

LIVE OUT YOUR LOVE
OF SCIENCE



UNDERGRADUATE
STUDIES



UNIVERSITY OF
NOTRE DAME
College of Science

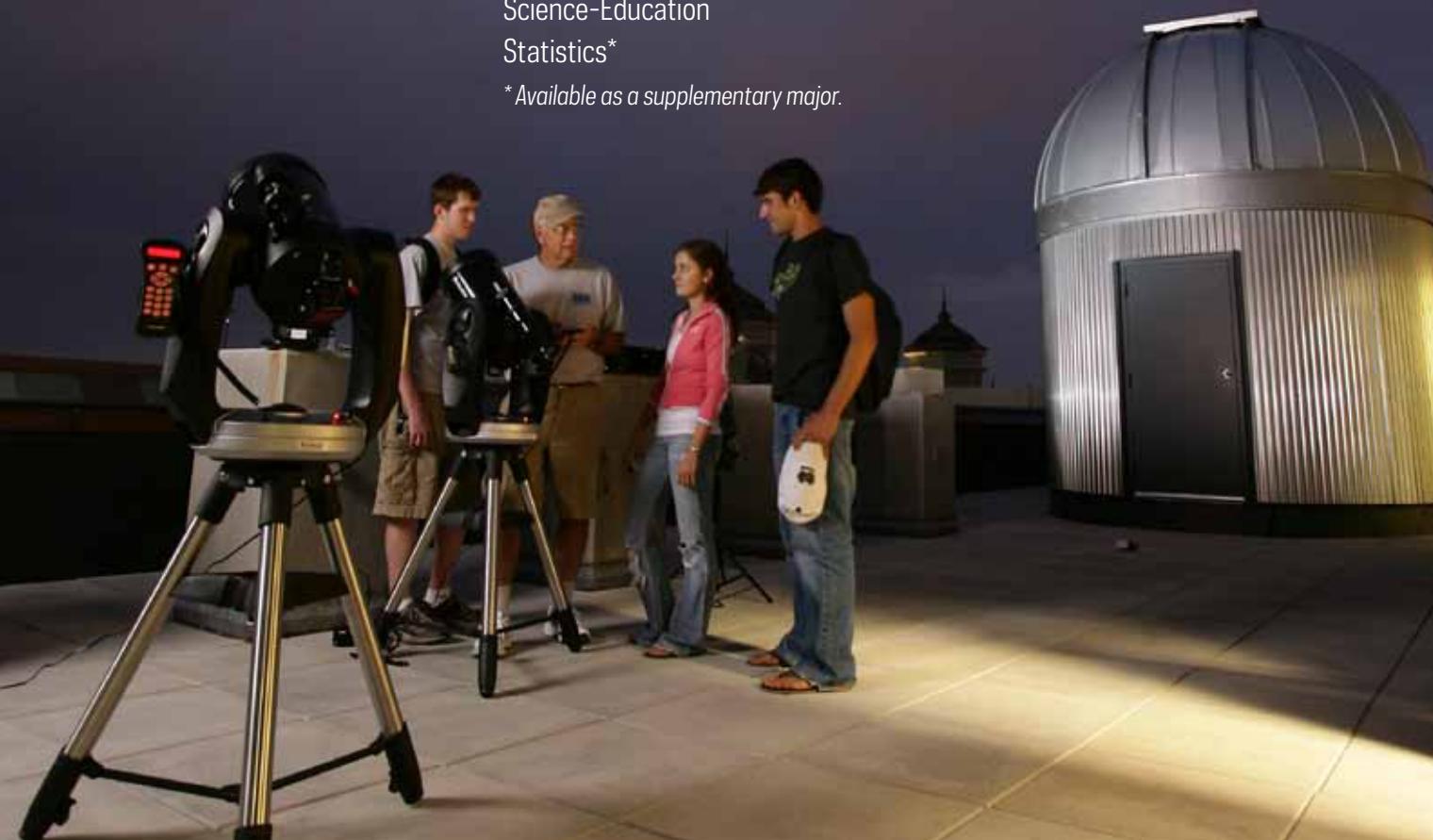
Minors

Actuarial Science
Energy Studies
Sustainability

Majors

Applied and Computational Mathematics and Statistics*
Biological Sciences
Biochemistry
Chemistry
Environmental Sciences*
Mathematics*
Physics*
Physics-in-Medicine
Preprofessional Studies
Science-Business
Science-Computing
Science-Education
Statistics*

* Available as a supplementary major.



