



UNIVERSITY *of* DELAWARE

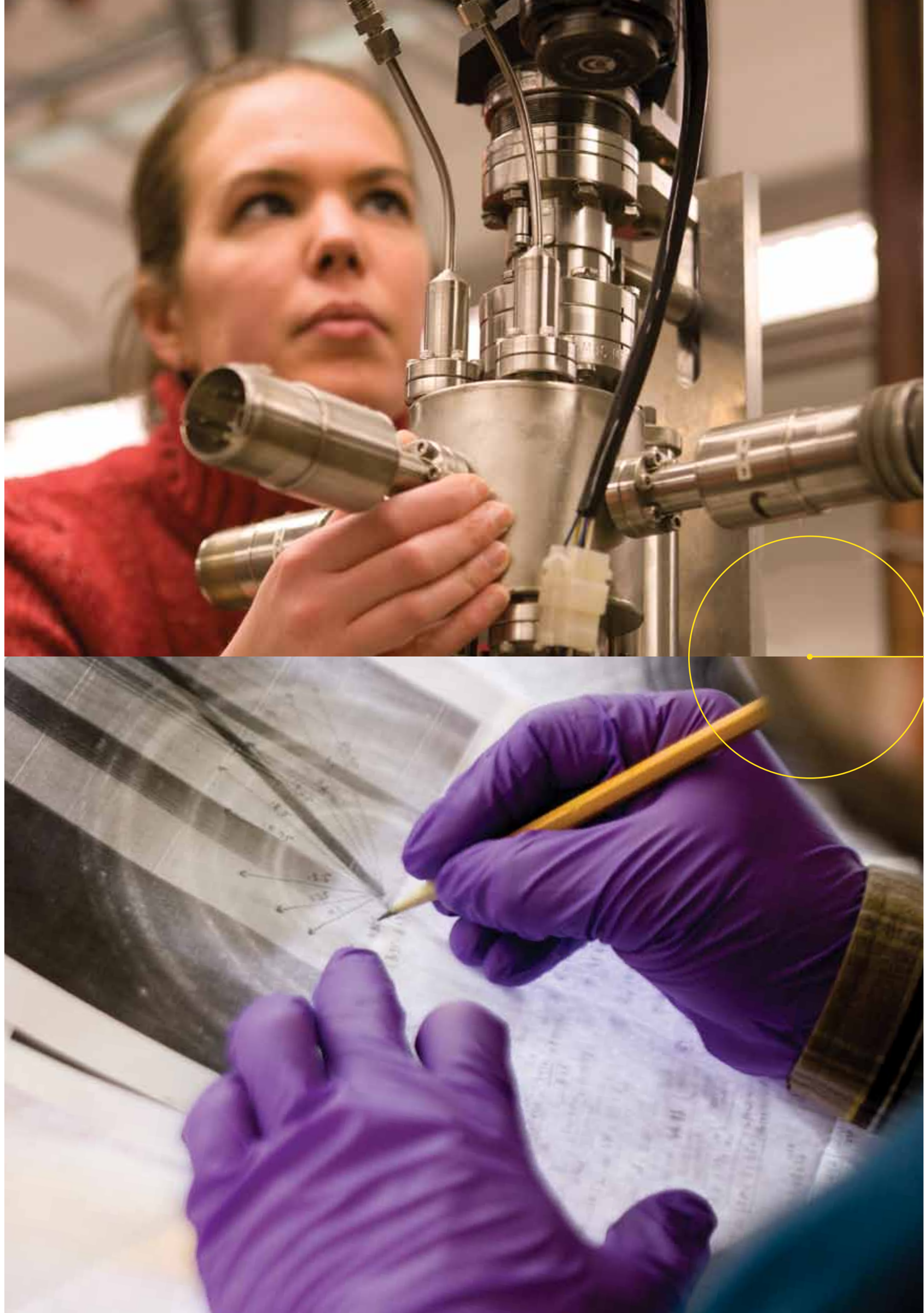


## INTERDISCIPLINARY SCIENCE & ENGINEERING LABORATORY

Every day, UD scientists and engineers  
dare themselves and their students  
**TO CHANGE THE WORLD  
FOR THE BETTER.**







