edu/

Background on the Morrill Act
http://usinfo.state.gov/usa/infousa/facts/democrac/27.htm

COMMUTER SPECIAL

Lockyer sees universities stepping up the pace at CDF

by Mike Perricone

Soon to become cospokesperson at CDF, Nigel Lockyer already practices life on the run.

"I don't have any spare time," he said with a chuckle. "But I do try to run every day. Fermilab is a good place to run."

Lockyer, who officially succeeds cospokesperson Franco Bedeschi at CDF on June 1, is well-acquainted with the pace of the lab. He arrived in 1984, following up his postdoc term on the Mark II experiment at Stanford Linear Accelerator Center by moving on to the faculty of the University of Pennsylvania. He's been teaching for nearly 20 years at Penn, primarily undergraduate physics courses, while maintaining the frequent-flier routine of the Fermilab visiting scientist. For the last two years, he has stepped up that pace as CDF's co-chief of operations, with Fermilab physicist Jeff Spalding, and he has usually spent Tuesdays through Fridays at Fermilab.

"The commute from Philadelphia isn't all that bad," he said. "In principle, as a cospokesperson you move here. Starting June 1, people should be able to find me when they need me."

Lockyer and his family live in Wayne, Pennsylvania. Ellen, his wife, teaches nursery school. Geoffrey, the oldest offspring, is at Ohio State; Martin is in high school, and Sara in middle school. Along with a wry sense of humor, always helpful to a cospokesperson for a group of nearly 600 scientists from 58 independent institutions, Lockyer brings an appreciation for the kind of work it takes to keep the 5,000-ton detector operating.

"My primary responsibility for many years was the alarm system," he said. "The control system checks that voltages are within tolerances, monitors high voltages, turns the high voltage on and off at the beginning of a run. There was formerly a talking computer issuing the alarms, and one of the few benefits of being on shift was programming it to say other, less-pertinent

On the Web:

CDF
www-cdf.fnal.gov

Photo by Reidar Hahn

Nigel Lockyer and the University of Pennsylvania group at the CDF Collision Hall. Kneeling (from left): Lockyer, Tianjie Gao, Cheunhui Chen, Joel Heinrich. Standing: Joe Kroll, Peter Wittich, Dave Ambrose, Denys Usynin, Isamu Nakamura, Rolf Oldeman, Andrew Kovalev. Back row: Matthew Jones, Shin-Shan Yu (Eiko) and Walter Kononenko.

Photo by Reidar Hahn

New CDF cospokesperson Nigel Lockyer hopes to "encourage the university groups to work on even more operational issues in commuter mode."

things. It's probably the most un-glorious job you can have at CDF. I tried to get out of it every year but failed. It's a thankless job, but it has to be done. So I completely sympathize with people who do that kind of work."

Lockyer also knows that, despite the lack of acclaim, those tasks are the critical foundation of success.

"From my perspective, as someone coming from a university," he said, "I believe CDF needs to encourage the university groups to participate in the pre-physics process. Naturally, university groups are very anxious to get their hands on the data. That's the end game, that's the excitement of being out on the frontier. But there are a lot of mundane things to do, like alarms, that require dedicated and talented people.

"The reward system in the field is primarily geared toward people doing physics analysis," Lockyer continued. "For a postdoc to get a faculty position, that's determined largely by what physics he or she has done on the experiment. But at least as much work, if not more, is involved in their contribution to building the experiment. In general, and unfortunately, that's not viewed in same light as the physics results. I'd like to help raise the awareness of how critical that work is, when an experiment is to run for the better part of a decade."

Lockyer acknowledged the difficulties in both outlook and logistics, but also outlined a possible strategy.

"I want to encourage the university groups to work on even more operational issues in commuter mode," he said. "They would make their own contributions back at the university, then come in here for couple of days every two weeks and take on an important operational role while they're here. That will make us a very strong experiment if we can accomplish it."

Behind Lockyer's easygoing manner is a firm understanding of what's at stake well beyond the prestige of a possible discovery in Run II.

"When all is said and done, it will be disappointing if don't find something," he said. "We expect to find something—and we're expected to find something. The high-energy frontier is here and now. The field of high-energy physics, both in this country and internationally, will be influenced by the success of CDF and DZero. That ratchets up the importance of everything we're doing."