THE COLLEGE OF SCIENCE AT THE UNIVERSITY OF NOTRE DAME

A community of innovators working in collaboration for the common good.

Since its founding in 1865, the College of Science has built upon Notre Dame's world-renowned intellectual resources, while building up the campus's state-of-the-art infrastructure, the \$70 million Jordan Hall of Science serving as the most recent example.

What hasn't changed—and never will—is the University's unwavering commitment to its Catholic character and the college's mission to prepare tomorrow's scientific leaders to think big, while also inspiring them to make a difference and to share their knowledge and discoveries in ways that encourage collaboration, advance learning, and contribute to the common good.

Call it what you will—a love of science, the Fighting Irish spirit, or both—but you see it in classrooms and laboratories, and in opportunities such as NDConnect, which brings the nation's best science undergraduates to Notre Dame for a nanoscience research competition.

You see it in local learning centers and health fairs where our faculty and students volunteer their time and talents to tutor children and screen adults.

You see it in countries around the world when our students choose to spend a semester studying abroad or a summer applying their skills in service to others.

Most of all, you see it in our eyes.

This profound sense of unity of purpose is what sets us apart, and it's what distinguishes the tens of thousands of young men and women who have entered the College of Science as promising students and graduated as even more promising scientists.

Science is who we are. Service is what we do. Join us.

Learn more at science.nd.edu.

Do more with a degree from the College of Science at the University of Notre Dame.

DEPARTMENT OF APPLIED AND COMPUTATIONAL MATHEMATICS AND STATISTICS

One department. Two disciplines. Endless possibilities.

Majors:

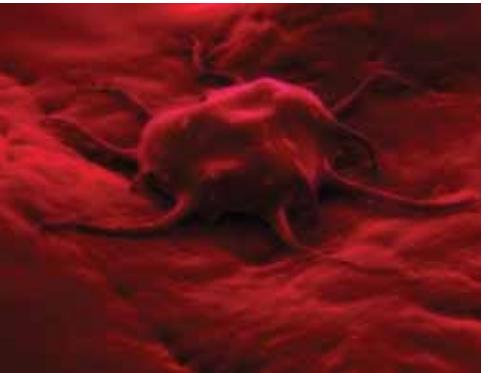
Statistics, Applied and Computational Mathematics and Statistics

What are the odds of landing a job when you graduate? A lot better, if you can do the math. That's because, from finance and politics to biosciences, astronomy, online advertising, and health care, data is pervasive in today's world. And it's likely only to be even more so in tomorrow's. In fact, in Big Data: The Next Frontier for Innovation, Competition, and Productivity (2011), McKinsey Global Institute stated, "The United States alone faces a shortage of 140,000 to 190,000 people with deep analytical skills, as well as 1.5 million managers and analysts to analyze big data and make decisions based on their findings." It's one reason why the Chronicle of Higher Education reported in 2009 that computational science is one of the top five up-and-coming majors.

The Department of Applied and Computational Mathematics and Statistics (ACMS) creates an environment for excellence and supports a collaborative, interdisciplinary approach to research. In doing so, ACMS prepares undergraduates to solve real-world problems across a variety of careers, including:

- Analysis of investment data in the banking industry
- Identification of patterns in transaction data for online sales
- Estimation of actuarial risk in the insurance industry
- Analysis of performance data in manufacturing

From human diseases such as breast cancer to environmental concerns like global warming, ACMS offers the knowledge you'll need to grasp a complex problem—and the tools, perspectives, and expertise you'll need to solve it.



Interdisciplinary Research

Research in the Department of Applied and Computational Mathematics and Statistics is highly interdisciplinary. Students are involved in faculty research which utilizes mathematics and statistics to create models for wound healing, develop a clinical prognostic test for breast cancer metastasis, simulate vertebrate limb development, and study important clues about blood clot formation and the spread of infection.

Through courses such as Mathematical and Computational Modeling in Biology and Physics, students learn how to formulate models and apply computational methods to real-world problems. In the Advanced Scientific Computing course, students gain the fundamental understanding necessary for using high-performance computing in science and engineering.