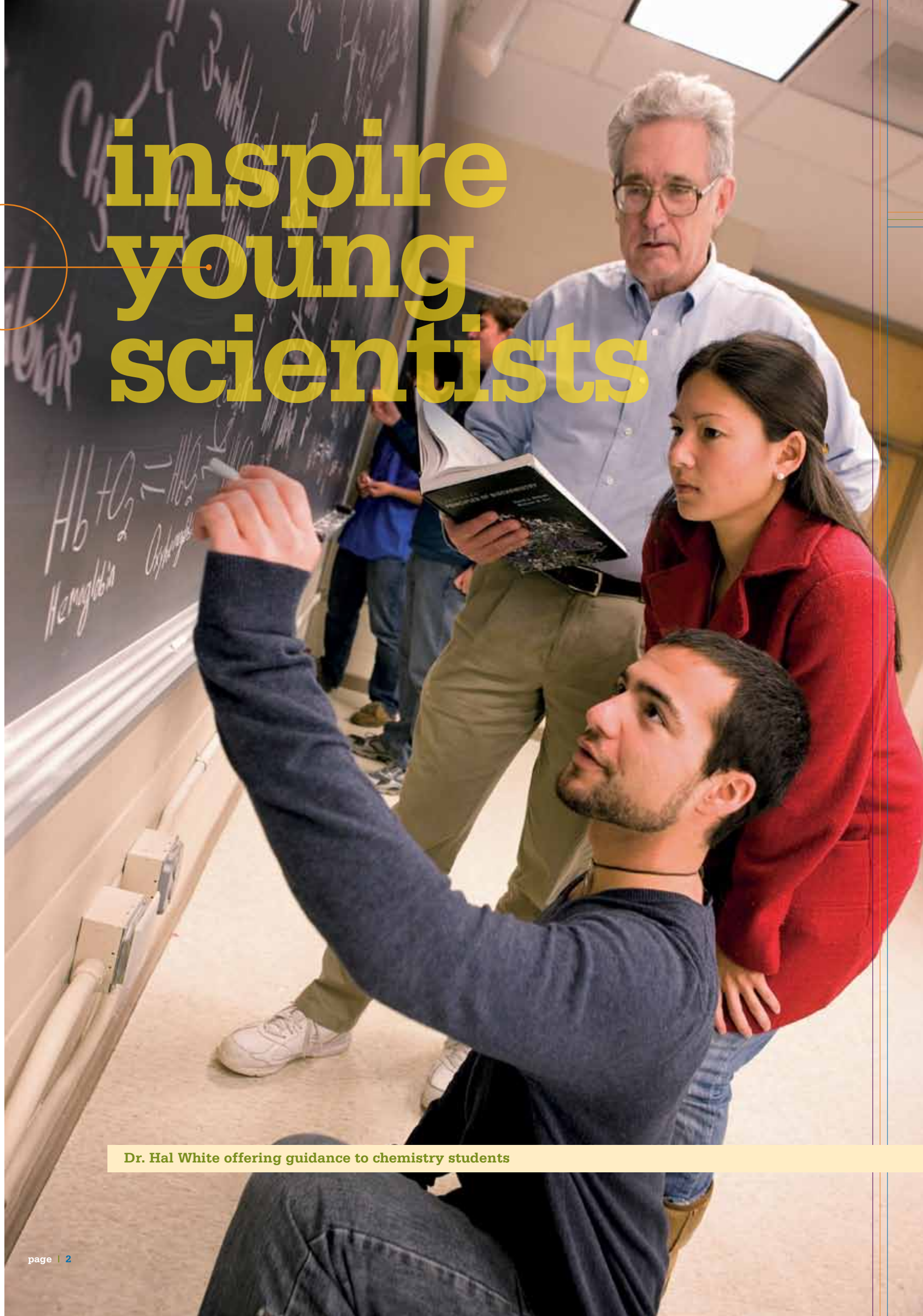
In labs and classrooms across this campus, people are bringing their skills and knowledge to bear on **A CENTRAL SCIENTIFIC CHALLENGE OF THE 21ST CENTURY:** How do we create the energy, materials and technologies our society needs while also making them more powerful, more efficient and more environmentally sound?

**AND HOW DO WE INSPIRE A NEW GENERATION OF SCIENTISTS AND ENGINEERS TO CARRY ON THIS WORK?**



**O**ur scientists and engineers know that the answers require innovative approaches to research and teaching that move beyond the way things were done in the past. **THE INTERDISCIPLINARY SCIENCE & ENGINEERING LABORATORY (ISE Lab)** is an essential next step in advancing their work. At a time when science and engineering are more critical than ever to the future of our region, nation and world, the University of Delaware is poised to lead the way.





