

PENNSTATE

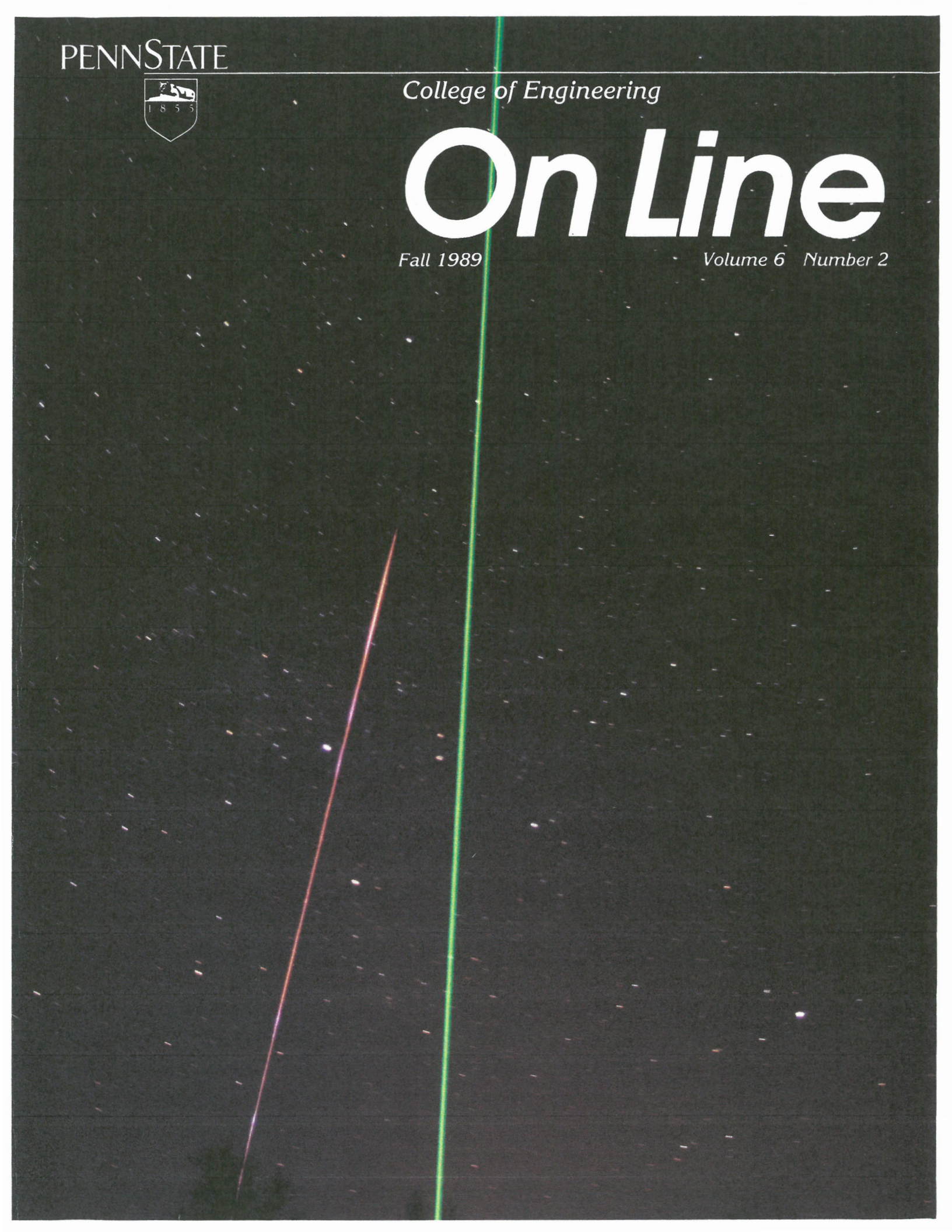


College of Engineering

On Line

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Engineering Houses NASA Space Center

by Phil Galewitz

Sometime in the next century an American expedition will leave Earth bound for the outer reaches of our galaxy.

The men and women on that months-long journey around the solar system would study the formation of planets, birth places of stars, development of black holes and the power source of quasars.

With that vision in mind, researchers at Penn State are working feverishly with scientists and engineers across the country to develop the technology to turn plans for Star Trek-like explorations into a reality.

NASA has invested more than \$10 million in research projects at Penn State and that is expected to triple by the mid-1990's. NASA grants to Penn State have nearly doubled from \$2.7 million in 1986 to \$5.2 million last year, placing the school 17th nationally in amount of NASA-funded research and third among universities on the East Coast.

[The College of Engineering accounts for over half the Penn State NASA funding, with \$2.8 million in funded projects this year.]

Officials at Penn State say they expect funding levels to rise as the space agency further commits itself to working closer with academic institutions in an effort to boost interest in space research.