DEPARTMENT OF BIOLOGICAL SCIENCES

Advancing human and environmental health through research, education, and outreach.

Majors:

Biological Sciences, Environmental Sciences

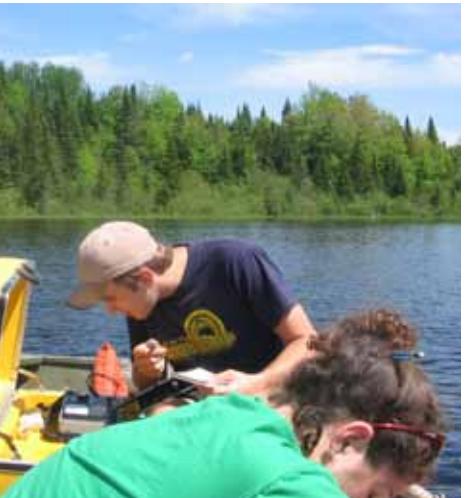
The Department of Biological Sciences is a recognized leader for its research in global health, biomedical sciences, and environmental change. Students and faculty use the most cutting-edge approaches—genomics, advanced imaging, and mathematical modeling—to study biological phenomena, including:

- Evolutionary Biology
- Cancer Biology
- Cellular and Molecular Biology
- Physiology and Morphology
- Genetics and Genomics
- Immunology
- Microbiology
- Aquatic Ecology
- Ecosystem Ecology
- Regenerative Biology
- Developmental Biology
- Parasitology
- Vector Biology
- Neuroscience

The department's 45 laboratories and research programs receive more than \$15 million of outside funding annually, primarily from the National Institutes of Health and the National Science Foundation. Students also take advantage of unique training experiences afforded to them by the University's many innovative interdisciplinary research centers and institutes, such as the Eck Institute for Global Health, the Center for Rare and Neglected Diseases, the Environmental Change Initiative, and the Harper Cancer Research Institute.

Environmental Sciences

Explore a world of knowledge about the planet on which we live. The Environmental Sciences major exposes students to a scientific view of our environment from biological, chemical, and geological perspectives. We place particular emphasis on understanding interactions between human societies and the environment from social, ethical, economic, anthropological, and governmental points of view.



UNDERC

*Undisturbed nature.
Unmatched undergraduate opportunity.*

The University of Notre Dame's Environmental Research Center (UNDERC) consists of two vast expanses of pristine land and lakes that serve as natural laboratories for research into environmental systems. Straddling the Wisconsin-Michigan border, UNDERC East's 8,000 acres of hardwood forests, lakes, and wetlands is one of just 20 sites designated by the National Ecological Observatory Network to measure environmental factors in areas undisturbed by humans. Located in the northern Rockies, UNDERC West is an untouched area of grasslands, montane forest, and streams inhabited by a wide variety of fish and wildlife.



DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

Acclaimed faculty. State-of-the-art research facilities.

Majors:

Chemistry, Biochemistry

The Department of Chemistry and Biochemistry emphasizes four primary research areas to train tomorrow's chemists: Biochemistry, Inorganic Chemistry, Organic Chemistry, and Physical/Analytical Chemistry. Undergraduates routinely interact with faculty and graduate students through both coursework and undergraduate research, which is strongly encouraged.

The department is well equipped with modern instrumentation and advanced research facilities, including computational computing clusters, the Mass Spectrometry and Proteomics Facility, the Nuclear Magnetic Resonance Facility, the Synthesis Core Facility, and the Molecular Structure Facility for X-ray crystallography.

Chemistry majors choose between two programs: the Chemistry Career Program and the Chemistry Combination Program. Students in the Chemistry Combination Program choose between the following:

- Chemistry with Business
- Chemistry with Computing

Regardless of whether you are interested in professional work in the chemical and biochemical sciences, business, or computing, the department is committed to the development of well-rounded scientists who can take on leadership roles in academia, industry, private research institutions and foundations, or government.



NMR Spectrometer
Revolutionizing the teaching of organic chemistry and biochemistry.

The Jordan Hall of Science contains an array of specialized equipment rarely found on a college campus. One example is the Bruker 400-MHz Nuclear Magnetic Resonance (NMR) Spectrometer, which features a robotic sampler for the automated handling of samples. One of the finest NMR facilities of its type, Notre Dame's spectrometer allows undergraduates to study molecules at the atomic level.