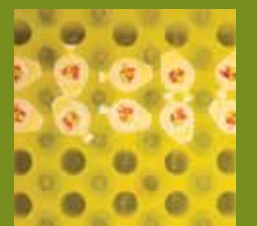
# inspire young scientists

Dr. Hal White offering guidance to chemistry students

## THE POWER OF PROBLEM SOLVING

**A** college student goes home for Thanksgiving with a surprise announcement: she is now a vegetarian. Her mother objects, arguing that complete nutrition certainly cannot come from plant proteins alone. Who is right? To solve this problem, students in Dr. Hal White's advanced chemistry course on intermediary metabolism immerse themselves in a study of amino acid metabolism and human nutrition. Working in small groups, they pose questions about which amino acids are essential, the food sources they come from, and how our bodies process them—and then analyze data from scientific studies to find the answers. Dr. White created this and a series of other “metabolic mysteries” to challenge his students to own the material and build true understanding.

“The traditional approach would have the professor standing at the board and marching through the metabolic pathways, with students taking notes and memorizing,” says Dr. White. “The problem-based approach gets students not just to cover the material, but to uncover it for themselves. It becomes not just about what they know, but what they do with what they know. This is how students of the future must learn.”



## DISCOVERY LEARNING

Over the past two decades, the University of Delaware has earned international recognition as a leader in problem-based learning through its Institute for Transforming Undergraduate Education. Our vision now is to reconfigure our science curriculum to involve undergraduates in solving real-world problems from day one, just as real scientists do, while also integrating traditionally separate disciplines such as biology, chemistry and physics. The ISE Lab is the key to this vision, with classrooms designed to combine group instruction with lab experiments and problem-solving sessions.



THE POWER OF COLLABORATION

**W**hat if we could use renewable resources such as trees and grasses to fuel our cars, power homes and businesses, and manufacture plastics? At the University of Delaware's Catalysis Center for Energy Innovation (CCEI), teams of faculty and students are unraveling the science of converting biomass into chemicals that can be turned into fuels, electricity and other products. CCEI is one of 46 Energy Frontier Research Centers nationwide receiving US Department of Energy support to spur the development of new energy technologies—the largest such federal commitment to scientific research and innovation in American history. Chemical engineers and chemists at UD are collaborating with scientists and engineers at several institutions nationwide—including the California Institute of Technology, Lehigh University and the University of Pennsylvania—to conduct this research.

“We are working to build the scientific foundation that will allow the biorefinery industry to exist in the future,” says Dr. Dion Vlachos, CCEI Director and the Elizabeth Inez Kelley Professor of Chemical Engineering. “The implications of this work are just tremendous—in terms of what it can do for the US economy, our quest for energy independence, and the reduction of carbon emissions that harm the environment.”



CITIZEN UNIVERSITY

Just like the CCEI, the Center for Energy & Environmental Policy, the Delaware Environmental Institute and the University of Delaware Energy Institute have dozens of faculty and students involved in research that promises to transform our world. The four center directors will move to the ISE Lab, where they will have opportunities to collaborate like never before—as will teams of scientists, engineers and policy experts. By locating many kinds of expertise in one place, the ISE Lab will help UD take a quantum leap forward as a leader in energy and environmental research, technology, education and policy.

# transform our world



Dr. Dion Vlachos with two student members of his research team



# build our future

## THE POWER OF TOP TALENT

**B**efore coming to the University of Delaware as the Karl W. and Renate Böer Professor and Chair of Materials Science and Engineering, Dr. David Martin built a successful research program at the University of Michigan. His work focuses on developing next-generation polymers at the interface between living tissue and electronic biomedical devices. This research has implications for improving the design and functionality of life-changing medical devices that range from prosthetic limbs, to cochlear and retinal implants, to electrodes implanted in the brain to stimulate areas lost to damage or disease. Dr. Martin moved to UD because he saw amazing potential here for advancing this and other materials science work—potential embodied by the ISE Lab.

“I literally came to UD because of its commitment to the ISE Lab as a place where scientists and engineers will have access to the most sophisticated instrumentation and processing equipment,” Dr. Martin says. “This is absolutely the key to retaining current faculty and attracting new faculty and students. In today’s world, the best people go where they know they will have the tools to perform their work at the highest level.”



## TALENT MAGNET

As the pace of discovery accelerates in science and engineering, the very best faculty and students are seeking opportunities to excel in the research facilities of the future. Such spaces are designed not only to enable collaboration among interdisciplinary teams, but also to put the most advanced microscopes, characterization and processing equipment, and other tools at their fingertips. The ISE Lab will attract the best science and engineering minds to UD, ensuring the strength of our programs for decades to come.