UPWARD BOUND

Since July 2001 when the first plane was installed, the MINOS collaboration has installed about 180 of the 486 far detector planes, meaning more than one third of the detector is installed and commissioned. A staff of 31 technicians is working on the installation, alongside MINOS physicists. There are usually about 12 physicists and students underground at Soudan each week. The MINOS collaboration expects to complete the first half of the detector in July, culminating in energizing the first of the two MINOS coils. The detector should be completed in the summer of 2003.

On the Web:

Experiment E875 (MINOS)
www-numi.fnal.gov

Upward muon marks a MINOS first

by Judy Jackson

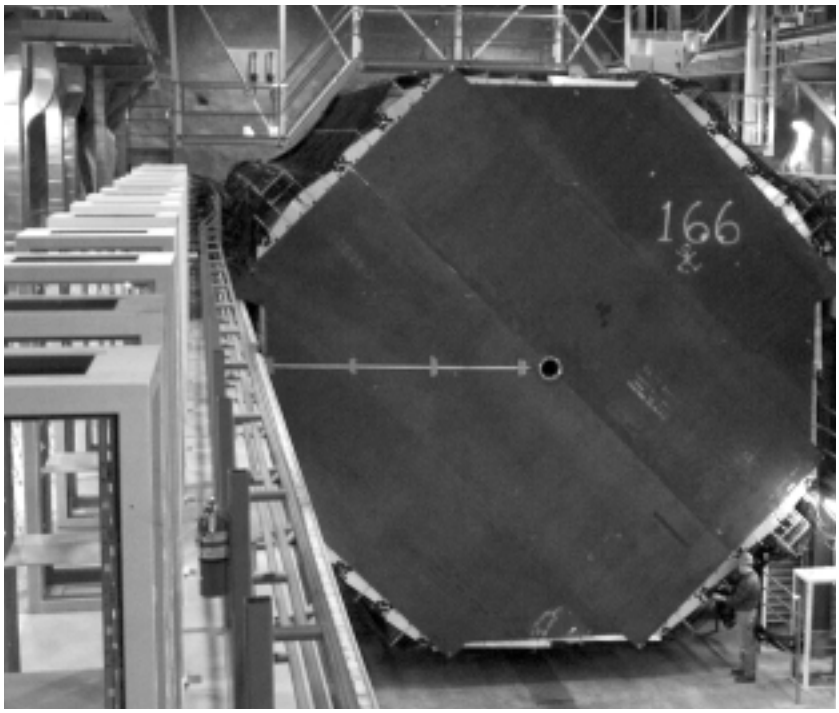
On Tuesday, March 26, 2002, the MINOS detector saw its first upward-going muon.

The MINOS detector is currently under construction half a mile underground in a former iron mine in Soudan, Minnesota. To date, the project has installed about 180 layers of the 486 slices of steel and scintillator that will ultimately make up the detector.

When the MINOS collaboration begins experimental operations in 2004, it will detect neutrinos sent to Minnesota from the Fermilab Main Injector. Last week's muon, however, was sent by Mother Nature, created by a cosmic ray in the atmosphere. Even in its unfinished state, the detector can "see" such particles generated by cosmic rays.

Why is the sighting of an upward-going muon so exciting? Because it means the MINOS detector works. It can distinguish the track of that all-important upward-going muon from the many thousands of tracks of muons going the other way—not upward through the earth, but downward from the sky. For every upward-moving track, the detector observes about 10,000 tracks of downward-moving muons. It is a great test of the pattern-recognition capabilities of the MINOS detector that it could pick out the needle of the upward-moving track from the haystack of downward-moving muons.

"Finding this upward-bound muon is a great tribute to all the people who have worked so hard to design and build the MINOS detector, and to write and debug the software that made the observation possible," said MINOS spokesman Stan Wojcicki. "It is very gratifying to us to see it all come together."



Photos courtesy MINOS

CALENDAR

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

NALWO

NALWO is pleased to invite the Fermilab community to a belated International Women's Day celebration, at noon on Sunday, April 28, 2002, in Ramsey Auditorium. Enjoy the dance, music, and drama performances of talented Fermilab children. For more info, contact Sue Mendelsohn, x5059, mendel@fnal.gov www.fnal.gov/orgs/nalwo/April28.hml

ONGOING NALWO

Free English classes in the Users' Center for FNAL guests, visitors and their spouses. The schedule is: Monday and Friday, 9:30 a.m. - 11:00 a.m.