NASA Center for Space Propulsion

"I think, realistically, no matter how you look at it, the use of space is going to increase," said Charles Merkle, director of the NASA Center for Space Propulsion Engineering and distinguished alumni professor. "I don't know if [astronaut] Sally Ride was right when she said we will have people living on the moon, but I suspect we will."

While Penn State has long been tapped for the Technical expertise of its faculty, NASA is increasingly using the university as a training ground to replenish the

Penn State is NASA Space College

Penn State has been named one of the 17 Space Grant Colleges/Consortia by the National Aeronautics and Space Administration.

The National Space Grant College and Fellowship Program, approved by congress in 1987, will establish a network of universities with interests and capabilities in aeronautics, space and related fields.

Penn State is one of three universities individually designated as a Space Grant College. MIT and the University of Washington are so designated. A total of 78 institutions are embraced by the other 14 consortia named in the Space Grant College Program. Penn State's five year renewable grant is \$1.25 million.

The Sky's No Limit

Space-Related Research at Penn State's College of Engineering

agency's work force.

Penn State's Center for Space Propulsion Engineering, founded in 1988 and housed in the College of Engineering, is one way to enlarge the nation's talent base for space research. In addition to fostering research, the Center prepares students for careers in space engineering.

"We certainly anticipate that industry and government will want to talk to our students," Merkle says.

The Center, housed in a recently completed \$6 million building on the east end of campus, is one of nine university-based NASA Space Engineering research centers around the country.

A dozen Penn State faculty from different engineering disciplines, 35 graduate students and 10 undergraduates conducted basic research at the Center this summer.

Merkle expects the center to receive more than \$1 million annually through 1992 to investigate ways to improve engine technology now used on the space shuttle and commercial satellites.

More efficient engines are needed to keep the vehicle in space longer and to launch heavier payloads. Both are key to building the proposed space station and exploring distant planets, Merkle said.

Aluminum Fuel for Rockets

Steve Turns, associate professor of mechanical engineering, is analyzing the use of aluminum as a rocket propellant. Aluminum, he said, is of special importance because the metal could be mined on the Moon.

NASA has awarded Turns \$209,000 to study the use of aluminum for three years.

Down the hall, Dr. Mike Micci, associate professor of aerospace engineering, and four graduate students are pursuing how NASA can better use solar cells to produce electricity for the space station and future shuttles and to keep satellites in their orbits.

Electrical propulsion would reduce the amount of fuel required to launch and leave more room for payloads such as satellites and experiments. "Space isn't cheap," Micci said, noting that if technology can be improved to keep satellites in orbit a year longer, millions of dollars could be saved.

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CSSL— A Leader In Atmospheric Studies

The Communications and Space Sciences Laboratory (CSSL), formerly the Ionosphere Research Laboratory (IRL), has been a major force in radio wave propagation and space science research for over forty years.

Sixteen engineering and science faculty engage in research ranging from space shuttle instrumentation to weather forecasting. John Mathews, electrical engineering professor, is director.

CSSL has three major areas of research: atmospheric and ionospheric physics and chemistry, computational electromagnetics, and communications electronics. CSSL also support an undergraduate teaching effort.

Lidar Penetrates Atmosphere

The development of a lidar (light detection and ranging) facility at Penn State will support a new area of research. The project will be overseen by C. Russell Philbrick, professor of electrical engineering. (See Philbrick's photo, on the cover.)

Philbrick, who came to the College from the Air Force Geophysics Laboratory at Hanscom Air Force Base last year, describes lidar as the light equivalent of radar. Lidar uses pulsed laser beams to measure phenomena in the lower and middle atmosphere regions. Potential research for the lidar facility includes shuttle reentry control, aerospace plane flight dynamics, profiles of atmospheric properties, weather forecasting, ozone and water vapor profiles and optical communications.

Lidar has been employed as part of the Penn State research effort at the National Astronomy and Ionosphere Center's observatory in Arecibo, Puerto Rico. Mathews, Philbrick and graduate student Qihou Zhou traveled to Arecibo in the spring to study the atmosphere and ionosphere as part of a National Science Foundation sponsored program. Using radar and lidar, among other tools, the two measured winds, atmospheric structure and waves.

These tests were the first time that all different radar types were used together to measure the atmosphere and deepened the understanding of how one radar interacts with another in measuring the dynamics of the atmosphere. A large meteor or fireball, named Bolide AIDA, also was studied as part of the international observing campaign.

'Wireless Antenna'

Another far-flung research initiative is located in Alaska, 30 miles north of Fairbanks. This is HIPAS, high power auroral stimulation, a facility with a 1.2 Megawatt Continuous Wave Transmitter and a high-power circular antenna

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The Space Shuttle Discovery, right, clears the tower and heads toward Earth Orbit. Ongoing COE research will help create new fuels and propulsion systems and train the next generation of NASA engineers. (NASA photo).

