FERMI NEWS

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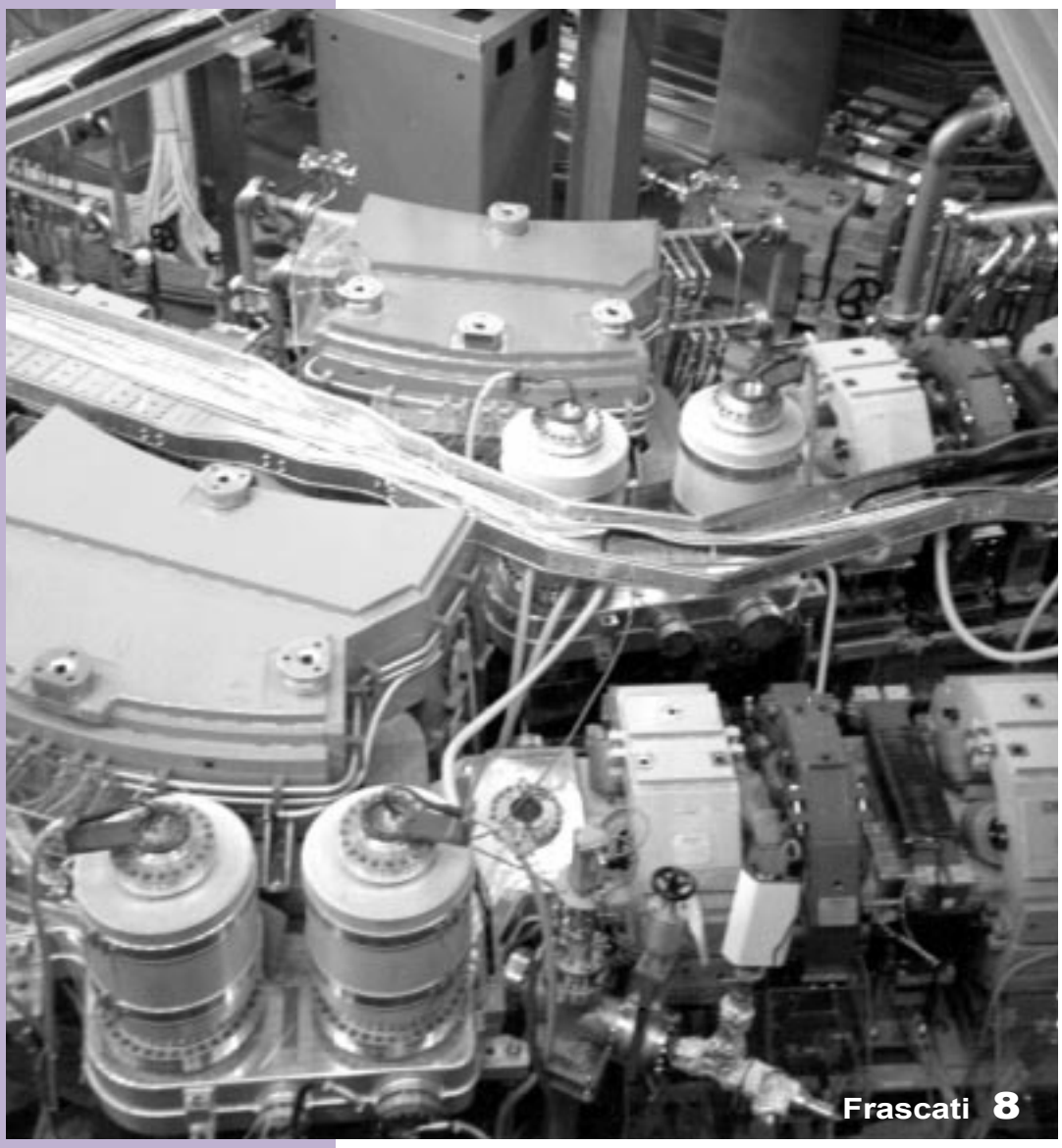

Frascati 8

Photo by Judy Jackson

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What's Next?

PHYSICISTS AT FERMILAB AND THROUGHOUT THE WORLD ARE CONTEMPLATING BUILDING A POWERFUL NEW LINEAR COLLIDER.

by Sharon Butler

Prototype of a typical segment of the accelerator structure in a U.S. NLC.

Europe wants one. Japan wants one. The U.S. wants one, too—a 20-mile linear collider with an energy level in the range of 0.5 to 1.5 trillion electron volts and a luminosity of 10^{34}sec^{-1}cm^{-2}, enough to probe the realm of the Higgs boson and the putative supersymmetric particles. It's already been dubbed the Next Linear Collider.

But, concedes Fermilab Director Mike Witherell, "the path to a decision to build a linear collider in this country will…be a long and complicated one."

As the first order of business, he said: "The U.S. particle physics community must be able to say that the NLC would be of overwhelming scientific importance, of highest priority for the field and worth the investment for both construction and operation."

Reaching that level of commitment requires a solid understanding of the capabilities of such a machine, its cost and its physics promise. Which is, in part, the reason why Fermilab joined the U.S. NLC collaboration last summer.

"Of all the possibilities for future facilities—an electron-positron linear collider, a muon storage ring, or a very large hadron collider—the linear collider is the closest to having a proposal for a real machine on the table," said Steve Holmes, associate director for accelerators at Fermilab. "Consequently, the decision of whether—and where—to build one is nearer for the linear collider than for the others. If Fermilab and the U.S. particle physics community are going to make an informed decision, Fermilab needs to be involved in the R&D."

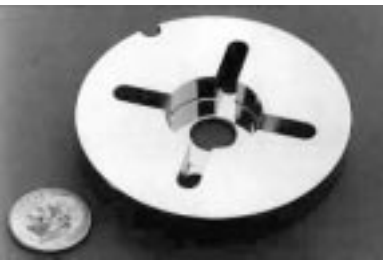
KEK's prototype 100-MW klystron, which can produce 4.5-microsecond-long radiofrequency pulses for accelerating a beam of electrons.