VIRTUAL ASK-A-SCIENTIST

April 30, 1 p.m. to 3 p.m. CST. Theme: Particle Detectors, with DZero cospokesperson John Womersley and researcher Natalia Kuznetsova. For more information: http://www.fnal.gov/pub/inquiring/virtual/

MEET SCIENTISTS AT SCIENCE EDUCATION CENTER

The popular Ask-a-Scientist program takes place every Saturday from 1 to 3 p.m. at Fermilab's Lederman Science Education Center. The Science Education Center with its hands-on science displays is open Monday through Friday from 9 a.m. to 4 p.m. and every Saturday from 9 a.m. to 3 p.m. Visitors must use the Pine Street entrance.

FERMILAB ARTS SERIES:

CAROL WINCENC, FLUTE & NANCY ALLEN, HARP

Saturday, May 4, 2002 $17 ($9 ages 18 and under)

Carol Wincenc Masterclass, sponsored by the Chicago Flute Club at 4 p.m.

"An impeccable flute soloist." — *The New York Times*

Critically acclaimed recitalists Carol Wincenc & Nancy Allen team up to present an elegant evening of music for flute and harp. These gifted artists have traveled throughout the United States and abroad, garnering rave reviews and standing ovations wherever they perform.

Their program will include works by Gorecki, Bach, Tower, Gossec, Ravel, Ibert, and Bartok. Opening night festivities will include a masterclass by Ms. Wincenc, sponsored by the Chicago Flute Club, a pre-concert talk and formal reception.

DOC WATSON

Saturday, May 11, 2002
$23 ($12 ages 18 and under)

"He is the godfather of the guitarists in the `new acoustic music' scene, and as virtuosic as any of them." — *The New York Times*

Recipient of the National Medal of Arts, National Heritage Fellowship and five Grammy Awards, Doc Watson is a legendary performer who blends his traditional Appalachian musical roots with bluegrass, country, gospel and blues to create a unique style and an expansive repertoire. He is a powerful singer and a tremendously influential picker who virtually invented the art of playing mountain fiddle tunes on the flattop guitar.

Born in Deep Gap, North Carolina in 1923, it wasn't until the age of thirty that he began to play gigs for money. In 1961 Doc was invited to perform at a now-legendary concert in New York City, and a year later Doc gave his first solo performance at Gerde's Folk City in Greenwich Village. From then on, he was a full-time professional. In the late 60's, though the folk revival was waning, Doc began touring with his son Merle. This period yielded many remarkable recordings, including collaborations with Flatt & Scruggs, Chet Atkins and the Nitty Gritty Dirt Band.

Though he briefly stopped touring after Merle, his son and accompanist, died in 1985, Doc now accepts a limited number of engagements. For the past several years he has hosted the Merle Watson Memorial Festival in Wilkesboro.

All Fermilab Arts and Lecture Series programs begin promptly at 8 p.m. in Ramsey Auditorium, in Wilson Hall. For more information, call 630-840-ARTS, send a fax to 630-840-5501, or email audweb@fnal.gov.

Fermilab is only accessible from the west side entrance at Pine Street and Kirk Road. For a map or further information, please see our web page at www.fnal.gov/culture.

TO FERMINEWS:

Thank you so much for at least partially reopening Fermilab for recreational access. Many of us use this large neighbor of ours for purposes other than high-energy physics, although we support that as well. Concerts, dancing, bird watching, hiking, biking, visiting the museum and prairie, taking tours, taking the Saturday Morning Physics for high schoolers—members of our family have done all of those. I was dismayed when the alert closed down many of these activities. I would urge you to continue to ease the access to the Fermilab facility, but appreciate at least what we can now visit again. Especially now, the duck migration season.

—Nancy Good, Naperville

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

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

Chez Léon MENU

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CAKES FOR SPECIAL OCCASIONS
DIETARY RESTRICTIONS
CONTACT TITA, X3524
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

LUNCH
WEDNESDAY, APRIL 24

Saucisson en Croute
Arugula and Sweet Red Pepper Salad
Lemon Cheesecake with Blueberry Sauce

DINNER
THURSDAY, APRIL 25

Garbanzo Vegetable Soup in Smokey Broth with Fresh Avocado
Red Snapper Fillet in Creole Sauce
Zucchini, Roasted Peppers and Corn in a Cream Sauce
Mango Sorbet with Mango Slices

LUNCH
WEDNESDAY, MAY 2

Barbecued Tandoori Shrimp Sticks
Basmati Rice with Vegetables
Cucumber Raita
Cheesecake with Mango Slices

DINNER
THURSDAY, MAY 3

Marinated Mussels on Half Shell
Roasted Leg of Lamb with Garlic, Herbs and Mushrooms
Steamed Asparagus
Toasted Orzo and Rice Pilaf
Orange Cake with Grand Marnier Creme Anglais

FERMI NEWS

FERMILAB
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The deadline for the Friday, May 10, 2002, issue is Tuesday, April 30, 2002. 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. Letters from readers are welcome. Please include your name and daytime phone number.