Dr. David Martin working with materials in his laboratory



# A REVOLUTION IN RESEARCH AND TEACHING

The Interdisciplinary Science & Engineering Laboratory will advance a revolution in research and teaching that is already under way at the University of Delaware. It will enable more undergraduates to take science and engineering courses that challenge them to use their knowledge in solving real problems. It will provide world-class spaces for researchers to collaborate on the innovations our society needs. And it will solidify UD's position as a leader in finding solutions that really matter.

## INSTRUCTIONAL WING

Features eight problem-based learning instructional labs, as well as twelve general purpose classrooms

## RESEARCH WING

Houses offices for the four UD institutes focused on energy and the environment, research and office space for interdisciplinary project teams, and shared core facilities



Academy Street

## COMMON AREAS

Include group study areas and conference and seminar rooms, all configured to foster collaborative work among students and faculty

## COURTYARD AND EXTERIOR

Designed to complement the existing science and engineering campus while also creating a welcoming new green space

“We want to elevate the level of discovery—be it in research or teaching. The problems that need to be solved don’t fall into neat disciplinary areas, nor do students and faculty think that way.”

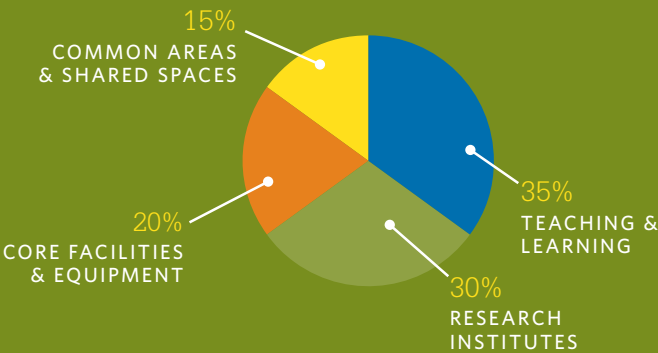
DR. GEORGE WATSON, DEAN, COLLEGE OF ARTS & SCIENCES

## LEARNING BY DOING

College students’ first introduction to science and engineering usually comes in the form of large lectures filled with abstract concepts and separate lab sessions with little real-world application. It’s no wonder that as many as half of them abandon science as a major. Today, 25 percent of undergraduates at UD major in science and engineering—higher than the national average of 15 percent. We are in an ideal position to attract even more students to the sciences, but only if we have the right spaces for doing so. In the ISE Lab’s problem-based learning classrooms, students will move directly from hearing about a theory or concept to actually using it to solve real scientific problems.



More than one-third of the new building is reserved for classrooms and other instructional spaces, just under one-third for the four research institutes. The remaining third includes shared spaces for meetings (15%) and advanced research (20%), including some of the most sophisticated and powerful equipment available today



## FOSTERING COLLABORATION

The ISE Lab’s design incorporates many common areas that will encourage students and faculty to share ideas outside the classroom or laboratory. We want to expose undergraduates to the research taking place right in the building and create opportunities for them to get involved. Large-screen monitors will broadcast actual projects in progress from the ISE Lab’s specialized research facilities.

### The ISE Lab will enable UD to:

- attract and retain more top science and engineering students
- nearly double the faculty in engineering
- increase the number of students participating in research





### A NEXT-GENERATION FACILITY

The innovations of the future will not be developed by scientists and engineers who stay within the boundaries of a single area of specialty. Today's scientific challenges are so complex that they require collaboration among people with many types of expertise—a reality not reflected in the design of traditional science and engineering buildings organized by department.

The ISE Lab is a **next-generation facility that centers faculty and students around shared projects and interests**—a key factor in encouraging multidisciplinary research.



### CREATING RESEARCH CENTERS

Now more than ever, our nation and our world need UD's expertise in clean energy solutions, environmental preservation and sustainability. Nearly 25 percent of research funding coming into the University is for projects related to energy and the environment. **The ISE Lab will bring together the research centers and institutes at UD focused on these critical areas:**

**Catalysis Center for Energy Innovation (CCEI)**

**Center for Energy & Environmental Policy (CEEP)**

**Delaware Environmental Institute (DENIN)**

**University of Delaware Energy Institute (UDEI)**

### PROVIDING THE MOST ADVANCED TOOLS

The University of Delaware has always been known for its strength in science and engineering. Here, faculty and students create new materials and technology with an almost limitless array of applications—from new fuels and hydrogen-powered vehicles, to synthetic tissues for damaged cartilage and vocal chords, to new types of body armor and surgical gloves that protect the skin from injury. As the first new laboratory building on UD's campus in nearly 20 years, the ISE Lab will propel this work forward by giving research teams the most advanced scientific equipment possible—equipment with specific needs such as vibration, temperature and humidity control; electric and magnetic field isolation; and more robust power systems.