SIGNIFICANT WORK ALREADY UNDERWAY

Research and development on a possible NLC have been underway in the U.S. since the mid-1980s, when SLAC, in California, completed construction of its present linear collider and immediately began studying ideas for a next-generation machine. Collaborating with the Japanese particle physics laboratory KEK, SLAC

Prototype of a klystron for a future U.S. NLC. Klystrons are microwave tubes that use the same technology as airport radar and microwave ovens, but provide far more power.

has developed high-powered components for the NLC, including quadrupole magnets to focus the beams, accelerating structures and klystrons. Kystrons are microwave tubes that use the same technology as airport radar systems and microwave ovens, but provide far more energy—a million times more power than an ordinary light bulb, and 75 thousand times the power of a high-end kitchen microwave.



Copper disks in a U.S. NLC would receive power via waveguides from klystron tubes and transfer the power to the beam.

In SLAC's concept of the NLC, the power from the klystron tubes would be transferred to a copper accelerating structure and then to the beams, giving the electrons and their antimatter counterparts a powerful kick as they pass along the accelerator's length.

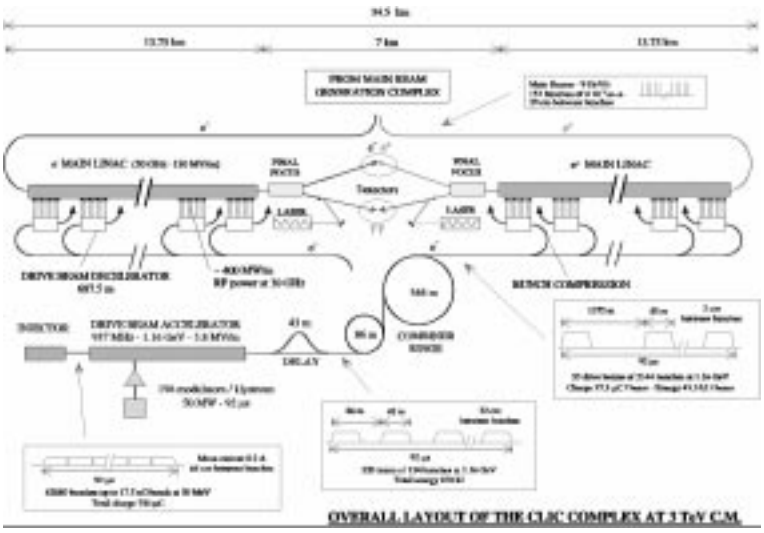
The U.S. is not alone in considering possible designs for a future, more powerful linear collider. DESY, in Germany, is studying designs for TESLA, the TeV Energy Superconducting Linear Accelerator, which would use superconducting devices to accelerate electrons and positrons to energy levels of about 0.5 TeV. Upgrades would later push the machine to 0.8 TeV.

The TESLA Test Facility, at DESY, in Germany, is working on prototype components for its TeV Energy Superconducting Linear Accelerator.

KEK is also studying designs for a 0.5 TeV electron-positron collider, with further upgrades into the TeV region.

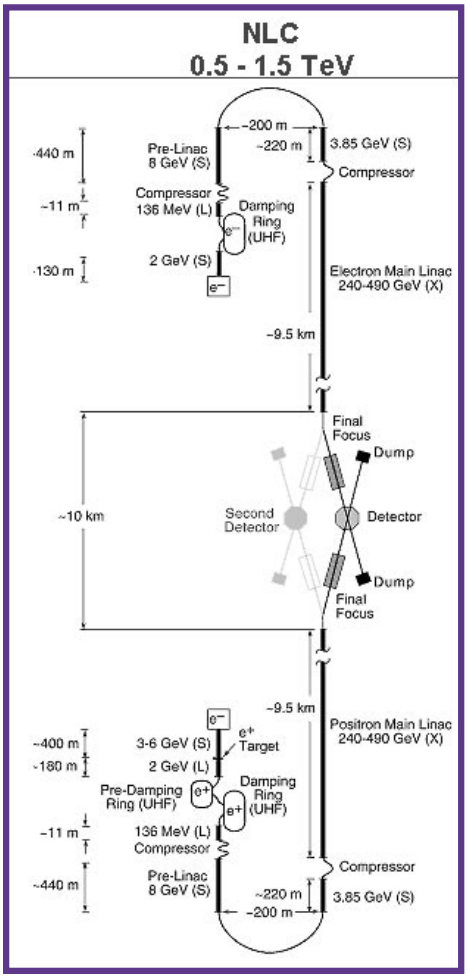
CLIC, the Compact Linear Collider Study at CERN, in Switzerland, is aiming eventually for much higher energies: 3 to 4 TeV, with a luminosity as high as 10^{35}sec^{-1}cm^{-2}. To achieve those levels, its physicists are trying out more novel, though currently less developed, technologies that would accelerate the beams using very-high-frequency (30-GHz) devices, powered by a drive beam.

KEK's Accelerator Test Facility for a possible future NLC consists of two major components, including the 1.5-GeV injection linac shown here and a damping ring.



Schematic drawing of CLIC's NLC, with an energy level ultimately of 3 TeV.

For all of the new designs, one critical issue is aligning the two beams just right, so that the electrons and positrons do indeed collide when they rush at each other head-on. The high-energy beams are incredibly narrow—a mere 5 nanometers, or 5 billionths of a meter, one-thousandth the size of the Tevatron beams. Unless perfectly aimed, they might just whiz by one another.



Preliminary design for an NLC in the U.S., with an energy level of 0.5 TeV to start with, and 1.5 TeV when upgrades are completed.

The task now

The task for the U.S. NLC collaboration now is to revisit the design it came up with last year and focus on pushing costs down. Initial estimates for construction of an NLC with all the bells and whistles was $5.1 billion—a pricetag too high in the present climate of budget constraints, and one that didn't even include detectors, adjustments for inflation, or contingency, which would bring the total tab to a whopping $8 billion.

At the first collaboration meeting held at Fermilab in November, David Burke, the SLAC physicist leading the NLC R&D effort, spelled out two ways of reducing costs. One is to stay within the scope of the original design but optimize engineering solutions to the technical challenges or substitute new, but cheaper, technologies that emerge from R&D efforts.

