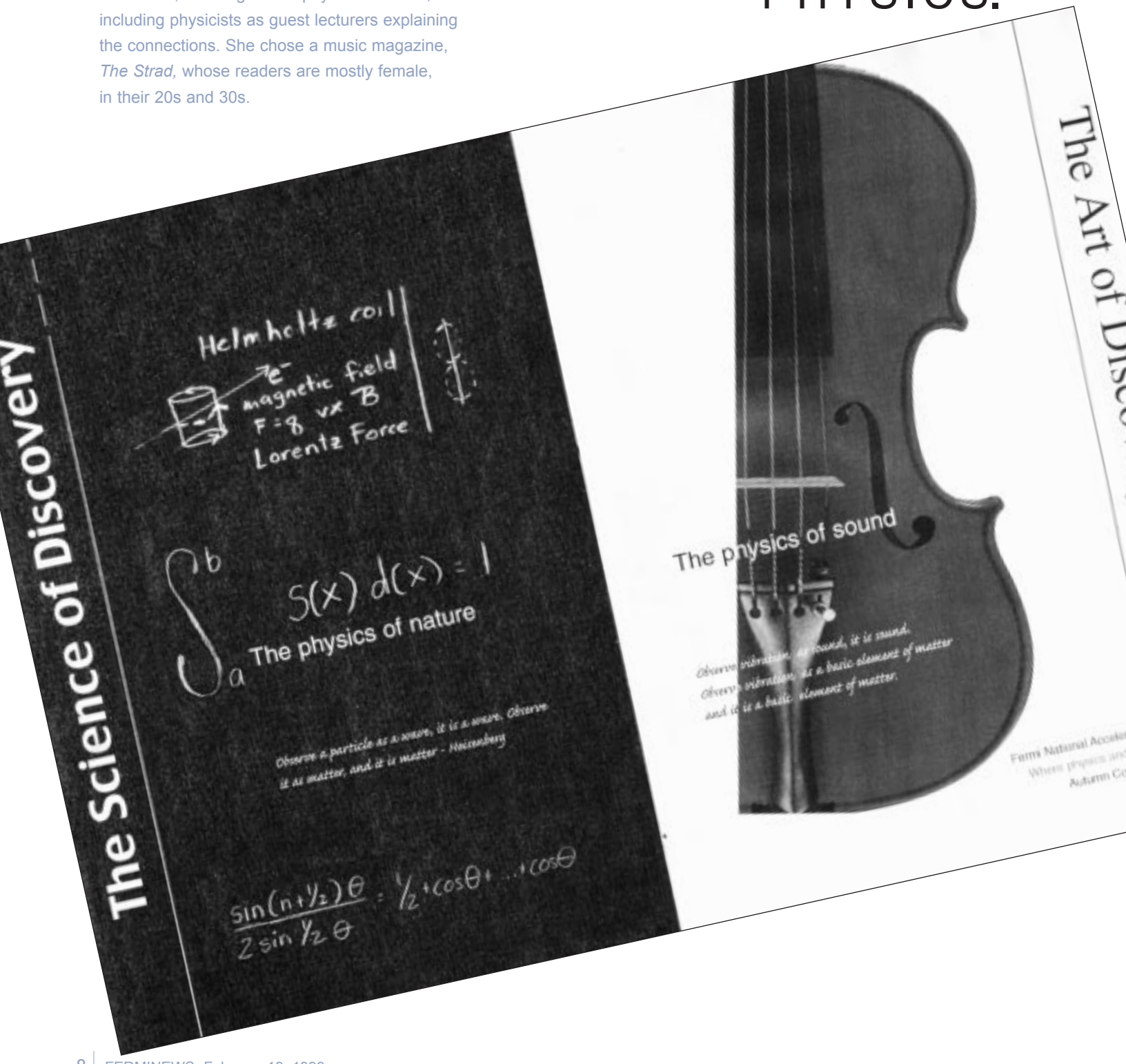
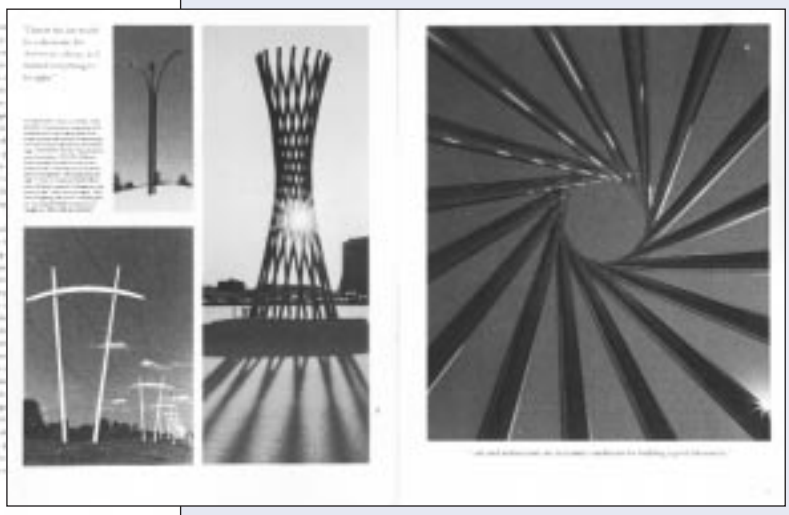
Take a fresh look at PARTICLE PHYSICS.