**The ISE Lab's research facilities will strengthen UD's ability to:**

- attract and retain the strongest scientific minds from around the nation and the world
- secure major private and federal funding for research
- gain greater recognition as one of the nation's leading research universities

**“Our vision is not to build silos of excellence. Rather, it is to raise the capability of the entire University in a deliberately cross-disciplinary way.”**

DR. MARK BARTEAU, SENIOR VICE PROVOST FOR RESEARCH,  
ROBERT L. PIGFORD CHAIR OF CHEMICAL ENGINEERING



### ISE Lab Core Facilities

- imaging and microscopy suite
- 10,000 square-foot nanoprocessing clean room
- synthesis lab for chemical research
- advanced materials characterization lab



TODAY AND FOR YEARS TO COME, UD SCIENTISTS AND ENGINEERS WILL DARE THEMSELVES AND THEIR STUDENTS TO CHANGE THE WORLD FOR THE BETTER.

**NOW YOU CAN DARE TO CHANGE OUR SCIENCE AND ENGINEERING PROGRAMS FOR THE BETTER.**

The University of Delaware has a central role to play in creating the scientific discoveries that our nation and world need, along with the new scientists and engineers who can carry this work into the future. UD's accomplishments in these areas are great but could be even greater. As the national conversation gives voice to concerns that the US is falling behind in science and engineering, we are more inspired than ever about the difference we can make. We have taken great care to design the ISE Lab in ways that will advance UD's current excellence and commitment to innovation in teaching and research.

Now we ask you to share in this vision. By supporting the ISE Lab, you can create the spaces that will take UD into the future. You can build the classrooms that revolutionize our science and engineering curriculum, creating more science and engineering majors who are also more engaged and better prepared. You can provide the research spaces and equipment that give scientists and engineers the best possible environment for doing high-level interdisciplinary research—and that bring top talent to UD. You can move UD forward in ways that truly matter.

**"I can see the need for and the benefits of the ISE Lab, and I am supporting it because of the great education I received at the University of Delaware. This seemed like the perfect way for me to give back while directing my resources to a specific project that will make a real difference."**

Jack Eagle EG '56, former ExxonMobil Vice President, along with his wife, Joyce EHD '56, made the lead gift in support of a problem-based learning classroom in the ISE Lab.

**"Innovation is my passion and it has been a core part of my career. That is the area I really wanted to contribute to at the University of Delaware, and the ISE Lab is the ideal way for me to do it. I have seen firsthand that developing new inventions really does require an interdisciplinary approach. I believe in the building and what it can do for this University."**

Ray Sokola EG '76, Vice President for Future Technology at Tyco Electronics, has lent his support to the ISE Lab along with his wife, Mary Ann AS '76.

**"There's no doubt UD has the knowledge, the talent and the inventive capacity to solve the world's most pressing scientific and engineering problems. With the Interdisciplinary Science & Engineering Lab, we'll have the space to gather this talent and grow this capacity in a research enterprise that will redefine what's possible."**

PRESIDENT PATRICK T. HARKER

**WAYS TO GIVE**

Gifts in support of the ISE Lab can be made outright and paid in full, as pledges payable over five years, or as planned gifts. They can also be paid in many forms, including cash, stock and matching gifts. The Development staff is ready to offer any assistance you might need in evaluating the tax implications of gifts and identifying the optimal forms they might take. The staff is also pleased to discuss a broad range of naming opportunities and other forms of recognition in the ISE Lab.

**FOR MORE INFORMATION**

**CALL** 302-831-3265

**EMAIL** [tpeterso@udel.edu](mailto:tpeterso@udel.edu)

**[www.udel.edu/giving](http://www.udel.edu/giving)**



**INTERDISCIPLINARY SCIENCE & ENGINEERING LABORATORY**

**[WWW.UDEL.EDU/ISELAB](http://WWW.UDEL.EDU/ISELAB)**

**THE PATH TO PROMINENCE™**

The Interdisciplinary Science & Engineering Laboratory is a key priority of the University of Delaware's larger strategic plan, the Path to Prominence™, initiated by President Patrick T. Harker. The plan resulted from a series of broad and inclusive discussions about the University's future. Central to the plan are six milestones focused on areas such as undergraduate and graduate education, research, and engagement with our community and wider world. Initiatives in each area will help us fulfill the mission of the University and be recognized around the world as one of the great public institutions of higher education in America.

Dare to be first.