The other tack is to cut costs by reducing the scope of the design. For example, the initial incarnation of the NLC could be a 0.5 TeV machine, with upgrades and substitute parts later to bring the accelerator to 1.5 TeV. In fact, in the current design, physicists have laid out a well-defined technological path from 0.5 to 1.0 TeV, although not yet for 1.0 to 1.5 TeV.

Permanent magnets?

Perhaps the most significant outcome of the collaboration meeting was the excitement generated by the possibilities of using Fermilab's permanent-magnet technology to lower costs in the NLC.

The Laboratory's new 8-GeV Line and Recycler use permanent magnets, based on an innovative design developed by Fermilab physicists Bill Foster and Gerry Jackson. These magnets, made of bricks of magnetized strontium ferrite, the same material found in refrigerator magnets, offer definite advantages. Specifically, unlike conventional types, they don't consume large amounts of electrical

power, require cooling water systems or need elaborate controls, all of which are expensive to build and maintain. Thus, not only are permanent magnets cheaper than conventional magnets, but permanent magnets would greatly reduce utility costs.

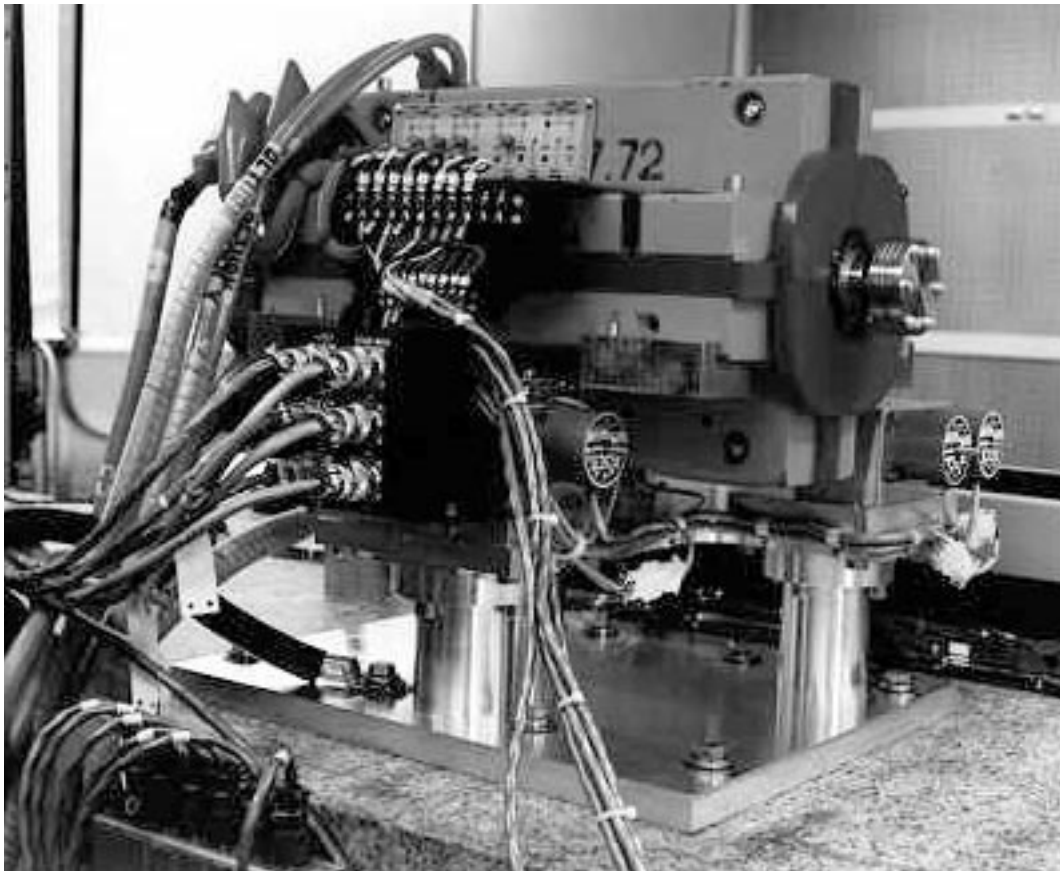
Whether permanent magnets can in fact be used in the NLC requires further study, but at least the physicists designing the acceleration mechanisms have a direction to explore.

Moreover, the fact that magnet experts from SLAC and Fermilab exchanged ideas was welcome news—and proof of the new spirit of cooperation between these two (often) rivalrous laboratories. Said Holmes, "Whether the NLC is built or not, we will have succeeded in establishing a good working relationship with SLAC." With the federal budget for high-energy physics slowly eroding in recent years, Witherell and Jonathan Dorfan, director of SLAC, have pledged to work together closely in shaping the direction of the field.

That spirit of cooperation is also evident in another respect: Rather than haggling over where the NLC might be built, the two laboratories have agreed to investigate potential sites both in California and Illinois, using the same criteria for evaluation.

Much more research and development work needs to be done before physicists can even ask the U.S. Department of Energy for approval to proceed to a conceptual design, with all its attendant costs fleshed out. But, as Witherell pointed out in his remarks to the collaboration, progress needs to be made on several fronts: not only accelerator research and physics studies (what new physics would the NLC offer?), but political education, too—all in parallel.

In Washington, sentiment is not favorable at present for large science projects. But Witherell asserted that he and Dorfan would make the case to Washington that U.S. national laboratories not only "know how to build and manage a big project" but that "big projects are an essential part of many fields of science—and in particular high-energy physics."



Prototype of a quadrupole magnet that would be used to focus the beam in an NLC in the U.S.

"What do you want to do when you grow up?"

Physicist Dave Finley discusses science careers with local high school students

by Mike Perricone

The sprawling Field House at Proviso West High School, in the near western Chicago suburb of Hillside, is large enough to hold comfortably an indoor track, a sand pit for indoor field events, several swing-down basketball backboards, and a bank of fold-down bleacher seats along one long wall.

But it can barely contain the noise and energy of hundreds of adolescent students set to roaming among two dozen tables staffed by representatives from an array of professions for the school's annual Career Day.