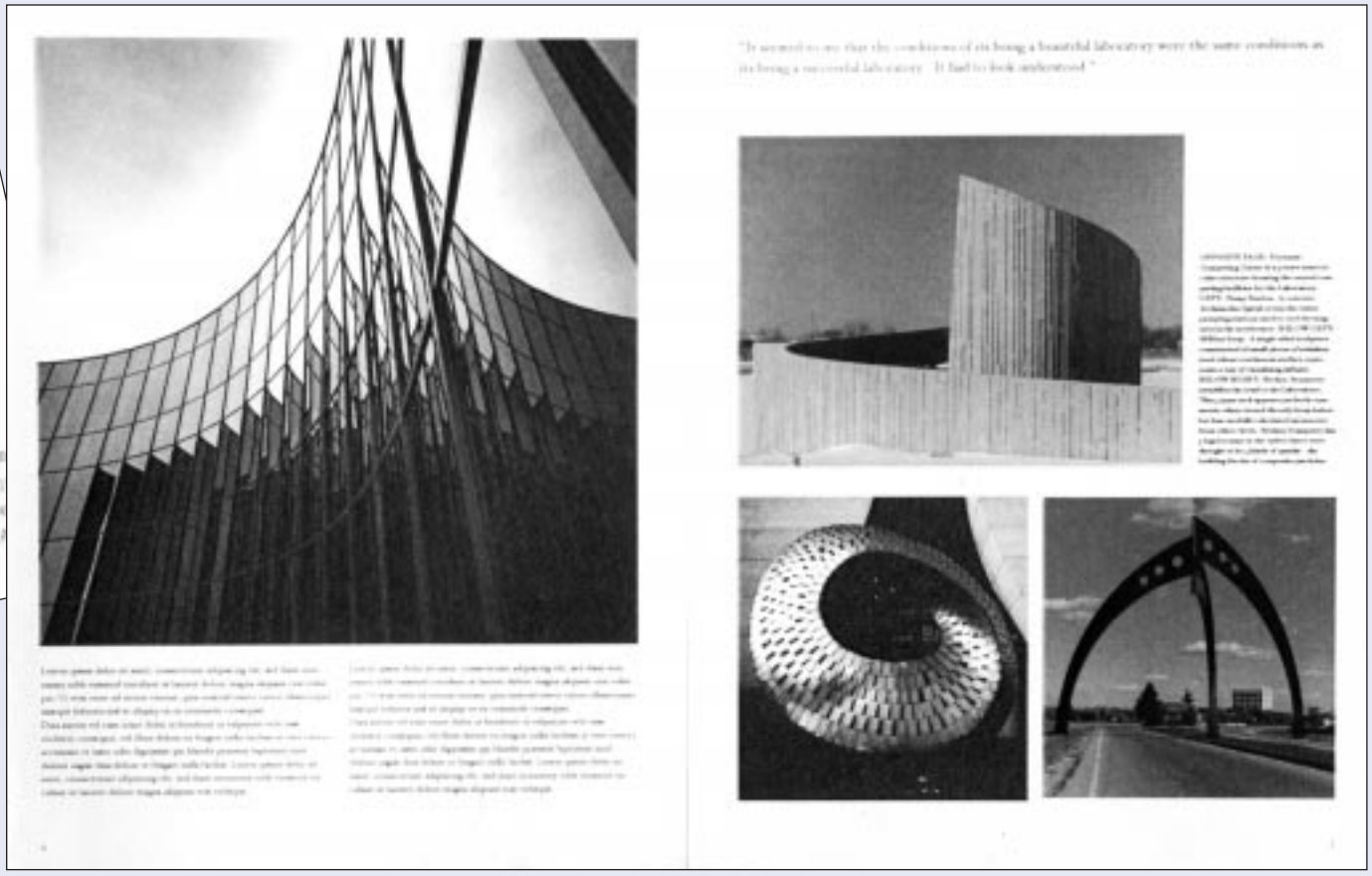
Sonal Saghani of Chicago envisioned a concert series demonstrating the relationship of music to science, focusing on the physics of sound, including physicists as guest lecturers explaining the connections. She chose a music magazine, *The Strad,* whose readers are mostly female, in their 20s and 30s.




ART COLLIDES WITH SCIENCE TO PRODUCE A CULTURAL SHOWCASE



Ling Yang of Ann Arbor, Michigan, incorporated the sculpture and unusual structures of the Lab into a feature article for *Architectural Digest*. The magazine's readers (median age 43, with 54% college graduates) are not primarily architects, she noted, but they do have a pronounced appreciation for design, color and aesthetics.



All Pumped UP

Upgrades have Central Utility Building flexing new muscles.

by Mike Perricone

When it's fully operational, the upgraded control room of Fermilab's Central Utility Building will stand as a testimonial to the Lab doing its homework.