DEPARTMENT OF MATHEMATICS

Committed to research, teaching, and service.

Major: Mathematics

"Let no one ignorant of geometry enter here" was inscribed on the entrance to Plato's academy; and, during the medieval period, arithmetic and geometry constituted two of the seven subjects considered essential for a liberal education. The most universal of all scientific tools, mathematics has had a profound effect upon civilization. Today, it continues to have a profound influence. From the theory of relativity and its applications to the study of the large-scale structure of the universe, to the development of the modern computer and its manifold applications in science, technology, and business, mathematics plays a vital role in modern science and society.

As mathematics is the foundation of science, the College of Science is the foundation of a mathematical education and career.

The Department of Mathematics at the University of Notre Dame provides you with the rigorous mental discipline and unsurpassed imaginative stimulation necessary to prepare for graduate studies or to employ your expertise in any area in which rigorous thought and precision of results are mandated.

Mathematics majors select one of seven areas of concentration:

- Mathematics Honors Program
- Mathematics Career Program
- Mathematics and Life Sciences Program
- Mathematics and Computing Program
- Mathematics Education Program
- Mathematics and Business Administration Program
- Mathematics and Engineering Science Program



SUMR

Where the best of the best in mathematics go to get even better.

Seminar for Undergraduate Mathematical Research (SUMR) is a two-year enrichment of the Mathematics Honors Program. SUMR provides support and direction to the University's most skilled sophomore-level mathematics students and prepares these elite students for work at the nation's top graduate programs in the mathematical sciences—Pure or Applied Mathematics, Statistics, Economics, Physics, Mechanical or Electrical Engineering, or Finance. Each of SUMR's first 70 graduates (1990–2006) who pursued graduate education in one of the mathematical sciences gained admittance, with funding, to one of the top 45 graduate programs in the United States; 52 were admitted to a Top 25 program.



DEPARTMENT OF PHYSICS

Answering nature's most fundamental questions.

Majors:

Physics, Physics-in-Medicine

You know their names—Galileo, Newton, Einstein, and Hawking. They, and scientists like them, explained gravity. They discovered radio waves, X-rays, radioactivity, electromagnetism, superconductivity, and the structure of the atom. And they invented radar, transistors, computers, lasers, MRI's, electron microscopes, nuclear power, and the Internet. They are physicists. And at the College of Science, you will learn to think like them; you will take a giant step towards knowing what they knew. What might you explain, discover, or invent? Find out.

The Department of Physics offers you more than simply an education in physics; it offers a training ground for the mind, a first-class education in the art and science of problem solving.

Undergraduates work with world-class faculty in the University's excellent facilities, as well as in research facilities around the globe, including those in Japan and South America, at the Fermi and Argonne national laboratories in Illinois, and at the European Organization for Nuclear Research (CERN). Notre Dame is also part of an international consortium that funded and manages the Large Binocular Telescope (LBT) in Arizona. With two 8.4-meter-diameter mirrors, the LBT is the world's most powerful telescope and one of its most advanced. Cutting-edge research—research that is truly collaborative, interdisciplinary, and international in scope—is carried out in astrophysics, nuclear physics, elementary particle physics, condensed matter, biophysics, and atomic physics.

Physics majors choose between four concentrations:

- Advanced Physics
- Astrophysics
- Applied Physics
- Computing

With the research opportunities of a large university coupled with the environment of a smaller, private university, the Department of Physics offers a variety of programs to accommodate the academic and professional interests of its students.



Nuclear Accelerator

The first new accelerator for low-energy nuclear physics in the United States since the 1980s was recently installed at Notre Dame. The \$3.5 million NSF-sponsored project includes a 10-ton vertical tank.



PREPROFESSIONAL STUDIES AND THE CENTER FOR HEALTH SCIENCES ADVISING

The education you need. The answers you want.

Major: Preprofessional Studies

Established in 1961, Preprofessional Studies positions students for career opportunities in a variety of health professions—medicine, dentistry, veterinary, physical therapy, psychiatry, and more— by providing undergraduates with an education in the best liberal traditions of scientific thought and analysis. The first thing you will learn?