"From the time they begin school, we ask them, 'What do you want to do when you grow up?'" says Gloria Wolanin, a Proviso West teacher for 25 years and the coordinator for the day's activities. "When they're seniors in high school, we're asking them the same question.

"Some of them have definite ideas of what they want to do," Wolanin continues. "But some of them don't have a clue. Our goal for this day is to have them learn about different types of careers. We try to vary the representation of careers a little each year."

Among the careers represented this year: airplane mechanic; U.S. Army (accompanied by a shiny black Hummer personnel carrier that rolls into the gym through a loading bay and proves to be the hit of the day); architect; carpenter; cosmetologist and nail technician; firefighter; forester; forensic scientist; judge; laborer; lawyer; massage therapist (she's also a Proviso West graduate); U.S. Navy; police; roofer; and physicist.

"Dr. Dave's World" is the legend on the Fermilab display, and "Dr. Dave" is Dave Finley, accelerator physicist and former head of the Lab's Beams Division. Fred Ullrich, head of Fermilab's Visual Media Services, has brought along a laptop computer with a video presentation of an "Intercollegiate Physics Bowl" quiz show, hosted by Fermilab physicist Catherine James.

And with Ullrich's help, Finley uses a velcro-friendly backdrop to display photos of the Lab site and the Tevatron, the buffalo herd, and the 12 participants in last summer's Target program. Nearly 400 students have gone through Target, a six-week summer program at the Lab combining mentoring and classes for gifted minority high school students.

"You can see that science is fun, because all the Target kids are smiling," Finley tells visiting students.

Proviso West has 2,350 students, and 700 come through the gym for career day. Though a suburban school by geography, this is an urban school in character, facing many challenges in common with big-city schools. The dropout rate of 9.2 percent is higher than the Illinois state average (6.2 percent) and more than twice as high as for some schools in neighboring communities. The school's composite score on ACT (American College

Testing) college entrance exams is 20.3, below the state average (23.1). Less than half its graduates (40 percent) go on to attend four-year colleges, though another 20 percent go on to two-year colleges.

But as in particle physics, energy is a key factor. Physics and chemistry teacher Bozena Suwary, who recently issued an assignment involving the energy efficiency of students' homes, asks how she can arrange a tour, because "my students are always asking when we can go to see Fermilab."

Finley says about a dozen students he meets are genuinely interested in science as a career, and "seem capable of pulling it off." One of them is Fallyn King, a senior, who has sent out her college applications and is awaiting replies.

Fallyn hopes to major in physics at Northwestern University—where her older sister, Terez, is a graduate student in physics, and coincidentally working at Fermilab's DZero detector while hoping to earn her doctorate.

"I'm really interested in physics," Fallyn says. "When I took physics last year, I really enjoyed learning about atomic structure, and I especially enjoyed doing electricity experiments."

Before career day winds up at noon, Finley runs out of the plastic Fermilab rulers he has been handing out. He also runs out of copies of *FERMINEWS*, and of its reprinted reading list, "Particle Physics for Regular People" (one copy goes to Proviso West principal Richard Clish, with Finley saying "here's how to stock up the school library").

The chairman of Proviso West's science department, Robert Stettler, called Fermilab's Education Office, which arranged the appearance. Dianne Engram is manager of the Lab's Equal Opportunity Office, which coordinates the Target program. Through its Speakers Bureau, Fermilab's Office of Public Affairs also maintains a database of scientists who are interested in volunteering their time, and matches availability with requests.

"I really did enjoy listening to these students, and I'd do it again if the opportunity presents itself," Finley says at the end of the day. "I wanted to do this because informing the public about what we do with their money is a responsible thing to do. If anything, we need to spend more time informing the public. I'm not sure what I expected today, but I have to say it was a success." □

Photos by Fred Ullrich

Fermilab physicist Dave Finley (right) shares his enthusiastic view of science with Proviso West students during Career Day.

Frascati

A Lab with a View

THE VIEW FROM THE *LABORATORI NAZIONALI DI FRASCATI*, ITALY'S HIGH-ENERGY LABORATORY, IN THE HILLS SOUTHEAST OF ROME, SHOWS EXCITING WORLD-CLASS PHYSICS JUST AHEAD—FOLLOWED BY A DIFFICULT CHALLENGE TO DEFINE THE LABORATORY'S ROLE IN GLOBAL PHYSICS RESEARCH FOR THE LONG-TERM FUTURE. SOUND FAMILIAR?

by Judy Jackson

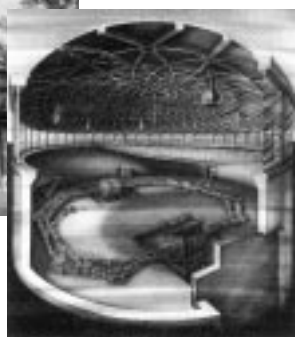
A visitor from Fermilab feels very much at home just now at Italy's national particle physics lab in Frascati. True, the lab's hillside perch with its flat-topped Roman pines, the *cucina italiana* in the cafeteria and the ubiquitous ashtrays are tip-offs that we aren't in Illinois anymore. But consider the similarities: Frascati today is a laboratory with a heritage of brilliant accelerator physics and contributions to our understanding of the structure of matter. It has a newly upgraded accelerator, experiments that promise great new physics, and collaborators champing at the bit to get started on the next collider run. Its young and dynamic director is thinking hard about how to lead his laboratory into a healthy scientific future. It feels a lot like home at the laboratory on *via Enrico Fermi.*

The LNF (for *Laboratori Nazionali di Frascati*) was founded by the *Istituto Nazionale di Fisica Nucleare*, or INFN, in 1955. Highlights from Frascati's history include construction of the first electron-positron colliding-beam accelerator, a ring called ADA, after the favorite aunt of its creator, Bernard Touscek. ADA had a radius of less than a meter and reached an energy of only 250 MeV; but all modern storage rings, including CERN's LEP collider, trace their ancestry back to great-aunt ADA. The ADONE ring came next, with a record-setting energy of 1.5 GeV and a long run of successful nuclear physics experiments.