The new digital-TV screens on the wall will display schematic diagrams of all the cooling water systems, from the cooling ponds around the site to the cooling towers atop the Central Utility Building. Operators will be able to spot a problem valve quickly, and spend their time fixing a problem instead of locating it—eventually even making corrections with the push of a button. The redesigned control console offers digital readouts on temperatures and pressures throughout the system, replacing the old-fashioned knobs, dials and gauges.

Photos by Fred Ullrich

Under the Utilities Incentive Plan, Commonwealth Edison installed state-of-the-art equipment like this 1,400-ton chiller, which will use about half the energy of the machinery it replaces.

"It's state of the art, year 2000 technology," said Fermilab Engineering Project Manager Steve Krstulovich. "We're replacing the 1960s technology, dating from the time Fermilab was built."

All because a dedicated group of people kept doing their homework until they found the answer to a knotty funding problem.

The changeover isn't limited to the control room, and it doesn't simply mean new bells and whistles for this "pumping station" at the heart of the Lab's cooling system, where cooling water is circulated to meet the needs of both machines and employees, experiments and offices.

The Central Utility Building has a symbolic location, surrounded by Wilson Hall and the first stages of the accelerator complex. It seems to rise out of the cooling pond for the Booster accelerator; in fact, it moves the water through the outdoor pond system that dissipates the heat absorbed from the machinery. The $3.5-million upgrade for the building's pumping systems goes right to the core of the reliability of the accelerators that keep pushing back the frontier in the Lab's high-energy physics experiments.

"When Fermilab was built, the design took all of the chilling capacity required for operating the accelerators, and for the comfort cooling of Wilson Hall and put it all together in a single group of chillers," said David Nevin, head of the Lab's Facilities Engineering Services Section.

"We're pushing 30 years now," Nevin continued. "As the system grew older, and the loads grew larger, we found that we would have problems with the comfort cooling and those problems could in turn knock out an accelerator. In other words, the accelerator would stop because somebody's thermostat in Wilson Hall wasn't working properly. That was an untenable situation."

That untenable situation is about to be officially reversed by a project as creative in its funding as in its technology, after more than two years of shepherding by Nevin, Krstulovich and the Department of Energy's on-site

Elaborate pipe systems in the Central Utility Building pump and receive water from the core of the accelerator complex. This chiller pump services the Linac, including return lines for the 55-degree LCW (Low Conductivity Water) system.

Fermi Group—with a sizeable assist from the Illinois utility giant, Commonwealth Edison.

Lab Director John Peoples first charged Nevin with upgrading the Central Utility Building three years ago. Nevin formulated a comprehensive, but unfunded, plan. Dixon Bogert of the Beams Division alerted Krstulovich and Nevin to a federal energy-saving program as a possible funding source, but their application foundered in the bureaucracy. Krstulovich then went back to his homework and, along with Assistant Director George Robertson, kept digging until he found the Utilities Incentive Program.

"The program said that if you can prove to a utility company that you can save money with new installations," Nevin explained, "then you can go to that utility company and have them provide that equipment, and pay the utility back from the savings."

The UIP process has a longstanding connection with the Department of Defense. Robertson, familiar with the program from his tenure as a major general in the Army Corps of Engineers, brought in consultants to explain the arrangement, offer sample contracts, and help the Lab develop its own package.

"Without George Robertson's timely intervention, the entire project might never have happened," Krstulovich said.

In April, Commonwealth Edison will complete the installation of equipment that separates the building's cooling functions into two segments, one for the comfort system and one for the process system. Krstulovich said the only direct out-of-pocket costs borne by the Lab stem from the time going into preliminary design and oversight.

"The upgrade will pay for itself in five years," Nevin said. "The first payment to Commonwealth Edison is not due until fiscal year 2000. And the payments will be made entirely out of operating funds—money we would have been spending anyway. Commonwealth Edison has done a super job of accommodating our needs and schedule. They've really been a partner with us on this."

The critical elements in the installations are the new chillers, refrigeration units that are far more energy efficient and environmentally friendly than the units they are replacing. There are two 1400-ton chillers and one 750-ton chiller for the process side, and two 800-ton chillers for the comfort side. All the chillers are free of ozone-depleting chlorofluorocarbons, and they will use about half the energy of the original equipment. The average home uses an air-conditioning system with a capacity of between two and four tons; the Central Utility Building's process system alone has a capacity of 4,500 tons, the equivalent of about 1,500 homes.

In addition to being more efficient, the new system will also be more "robust," as Nevin describes it. Cooling capacity can be shifted from the comfort system to the process system when necessary, meaning the accelerators will have dependable backups in case problems arise.

"We'll have backup on top of backup," Krstulovich emphasized.

Dependability, new technology, creative funding, environmental responsibility, added "robustness," savings in money and energy—they add up to a testimonial to the rewards of doing your homework.

Photo by Fred Ullrich

This new lineup of chilled water pumps will handle the comfort cooling side of the revamped systems in the Central Utility Building. The muscular bulge in the pipe houses a triple-duty valve.