You are not alone in your pursuits.

The Center for Health Sciences Advising helps you to understand what medical schools are looking for and how to navigate your undergraduate career and make a successful application to the school of your choice. It can also answer the questions that every medical student needs to know: what is the best major for medical school? Do you need research for medical school? Do you need clinical experience? Do you need to do service? Can you study abroad and still prepare for medical school or other education in the health professions? The Center—and its website at preprofessional.nd.edu—can answer these questions and any others you might have.

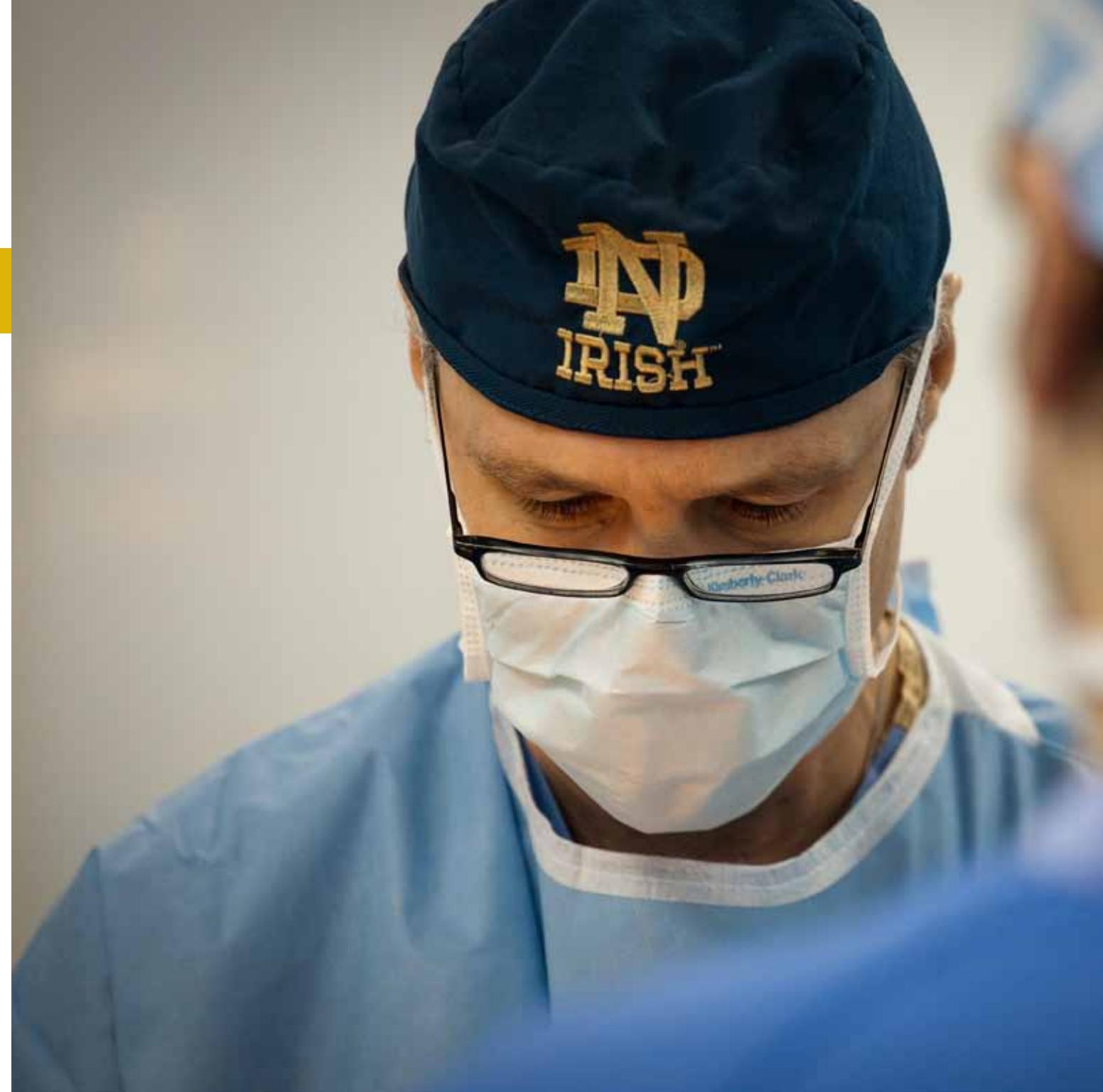
For over 100 years, Notre Dame has been recognized as an accredited institution for premedical studies. Thanks both to an undergraduate education that emphasizes research, clinical experiences, and interdisciplinary thinking and to the work of the Center for Health Sciences Advising, the average Notre Dame applicant has a Medical College Admission Test (MCAT) score significantly above the national average, and about three out of four of all Notre Dame applicants to M.D. or D.O. programs are accepted.