Following the success of ADONE, a significant accelerator upgrade, SuperADONE, received INFN approval, but when funding to build the project did not materialize, the laboratory's leadership recognized that Frascati needed a cheaper, better idea.

Cover Photo: Think of it in color: yellow, purple, red, green components give Frascati's new DAΦNE accelerator an Italian-designer look.

Photos by Judy Jackson



The new DAΦNE phi factory had to fit into Frascati's existing accelerator enclosure whose dome, an Italian national monument, had to be preserved.

UNA FATTORIA DI PHI

In jeans and polo shirt, Frascati Director Paolo Laurelli is very much a new-generation director of the nineties. And like his U.S. counterparts at Fermilab and SLAC, Laurelli finds himself at an exciting moment in his laboratory's history, with a new accelerator and important new physics just ahead, after a long struggle to reach that point.

"By the late 1980s," Laurelli said in a recent interview, "it had become clear that funding for INFN made it unlikely that Frascati would be able to build SuperADONE anytime soon. The situation was not healthy. But we knew it was important for the life of our laboratory to build a new machine, so we asked ourselves, what would be the best machine for us? At first, we thought about a B Factory, but as we thought about it further, we realized that, actually, a phi factory would be the right machine for us to build."

Particle factories come in different flavors. B factories, like those recently built at the KEK laboratory in Japan and at DOE's Stanford Linear Accelerator Center in the U.S., are colliders designed to produce copious amounts of B mesons. A phi factory, in contrast, is tuned to produce quantities of phi mesons, particles containing a strange and an anti-strange quark. Phi mesons decay in a very clean fashion to two types of kaons, K long and K short, that experimenters use to study CP violation, a form of matter-antimatter asymmetry, in kaons.

Frascati physicist (and CDF collaborator) Sergio Bertolucci expanded on the genesis of Frascati's new phi factory.

"Based on the square feet of the lab, and the square feet of our wallets, we concluded that a phi factory would be both feasible and have good physics potential."

Space constraints were important. Because of the innovative design of its domed roof, the building that housed ADONE had been declared an Italian national monument and could not be torn down. Any new accelerator would have to fit in the old building. A phi factory would fit the available space, fit the budget, and produce important physics results.

In June, 1990, INFN approved Frascati's phi factory, and engineering and construction of the DAΦNE accelerator began in the spring of 1991. The next task in putting Frascati back on the map was to form a physics collaboration to build a new detector to use DAΦNE's particle beams.

Today's e^+e^- colliders all trace their ancestry back to Frascati's ADA, the first successful electron-positron collider, now preserved under glass.

Frascati

DAΦNE Project Manager Gaetano Vignola pinpoints a difference between an American lab and an Italian lab: "In Italy, you can smoke."

Like Fermilab, Frascati recycles old accelerator parts as sculpture.

La Collaborazione

"In the beginning," Bertolucci said, "nobody knew where Frascati was. But under the leadership of Nicola Cabibbo and Enzo Iarocci at INFN, Italian physicists had done very well on experiments outside of Italy. We had a generation of young Italian physicists who had been trained, not in a provincial way, but in mainstream international particle physics. Laurelli, Paolo Giromini and Giorgio Bellettini had brought Italians first to CERN and then to Fermilab. This international experience was very important. They had learned that they could DO things. Now we wanted to bring them together for a new project at home."

Under the leadership of Bertolucci and physicist Paolo Franzini of Columbia University, the KLOE collaboration came together from the four corners of the particle physics world.

"Their different styles showed up in the collaboration," Bertolucci said. "My 'cowboys' from Fermilab were perceived just that way. The 'Gruppo SLAC' was a little 'cooler.'"

Bertolucci is determined to equip KLOE's young collaborators to contribute to global particle physics.

"All our meetings and colloquia are held in English," he said. "Our young people cannot grow up in the cradle of their language. They must be in the mainstream. We insist that they make presentations formally, as they are done in the States, rather than in the spontaneous style that applied when I was a student."

In any language, the physics from KLOE, scientists agree, will be well worth Frascati's effort.

"I am very eager to see what comes from KLOE," said physicist Bob Tschirhart, co-spokesman of Fermilab's KTeV experiment, which also studies CP violation in kaons. "KTeV and CERN's NA48 (another CP violation experiment) have recently reported on precision measurements that signal a new type of CP violation is present in nature. The KTeV and NA48 detectors measure the decay products of kaons in similar ways. But the KLOE experiment at DAΦNE produces kaons and detects their decay products in a completely different way, which will provide a vital independent measurement of this new form of CP violation. I am very eager to see what KLOE will tell us."

Tschirhart is not the only one. With the detector built and the accelerator completed, the KLOE experimenters are ready to roll. But, in a situation any Fermilab experimenter can understand, they have to wait a little longer.

Avanti!

DAΦNE, which saw its first particle collisions in March, 1998, was operating at close to design levels until the introduction of the KLOE detector disrupted the accelerator beam and luminosity plummeted, a problem the laboratory is working intensively to correct. Bertolucci is anxious to see the problem solved so that his restless "cowboys" can start taking data. Otherwise he frets that it may be hard to hold them together.

"Ph.D. students need data for their theses, and sometimes it is difficult not to think that the neighbor's garden is greener."

On a golden day at the end of October, Gaetano Vignola, DAΦNE project manager, is clearly a man under pressure. With his team, he is working virtually around the clock, wrestling with the problem of unacceptably high backgrounds

showing up in KLOE as a result of the interaction between the detector's solenoid and the particle beam.

"I hope that in a matter of weeks we'll have this fixed," Vignola said.

Before returning to Frascati, Vignola spent eight years at Brookhaven National Laboratory. He says the experience in an American laboratory was useful.

"The 'American style' of no-nonsense accelerator building is a good complement to the Italian approach, which is perhaps more politically sophisticated," Vignola said. "At Frascati, a mixing of the two is clearly a necessity."

Il futuro

Like every particle physics laboratory on the planet, Frascati is thinking hard about the future.