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CLASSIFIEDS

FOR SALE

■ '01 Honda 400ex ATV, excellent shape, 440 big-bore kit, jet kit, k&n filter, fmf bars, dg skid plate, runs great, $4,500 o.b.o. x 4971, pager 630-905-0215, mcarter@fnal.gov.

■ '98 Dodge Dakota club cab SLT truck. Black with gray cloth interior, 3.9L V-6 engine, 4-speed auto., PS, PB, AC, intermittent wipers, AM/FM cassette, tilt wheel, power locks, and windows, sliding rear window, rear cap and much more. 45K, 6 year warranty. $12,500 o.b.o., 630-505-0276.

■ '95 Ford Escort Sedan 4 Door LX, 94K miles, air conditioning, alarm, automatic, electric power mirror, dark green, excellent condition (new tires, brakes repaired, time belt changed, oil changed). $2,500 o.b.o. hidaspal@fnal.gov, 630-840-6856.

■ '94 Dodge Ram 1/2-ton 4x4, std cab long bed, 102K, good shape runs excellent, slt model fully loaded, 5 spd trans, two sets of wheels, blk w/gray interior, 5.2 V8, soft tonneau cover, 3 inch body lift, AC, $8,000. x4971, pager 630-905-0215, or mcarter@fnal.gov.

■ '95 Ski Doo mxz 440 liquid-cooled snowmobile, good shape, runs well, comes with spare hood and belt and plugs, 3,900K, not even 50 miles on fresh rebuild, had new cylinders and head and pistons, rings, etc. $1,800 o.b.o.

■ '93 GEO Storm, five speed, 85k, $1,750 o.b.o. x5003 or 630-848-1331.

■ '89 Dodge Daytona. Blue 2 door hatchback. 89K miles. Automatic. Runs well. $950. Mark x4472 or ruschman@fnal.gov.

■ '89 Dodge Caravan, navy blue, automatic transmission, remote starter, runs well, 166K miles, $700 o.b.o., call Mike at x6124 or 630-208-1751.

■ '89 Plymouth Acclaim, 61K miles, looks good, runs great, well maintained. $2000. bergen@fnal.gov or x2326.

■ '86 Chevy Celebrity 4 door, good tires, new heater core, shocks, battery, radiator, belts 120K miles, $800 o.b.o. 630-932-8508 after 5 pm, 630-399-0332, Dale.

■ '87 Honda Accord LX, gold, 4 door, 5 spd., radio/cassette, cruise control, power steering, power mirror, power windows, power locks. Runs great $1,075 o.b.o. Lucas x4366 or nxuan@fnal.gov

■ Fiberglass truck cap. Blue, from '88 Chevy short bed. 3 sliding windows, 2 lights. Exc. condition. $300. Mark x4472 or ruschman@fnal.gov.

■ 1973 Crestliner 14′ boat with Sea Bird trailer. 5-1/2 HP Johnson Seahorse motor, 2-electric trolling motors, Garmin Fish Finder, dual anchors with cranks, misc fishing poles, tackle, vest, etc. $2,000, o.b.o. Call 630-505-0276.

■ Set of 33″ BFGoodrich All-terrain tires on Eagle polished aluminum rims, 6-bolt Chevy pattern, $800. Century fiberglass truck cap, black, off of short bed S10. Sliding windows in front and sides, $500. 2000 Kawasaki Lakota four wheeler, 50 hours ridden easy, $3,000. Home 815-787-9415 ask for Bill, dymond@fnal.gov or ext. 3691.

■ Garage Door, wood raised panel, 16′ wide x 7′ high, four (4) panels, very good and solid condition, most of the original hardware included. Needs a good coat of paint...$75 o.b.o. Call Ed Dijak, x6300 work, 630-665-6674 home, dijak@fnal.gov

■ Queen size sleeper sofa, forest green and cranberry striped, inner spring mattress. Very good condition. Sheet set included. $150. jnelson@fnal.gov.