Ruth M. Hillebrand Center for Compassionate Care in Medicine

The Hillebrand Center was founded in 2011 to advance the scientific theory and practice of compassionate care in medicine and to promote effective communication skills in physicians, nurses, and allied health professionals at every level of training and practice.

As an undergraduate student you will be able to select from courses such as the Science of Compassion in Medicine, Medical Counseling Skills, Spiritualities of Caring in Medicine, the Pathos Project, and an Introduction to Hospice and Palliative Care.



COLLEGIATE SEQUENCE

The science of business, computing, and education.

Majors:

Science-Business, Science-Computing, Science-Education

The collegiate sequence's interdisciplinary programs are designed to help you obtain a strong science background while simultaneously preparing you for professions in health care, business, computing, or education.

Science-Business

The Science-Business major is an individualized course of study that incorporates basic business courses along with the four basic areas of science— biology, chemistry, physics, and mathematics. The major prepares students to pursue health care professional education—such as medical or dental school, physical therapy, or pharmacy school—or to enter an MBA program, or the scientific business market immediately upon graduation.

Science-Computing

The Science-Computing major is an individualized course of study that incorporates computing courses, along with the four basic areas of science— biology, chemistry, physics, and mathematics. The major provides students with working knowledge of various computer languages and experience using current computer technology, as well as the opportunity to focus in an area of science of particular interest. Graduates enter the scientific computing job market immediately upon graduation.

Science-Education

The Science-Education major is an individualized course of study that incorporates courses from the four basic areas of science— biology, chemistry, physics, and mathematics—along with education courses that most states require for certification to teach secondary school.

Bachelor of Science/Master of Business Administration

The dual degree is a demanding, five-year program that offers highly motivated and scholastically superior undergraduates in the College of Science the opportunity to simultaneously earn a Bachelor of Science and an MBA.



Career Center

*You know where you want to go.
The Career Center helps you to get there.*

The Career Center offers you unsurpassed personalized support through every step of your career development. Services include individual career counseling, self-assessments, workshops, on- and off-campus career fairs, internship and job searches, interview preparation, resume and cover letter writing, and networking.



MINORS

Three minors that can play a major role in contributing to your career prospects.

Minors:

Actuarial Science, Energy Studies, Sustainability

Actuarial Science

The business of statistics. The minor in actuarial science is a new course of study tailored to the needs of students interested in actuarial careers, especially those in business. The minor provides instruction in probability, statistics, financial mathematics, accountancy, corporate financial management, macroeconomic analysis, investment theory, the principles of microeconomics, and econometrics.



Energy Studies

The interdisciplinary minor in energy studies equips students for a future in which energy efficiency and sustainable energy will be increasingly vital. It offers separate technical and non-technical tracks for students with different interests. The minor surveys the fundamental aspects of energy infrastructure and resources as well as examines the political, societal, and business ramifications of that infrastructure and its place in a world of depleting fossil resources and changing climates. Classes are taught by staff from the College of Science, the College of Engineering, the College of Arts & Letters, the Mendoza College of Business, and the School of Architecture.



Sustainability

One of the gravest challenges humankind will face in the twenty-first century is that of forging a new relationship with the natural world. Both through formal courses and independent study, the minor in sustainability takes a multidisciplinary approach to examining the theories, principles, and practices of sustainability, preparing students to meet the challenge of satisfying current human needs while preserving natural capital for future generations.



UNDERGRADUATE RESEARCH

A rich history of research excellence.
And it's only the beginning.

Participation in research is the best way to understand the true nature of science and the scientific process, for it deepens and broadens a student's knowledge and experience in their chosen field, while also developing those problem-solving skills that are so highly sought after by potential employers.