"Building DAΦNE created a good group of accelerator physicists," Director Laurelli said. "We are engaged in two accelerator collaborations now, with DESY on TESLA, and with CERN on CLIC. Frascati is part of Run II at Fermilab, as well as the ATLAS collaboration on LHC, and is looking with interest at the proposed CERN neutrino experiment at Gran Sasso. We are also thinking about possible experiments in space."

In the longer range, Laurelli believes that the world has room for just one next linear collider. Deciding which one will involve two important aspects.

"First, which machine to build: the cheapest one, the one that gives most luminosity, and the one that is most expandable. Choosing the site is the next aspect. It will go to the first site to put up 60 percent of the funding. Wherever it is built, we have to make sure that each lab gets responsibility for a complete item for the new machine, and has the opportunity to put that piece into operation, to have ownership and visibility in a global project."

Bertolucci voiced similar thoughts.

"What's next for Frascati? Finally, after 2,000 years, in Europe we have learned that we have to team up, but teaming up is not so easy. We see ourselves in the future as one of a net of European labs. And the same kind of teamwork needs to happen worldwide, if we are going to make real progress. After all, since all the possible has been built, isn't it time to try the impossible?" □

Photos by Judy Jackson

KLOE physicist Sergio Bertolucci is also a member of Fermilab's CDF experiment.

The DOCTOR is IN

by Sharon Butler

When John Foxen was just a skinny kid living in a simple frame house in the hamlet of West Chicago, his family physician was Dr. David R. Morrison. Foxen remembers vividly an incident from his childhood. One of his fellow Little Leaguers, standing in the field behind him, threw a ball, and called out to him. Foxen turned , and caught the baseball straight in the eye. He was knocked out cold. The next thing he knew, Morrison was staring him in the face. Foxen was screaming at the top of his lungs when he came to, and the good doctor just looked down at him and calmly enquired. “Does something hurt? Why are you screaming?” Foxen thought for a second, realized he wasn’t in pain, and promptly shut up.

Little did Foxen know then that, some 40 years later, he would succeed Dr. Morrison as Fermilab’s doctor-in-residence—officially, Director of Occupational Health.

Foxen came on board this past January just as the Medical Office was transferred from the Laboratory Services Section to the Environment, Safety, and Health Section. That organizational change underscored the office’s role in occupational health. An important mission of the medical office, Foxen explained, is “to function as an occupational health facility that finds ways to prevent injuries and make the workplace safer.” That responsibility involves being actively involved in managing work-related injuries, and minimizing the need for long-term, complicated and costly treatment.

The organizational switch to ES&H was “a logical and effective way to structure the organization,” Foxen said, making the entire medical staff “teammates of the safety officers” and enabling them all to work more closely and provide still better service. The medical staff includes two nurses, Mae Strobel and Elaine Brown; a receptionist, Linda Hardamon; and an insurance administrator, Sharon Koteles. “Without them,” Foxen said, “I couldn’t do my job.”

In his first 10 months here at Fermilab, Foxen has already made some significant changes. For one, he’s making “house calls.”

“Family doctors know how important it is to make house calls—you don’t really know your patients until you visit them at home,” said Foxen, whose training is in family medicine. Similarly, by visiting the industrial and experimental areas at Fermilab, Foxen believes he can help his patients here by seeing the environment in which they work.

Photo by Reidar Hahn

John Foxen, M.D., has instituted customized physical exams for staff who want them.

He visited one of Fermilab's clean rooms where workers in protective clothing handle epoxy resins that can cause rashes and even more severe allergic reactions. He visited the DZero experimental hall, the daycare center, and the area housing the Beams Division. (Out of curiosity, he also snuck a look at the old bubble chamber, no longer in use.) Foxen will soon be making a house call to CDF to help a worker suffering from tendinitis figure out which tasks he can do and which he can't to avoid aggravating his medical problem.

Besides making house calls, Foxen has also streamlined certain medical practices. For example, workers used to undergo a time-consuming series of medical tests to obtain approval for entering areas of the accelerator tunnel declared potentially hazardous because of oxygen deficiency. Foxen now does a brief history and a brief physical exam, requiring the tests (e.g., an EKG) only if needed. Approval can take as little as 10 minutes, depending on the worker's physical condition.

With the accelerator complex turned on in stages this year, and areas sometimes declared "ODH" overnight, the streamlining of the medical approval procedure made a real difference—while still fully protecting workers.

Foxen has also now customized and personalized the physical exams offered to Fermilab's 2,000-some employees as a benefit, making the exams more relevant to the individual while allowing Foxen the time he needs to devote to occupational health issues. Previously, employees received a slew of tests, regardless of whether there was any clinical reason to suspect a problem.

Above all, Foxen is eager to open communication between the medical staff and all members of Fermilab's community—workers and their supervisors—to protect everyone's safety and health, and to ensure that, when injuries do occur, people are treated promptly and effectively. He sends a message to all employees: yes, the doctor is in. □

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The Search for Extraterrestrial Intelligence, Down on the Farm

Fermilab isn't searching for signs of extraterrestrial intelligence, but some of its computers are—in their spare time.

The California-based SETI Institute, whose first research grant came from the National Aeronautics and Space Administration, has been looking for signs of intelligent life in the universe since 1985. The basic premise is that if alien civilizations exist somewhere in the wide expanse of space, they might be trying to contact us via radiowaves. So, with a telescope in Puerto Rico and a bank of computers, SETI daily scans the interstellar radiowaves for candidate signals of distant tribes.

Reaching out and touching someone (or something) in the universe requires enormous amounts of computer time—over 100,000 years of computer time so far. SETI has recorded over 85 million "candidate signals" and is now preparing to start the second phase of analysis, which will search these candidates for "repeat events." SETI's own computers can't handle all this information, so the institute relies instead on hundreds of thousands of volunteer computers spread across planet Earth, connected through the Internet.