■ Alarm clock with radio, toaster, blender, coffee maker, stereo set and speakers, TV, 6 rattan chairs, wireless phone and answering machine. Ext. 2326 or bergen@fnal.gov. Any reasonable offer.

■ Musical instruments: Ludwig Bell Kit for beginning drummers. Includes Bells, practice pad, stand, and zippered carrying case for $150. Also, Yamaha Portatone PS-25 electric keyboard with molded carrying case for $50. Call T.J. at 630-840-3299 or sarlina@fnal.gov.

■ Zano's Spa and Salon Gift Card. $70 Value, great gift idea. Call Jerry at X4571.

■ Furniture refinishing and restoration. Pick-up and delivery. Call 815-695-5460, or x3762.

■ Landscape renovations, perennial gardens, horticultural consultations. Call Frank, 815-254-6996, or x3303.

■ Weight lifting stuff; over 1,000 lbs. of steel weights, olympic style bar, curl bar, dumbbells, "IMAGE 4.0" free weight station with bench. $450 for all. Call Ed Dijak, x6300 /work, 630-665-6674 /home, dijak@fnal.gov

■ Telex flight headset, $40, o.b.o. 630-584-2801, Jim Griffin.

■ DR walk-behind weed-cutter, 5.5 HP, electric start, large rear wheels, new cutting head included (value $100), Great for cutting on slopes or uneven ground. Great condition. $300. o.b.o. Call Craig at 630-505-0276.

■ Golf clubs: King Cobra 1 & 3 woods, Ti, offset, regular graphite shafts, $50 each o.b.o. Odyssey Dual Force putter, $25 o.b.o. 630-377-9252 or jvenard@flash.net.

■ Complete set of golf clubs with pro style bag, 3-PW Tommy Armour titanium irons with graphite shafts, metal woods, driver, 3W, 5W and a soft face DuoTech putter. Complete set, $285; will sell irons separately. Call X2812 ask for Jack.

LABRADOR AVAILABLE

■ Sparky is a friendly 8-yr-old chocolate Labrador. He is an inside dog, but enjoys spending time outdoors. He is neutered and is current on his vaccinations. Due to allergies he can no longer stay with us. If interested, call Diana at 630-844-1259, or email diana@appraisalservices.com.

HOUSE FOR SALE

■ 3 bedroom tri-level in Lake Holiday, 2 bath, professionally landscaped, Sandwich Schools, large lot, 3 beaches, boating, fishing, water-skiing, low taxes. $139,900. x3499.

CONDO FOR SALE

■ Naperville, 2 bdrm, 1.5 bath, close to I-88 and Metra, 5 miles from Fermilab, all appliances including washer/dryer, indoor heated garage, secure elevator bldg, courtyard view with large balcony. $114,000. 630-416-1418.

FOR RENT

■ One big bed room plus bath room on independent floor in family house. Quiet residential Naperville. Car garage, laundry, living room available. $495/month. Ready April 30. Call: 840-2574 office hours

GARAGE SALE

■ Attention Dr. Who fans: We have books (some out of print), magazines and videos which we are going to sell at our garage sale May 10th and 11th. We also have many Audio Cassettes and a few CD's and Movies. For an early bird sale please call Alma, 879-3809.

GOLF LEAGUE

■ The Fermilab Golf League is looking for golfers to participate in our weekly golf league at the Fox Valley Golf Club in North Aurora on Tuesday afternoons. Please visit our web site, http://mccrory.fnal.gov/golf, for details and an application form, or call Elliott McCrory at x4808. Please reply with confirmation of receipt.

MILESTONES

RECORD SET

■ By Fermilab's Beams Division, on Saturday, April 6, 2002: A luminosity record for Run II, of 14.8 E30. Luminosity is a measure of particle interaction. The higher the luminosity, the greater the chance of quark production and new discoveries.

AWARDED

■ To Elaine McCluskey (ID 06859N, FESS-Engineering): A Fermilab Employee Recognition Award, by Fermilab Director Michael Witherell, on April 2, 2002. McCluskey supervised the recently completed Wilson Hall Safety Improvements Project. Witherell cited the efficiency of the project, its safety record, and communication efforts keeping lab employees updated.

■ To *FERMINEWS*, the newsletter of Fermilab: A Silver Trumpet Award, by the Publicity Club of Chicago, on March 29, 2002. The Silver Trumpet award recognizes distinguished achievement in planning, creativity and execution of a public relations effort. The Publicity Club of Chicago, founded in 1941, is the nation's largest independent public relations membership organization.

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

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