The possibilities for undergraduate research at the College of Science are considerable. In fact, a diversity of faculty interests combined with the University's vast resources allow for unsurpassed undergraduate research opportunities.

Summer Undergraduate Research Fellowship (SURF)

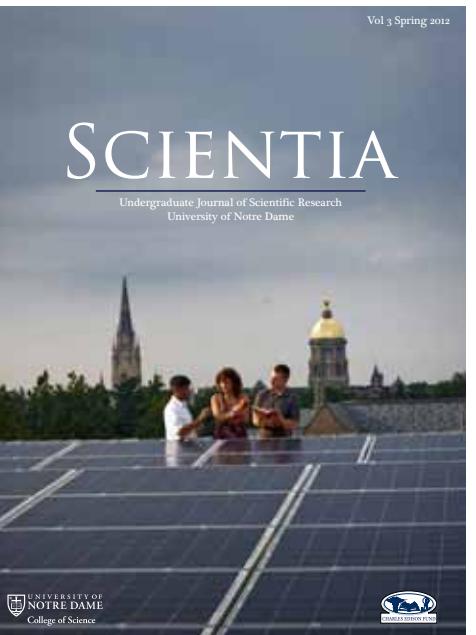
SURF is a full-time, 9–10 week summer research fellowship program for College of Science students. Fellowship recipients receive mentoring from College of Science faculty as well as a \$4,000 stipend and \$500 for supplies. The Clare Boothe Luce Foundation, Indiana University School of Medicine–South Bend, Balfour Foundation, and GLOBES support SURF.

Undergraduate Research Opportunity Program (UROP)

A joint program between the College of Science and the College of Arts and Letters, UROP is an intense educational experience that exposes students to the entire process of research, including writing a proposal, conducting research, analyzing data, completing a final written report, and, in some instances, presenting completed research at a conference.

Administered by the Institute for Scholarship in the Liberal Arts, the program enables science students to work with faculty in the College of Arts and Letters.

And as the University endeavors to do something that's never been done—to establish itself as a preeminent research university with a distinctive Catholic character that seeks the truth for its own sake, as well as to benefit the common good—it's only the beginning.



Scientia
Latin for "knowledge", Scientia is a student-run, online journal of scientific research that encourages high-quality undergraduate research, provides a forum through which students can gain essential writing and reviewing skills, and contributes to the advancement and cohesiveness of Notre Dame's scientific community. A print version is published once a year.



GLYNN FAMILY HONORS PROGRAM

A small number of outstanding students with academic intents for the College of Science or the College of Arts and Letters are identified at the time of admission. The program seeks to identify students with a deep intellectual curiosity and provides funding for summer research. All honors students are expected to complete a senior honors thesis based on their own research.

glynnhonors.nd.edu



Learn more at nd.edu/~ois.

STUDY ABROAD

Gain exposure to international academics, research, and cultural engagement.

The University of Notre Dame is committed to providing you with opportunities to enlarge your understanding and vision beyond the borders not only of this campus, but also of this country. In fact, Notre Dame President Emeritus Rev. Edward "Monk" Malloy, C.S.C., said it best when he stated, "Our campus is in South Bend, Indiana; our classroom is the world."

The percentage of Notre Dame undergraduate students who study abroad is consistently among the highest in the nation. The Office of International Studies offers over 40 programs in at least 20 countries, including France, China, Italy, England, Ireland, Australia, Japan, Mexico, Greece, Germany, Egypt, Senegal, Israel, Russia, Scotland, Brazil, and Chile.

THE COLLEGE OF SCIENCE— THEN, NOW, AND ALWAYS

Building upon our past to build a better future for all.

In 1885, Notre Dame became the first college in the United States to install electric lighting. In 1893—10 years before the Wright brothers' first flight—Notre Dame Professor Albert Zahm presented "Stability of Aeroplanes and Flying Machines" at the First International Aeronautics Congress. Based on research he conducted at the University's Science Hall in the 1880s, Zahm proposed the first modern method for launching airplanes and manually controlling them in flight by using rotating wing parts to balance the aircraft laterally and a double tail to control pitching and side-to-side movement.