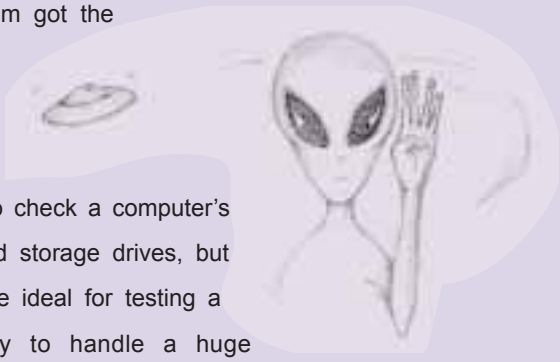
Participants who sign up through the SETI@home project are offered the tantalizing possibility that their computers might just be the ones to detect what the web site describes as "the faint murmur of a civilization beyond Earth." Whenever their computers are on but not in use—when the screensaver pops up, for instance—the machines might be used to download and analyze a 360-kilobyte "work unit" of data from SETI's telescope.

Participants range from prisoners at Fort Leavenworth to students at the Illinois Math and Science Academy, Compaq employees, finance groups and flight simulator enthusiasts.

Among the100 top participants listed on the SETI@home Web site is the Fermilab Burn-In Farm in the Computing Division.

But the scientists aren't necessarily interested primarily in faint murmurs from outer space.

They're interested instead in testing the 150 computers in their PC farm—"burning them in," in geek vernacular, stressing the computers' central processing units by having them "chunk" (more vernacular) through lots of data. Troy Dawson and the rest of the farm's administration team got the test going.



The Computing Division runs other programs to check a computer's network ports and storage drives, but the SETI data are ideal for testing a computer's ability to handle a huge computational load. Pieces of physics code might work, too, but can't always be stopped and started the way they need to be in test runs.

By the burn-in's end, the SETI@home program will have run simultaneously on all 150 computers for 30 days. The test is nearly complete, and already the Fermilab PC Farm has analyzed 600 work units for SETI, which took 37.6 years of CPU time (as of November 23). For that, SETI got 36,283 results.

And for that, Fermilab experiments will get 150 new certifiably tough and computationally competent computers.

–Sharon Butler

CALENDAR

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

DECEMBER 10

Fermi National Accelerator Laboratory Women's Organization

All Fermilab women are welcome to come to NALWO's annual winter holiday tea, in the Users' Center Music Room. Friday, December10, 1999, 10 a.m. to noon. Please bring a favorite dessert or appetizer from your tradition or country to share; but if you cannot bring a treat, please come anyway! For additional information, contact Rose Moore, 208-9309 or cmoore@fnal.gov, Linda Olson-Roach, 840-3082 or lor@fnal.gov; Sue Mendelsohn, 840-5059 or mendel@fnal.gov; Mady Newfield, 584-0285 or MadyNewfld@aol.com.

Please come to NALWO's end-of-century family potluck supper, Friday, December 17, 1999, 6pm until 9pm in the Music Room of the Users' Center. Enjoy the company, conversation, and cuisine of lab associates, visitors, and guests from around the world. Please bring a main dish, side dish, dessert, or appetizer to share; if you cannot bring food, please contribute $3 per adult. Children are welcome. For additional information, contact Rose Moore, 208-9309 or cmoore@fnal.gov; Selitha Raja, 305-7769 or selithar@aol.com or Katharina Lehner, lehner@fnal.gov or Maria Holtkamp, 231-5047

ONGOING

English Classes, Thursday at the Users' Center, 10-11:30 a.m., free. NALWO coffee for newcomers & visitors every Thursday at the Users' Center, 10:30-12 noon, children welcome. In the auditorium, international folk dancing, Thursday, 7:30-10 p.m., call Mady, (630) 584-0825;

SKYDIVERS: LOOKING FOR THAT EXCUSE TO MAKE YOUR FIRST JUMP?

Or are you a current student or experienced skydiver just interested in getting together with a group of fellow employees and taking advantage of group rates? We are looking for people for a proposed new club. Contact either Paul at 4495 or Rod 2565.

SUNDAY, DEC. 12

Barn dance in the Kuhn Village Barn from 7 to 10 p.m. Music provided by Fred, Howard, & Lynn. Calling will be by Tony Scarimbolo. All dances are taught and people of all ages and experience levels are welcome. Admission is $5, children under 12 are free (12-18 $2). The barn dance is sponsored by the Fermilab Folk Club. For more info, contact Lynn Garren, x2061 or Dave Harding, x2971.

SUNDAY, DEC. 19

Afternoon barn dance in the Kuhn Village Barn from 2 to 5 p.m. Music provided by The Common Taters. Calling will be by Dan Saathoof. All dances are taught and people of all ages and experience levels are welcome. Admission is $5, children under 12 are free (12-18 $2).

The barn dance is sponsored by the Fermilab Folk Club. For more info, contact Lynn Garren, x2061 or Dave Harding, x2971.

Scottish country dancing Tuesdays, 7:30-9:30 p.m., call Doug, x8194 or e-mail folkdance@fnal.gov.

MILESTONE

RETIRING

Frank Beverley, Business Services, ID 3628; effective December 17, 1999, his last day of work.

LUNCH SERVED FROM 11:30 A.M. TO 1 P.M. $8/PERSON

DINNER SERVED AT 7 P.M. $20/PERSON

Chez Léon MENU

FOR RESERVATIONS, CALL X4512
CAKES FOR SPECIAL OCCASIONS
DIETARY RESTRICTIONS
CONTACT TITA, X3524
HTTP://WWW.FNAL.GOV/FAW/EVENTS/MENUS.HTML

LUNCH
WEDNESDAY, DECEMBER 8

Stuffed Portabella
Mushrooms
Caesar Salad
Chocolate Almond Mousse with Cookies

DINNER
THURSDAY, DECEMBER 9

Calamari Al Ajillo
Grilled Duck Breast with Ginger and Lime Sauce
Steamed Wild Rice
Black Bean Salad with Chipotle Dressing
Grand Marnier Souffle

LUNCH
WEDNESDAY, DECEMBER 15

Cheese Fondue
Winter Salad
Poached Pears with Cranberry Coulis

DINNER
THURSDAY, DECEMBER 16

Booked

FERMI NEWS

FERMILAB
A U.S. DEPARTMENT OF ENERGY LABORATORY

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The deadline for the Friday, December 17, 1999, issue is Tuesday, December 7, 1999. Please send classified advertisements 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.

Fermilab is operated by Universities Research Association, Inc., under contract with the U.S. Department of Energy.

CLASSIFIEDS

FOR SALE

■ '99 Goldwing SE (Silver) under 11K Miles. Runs great. Must sell, will even store it for the winter. Asking $16,000. Has Markland Receiver Hitch and (5 pin) OEM Trailer Wiring Kit, Markland Floorboards, Foam Grips and Extra Windshield. Also have 2 headsets for the intercom, one full-face helmet model and one that can be used either on a full-face or open-face. Still has 2 yrs. on original as of Nov 5 (Unlimited Mile) Warranty. Can get another 3 yrs extended (unlimited miles). Call Terry X4572 or e-mail skweres@fnal.gov

■ '96 Dodge Neon 4dr Highline sedan, blue, automatic, a/c, power steering, AM/FM stereo/cassette with premium sound, dual air bags, new tires, 94k miles, good condition. $6,900 obo. Call Hank x8105 or 630-369-8006.

■ '93 Toyota Corolla Standard 4-Door Sedan, 44K original owner $5500 obo. For more information: treend@fnal.gov. 630-859-3789.

■ TV/VCR Test and measurement equipment Hitachi V-202 oscilloscope 20Mhz $200; Sencore VA48 video analyzer, TV/VTR/MATV $650; Hewlett Packard 3310A function generator $500; Sencore CR31A Super Mack CRT tester $200; VIZ WV-551A dummy load RF meter $50; EICO Electronics high voltage probe $20; misc. items - small meters, test leads, Eprom burners etc. All items o.b.o. call X2811 Bruce e-mail bpopper@fnal.gov

■ Boy's 6-drawer dresser (needs refinishing) $50 obo. Green/Gold Plaid couch, love seat and ottoman chair, asking $200; great for family room (815) 726-2301 after 7:00 p.m. or ext. 2326 or carriveau@fnal.gov.

■ Like new wardrobe and dresser set, black with mirrors bought for $800 will sell for $350 o.b.o. Contact Tony @ 6527.

■ Samsung Microwave oven (carton never opened), Good Housekeeping Seal, 0.9 cu. ft., 1000 watts, turntable, sensor reheat & auto defrost, child lock-out feature, best reasonable offer. bruch@fnal.gov, x2271 or (630) 896-8919.

■ Beautiful 7 1/2-foot lifelike Deluxe Mountain Fir Christmas tree. Easy assembly, natural looking, very full. Original price $150.00. Asking $40. Please call Mike at 208-1751.

■ LeRoy Nieman full-color football player lithograph framed poster, 20″x15″. Autographed by 20 NFL Hall of Famers, including Jim Brown, Bobby Bell, Fuzzy Thurston, and Ray Nitschke. Perfect condition. Guaranteed authentic. $125 obo. Please call 630-443-9881, leave message indicating item of interest.

■ Full-length (below the knee) mink coat, unique champagne color. Full collar, heavy embroidered satin lining. Owned by non-smoker, stored during off-season, like new. Must sell, mother moved to Florida. $750 obo. Please call 630-443-9881, leave message indicating item of interest.

■ Lot for sale, 1 acre, St. Charles, northwest of city in established Deer Run East Subdivision. One-half mile west of Denker Rd. on Deer Run Dr. $112,000 Call (630) 879-2475.

■ Happiness is cutting down your own fresh Christmas Tree at Marmion Abbey. You can cut your own tree any day, Sundays included, beginning Saturday November 20 thru December 23, from 9:00 am until dusk. There are no lights in the field so come early enough to find your tree in the daylight. Please come prepared: warm clothing, gloves, boots. Bring your own small bow saw or rent one of ours for a deposit of $10 which is part payment on your tree. Also available, wreaths, door swags and crosses made from fresh boughs.Call (630) 897-3011 for up-to-date information.

FOR RENT

■ Condo for rent Downers Grove, 2 bedrm 2 full bath. 75th and Fairview Streets, 2nd floor w/balcony, laundry facilities in building, club house/swimming pool, ponds, very well maintained property, security entrance to building, pretty area. Heat and water included-$800. 20 minutes to Argonne Lab, 25 min to Oak Brook. treend@fnal.gov 630-959-3789.

■ House for rent, St. Charles, old neighborhood, two bedrooms, large yard, nice location, close to river and bike path. $850 steinbru@fnal.gov or phone 587-9464.

LAB NOTES

CHARITIES PROGRAM

The Charities Program has a new procedure this year. Check out the Fermilab at Work web page for directions & instructions how to properly fill out your form. If you have any questions, concerns, need assistance or do not have access to the web you may request paper forms by phoning Equal Opportunity Office At x4633, http://www.fnal.gov/faw/charities/charity.html

MILEAGE RATE CHANGE

The standard mileage rate for transportation expenses paid or incurred beginning January 1, 2000 will be 32.5 cents per mile, up from the 31 cents per mile rate in effect since April 1, 1999. Fermilab will use the new IRS rate for mileage reimbursement requests for all travel on and after this date.

URA SCHOLARSHIPS REQUIRE SAT TEST

Universities Research Association (URA) scholarships are awarded on the basis of SAT (Scholastic Aptitude Test) scores. High-school seniors are reminded to sign up for a fall testing date if they have not already taken the test.

URA awards a number of scholarships to regular, full-time employees' children who are currently high school seniors and who will begin a four-year college degree program the next fall. The maximum amount of the scholarship is $3,000 for tuition and fees and is renewable for four years if the student is in good standing. Scholarship applications will be available after the first of the year and are due March 1, 2000.

FERMILAB LECTURE SERIES presents: THE ANTARCTIC OZONE HOLE

Dr. Mario J. Molina, 1995 Nobel Laureate in Chemistry Institute Professor of Chemistry, Massachusetts Institute of Technology, Friday, January 7, 2000 at 8:00 p.m. Tickets are $5.00. For more information call 630-840-ARTS.

http://www.fnal.gov/directorate/public_affairs/ferminews/

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