In 1899, Notre Dame Professor Jerome Green became the first American to transmit a wireless message. In 1913, legendary Fighting Irish football player and coach Knute Rockne—a professor in the College of Science—applied his scientific knowledge to master the physics of throwing a football, popularizing the forward pass and forever changing the game. Today, the Notre Dame Radiation Laboratory is home to the largest concentration of radiation chemists in the world.

Whether adopting new technologies or contributing to scientific breakthroughs, Notre Dame's College of Science has been and remains at the forefront of scientific knowledge.



Discover what's new in Notre Dame College of Science news at science.nd.edu

Undergraduate researchers contribute to new discovery in superconductor metastability

Professor of Physics co-investigates the largest Hubble telescope project ever undertaken

Researchers publish new findings on aging pediatric bruises

Notre Dame student discovers rare Wolf-Rayet star

Notre Dame's London Centre hosts collaborative workshop on Biomedical Modeling

Undergraduate's research published in the journal *Retinal Physician*

March of Dimes funds study of congenital kidney defects

Biologist's research offers important clues about grasshopper population explosions

Undergraduate researches Ugandan healthcare

Astronomy team discovers new class of planets

NOAA awards Notre Dame researchers with invasive species grant

Senior biochemistry major publishes findings that could improve fuel cell efficiency

Biochemistry undergraduate develops new method for porphyria diagnosis

Professor honored for environmental-justice work

Professor listed among Top 100 Chemists

Lab brings new insight into blood cell development

Researchers provide new genetic information about the circadian rhythms of the malaria mosquito

Scientific and Medical Leadership course brings undergraduates together with top scientists, entrepreneurs, and physicians as well as leaders in academia, the military, business, and innovation

Professor of chemistry and biochemistry shows computation can speed disease treatment

Team of physicists finds a new path to increase semiconductor functionality

Lab discovers dual-action compound for potential treatment of TB and malaria

Notre Dame teams take first and second place in nanotech competition

Notre Dame and U.S. Department of Energy collaboration enables development of unique spectrometer

Research provides new insights into the evolution of a supernova

Nuclear Magnetic Resonance research aids in drug design

Undergraduate conducts climate change research at Harvard Forest

Researchers use novel method to combat malaria drug resistance

JORDAN HALL OF SCIENCE

Collegiate gothic on the outside,
twenty-first century science
center on the inside.

With the most advanced science and educational teaching instrumentation of any university in the nation, the College of Science's \$70 million Jordan Hall is setting the standard for undergraduate education and research in the twenty-first century. Jordan Hall features two 250-seat lecture halls, 40 state-of-the-art laboratories; a Nuclear Magnetic Resonance Spectrometer; a 136-seat Digital Visualization Theater that allows for a high-resolution, 360-degree visual learning experience; a museum of biodiversity with an extensive collection of amphibians, fishes, birds, mammals and insects that have been collected over the last century; an observatory; greenhouses; and unique common areas that offer undergraduates unprecedented opportunity for collaboration.



The Jordan Hall Digital Visualization Theater

Light years ahead of any theater you've ever seen.

Boasting the Sony SRX-S110, one of the newest projection systems available today, as well as a JBL 9,000-watt 5.1 Dolby surround sound system and ten computers for the real-time rendering of 3D objects, Jordan Hall's 136-seat hexagonal Digital Visualization Theater (DVT) offers instructors the ability to immerse students in high-resolution, high-fidelity images projected on a 50-foot-diameter dome. Take a tour inside 3D models of complex molecules, DNA, or cancer cells; view the internal structure of the human body as revealed by CT or MRI medical imaging technologies; or fly to the edge of the observable universe.

The Jordan Hall of Science Greenhouse

Have a theory? Grow for it!

Jordan Hall's greenhouse facility consists of a support lab and four, 210-square-foot greenhouses, each with a computer-controlled environmental system that allows for a vast array of experiments.



The Jordan Hall Observatory

The sky's the limit.

Sitting atop the third floor, the Jordan Hall Observatory features a number of small telescopes as well as a research-class, computer-controlled telescope with a full suite of modern instrumentation, all contained in its own dome. The telescope can be remotely controlled via the Internet and is capable of viewing astronomical objects in several distinct wavelengths of light.

UNDERGRADUATE RESEARCH

Over 500 College of Science students conduct undergraduate research every year, either on campus, across the country, or around the world.



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at the University of Notre Dame.

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