

# Advance. Explore. Discover.

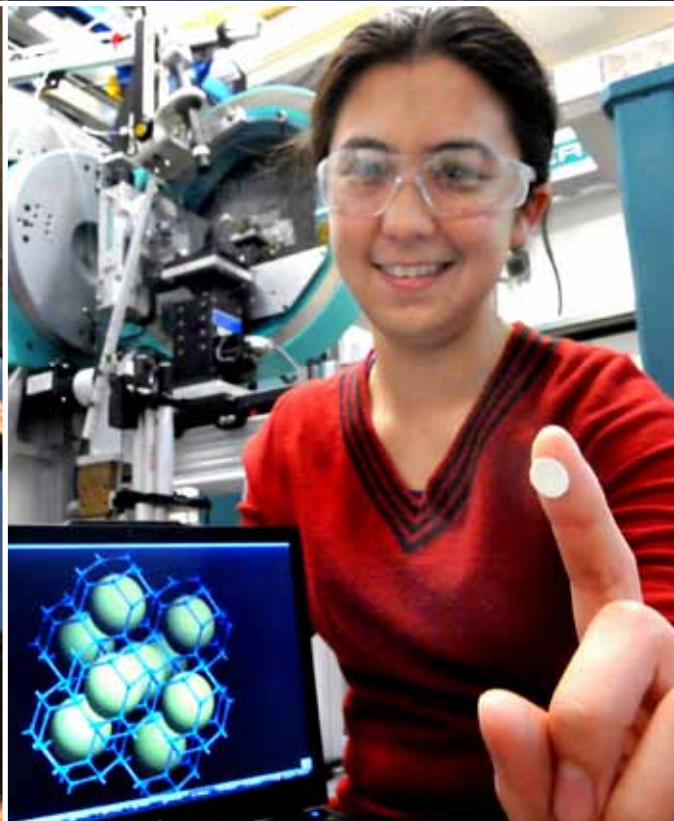
Science,  
Technology,  
Engineering, and  
Mathematics  
at UChicago



THE UNIVERSITY OF  
CHICAGO

UChicago





**Pursue supersymmetry.  
See the world at nanoscale.  
Experiment with the Gammasphere.  
Engineer an anode board.  
Create a nine-membered macrocycle.  
Tackle Galois theory.  
Explore quantum computing.  
Measure the big bang's afterglow.  
Imagine the unimaginable.  
Imagine yourself here.**

**University of Chicago scientists drive innovation.**

Our breakthroughs redefine how we understand the universe. The structure of DNA. Carbon-14 dating. The speed of light. And we continue looking ahead. Our researchers—undergraduates, PhD students, Fields Medalists, and Nobel laureates—harness cutting-edge technologies and employ forward-thinking approaches to challenge the world's greatest mysteries.

Our quest for new knowledge is never-ending.

**Help us define the next frontier.**

**ON COVER** Working with Argonne National Laboratory physicist Birger Back, Zach Grelewicz, AB'09, prepares a sensor-probe jig to measure the magnetic field inside an MRI magnet adapted for use in a spectrometer. While in the College, Grelewicz worked as a paid summer intern at Argonne, where he and Back recreated the conditions inside stars and supernovae.

**OPPOSITE (left to right from top)** Harold Clayton Urey, the Martin A. Ryerson Distinguished Service Professor in Chemistry at UChicago, received the 1934 Nobel Prize in Chemistry for his discovery of heavy hydrogen; graduate student Ye Fu researches the biochemical function of FTO, a protein associated with human obesity, in the Gordon Center for Integrative Science; the complex oxide molecular beam epitaxy instrument in the Center for Nanoscale Materials at Argonne National Laboratory; University scientists use the South Pole Telescope to help solve the cosmological mystery of dark energy; UChicago is a founding member of the Giant Magellan Telescope Organization, a project that will peer more deeply into the universe's history than humans have ever attempted; Argonne scientist Karena Chapman holds up a wafer of metal-organic framework ZIF-8 with its structure displayed on the computer screen; computer scientist Jean F. Hall at work on Argonne's first digital computer, which began operation in January 1953; a superconducting radio frequency cavity at Fermi National Accelerator Laboratory.



“The most important resources at UChicago are the people here. The physics professors are very welcoming of help from undergrads in their research. They’re willing to invest in their students, because they know that undergrads can make important contributions.”

**Michael Baumer, College Class of 2012,** physics and mathematics  
**What he did last summer:** Researched experimental fluid dynamics at the University of Chile in Santiago, an opportunity he found through the Chicago Materials Research Science and Engineering Center at UChicago.



**ABOVE** Michael Baumer hikes in the Atacama Desert outside of Santiago, Chile, during his summer abroad experience.

## CURRICULUM

# Advance Your Expertise

At UChicago, we straddle boundaries as we seek new and better approaches to today’s scientific quandaries. The physical and biological sciences share faculty and facilities. College and graduate students study and work together. Courses explore theories and engage students in hands-on application. Through our comprehensive, interdisciplinary programming, you’ll learn from the experts as you become one yourself.

### Getting at the Core



By partaking in the College’s Core curriculum, you’ll gain a wealth of knowledge while developing specialties. The

liberal arts background in natural and mathematical sciences, humanities, civilization studies, and social sciences provides a context for more advanced studies and builds the most fundamental skill in science: the ability to continue asking questions.

**ABOVE** (left) Assistant Professor Elisabeth Moyer teaches an undergraduate geophysical sciences course; (right) Associate Professor Juan Collar works in the sub-basement of the Laboratory for Astrophysics and Space Research on the UChicago campus.

### Beyond Essentials



The rigorous education of the Division of the Physical Sciences prepares students for specialties in many fields. The

program’s rich history includes 45 Nobel Prizes and 9 Fields Medals, including one in 2010. Most undergraduates in the division take advanced PhD courses during college. You can attain a bachelor of arts, bachelor of science, or joint bachelor of science and master of science degree in just four years, and you’ll have the flexibility to take courses in the University’s three other divisions: Biological Sciences, Humanities, and Social Sciences.

“In my industry, you have teams of hundreds of specialists coming together to create a video game. I think it’s been very helpful for me to have a UChicago background, where I received a solid understanding of many different subjects. In my career, I’ve been a programmer, a designer, a producer, a sound engineer. If I could draw, I would’ve tried being an artist. The greater understanding of the world I got at UChicago has allowed me to develop expertise, so I can bring all those disciplines together and effectively make one team out of the many contributors.” —Alex Seropian

**Alex Seropian, SB’91,** mathematics  
**Occupation:** Senior vice president and general manager of core games at Disney Interactive Media Group  
**First job after college:** Founding president of Bungie Software. Seropian met his business partner Jason Jones in an artificial intelligence course at UChicago, and the team went on to develop *Halo*, one of the most successful video game franchises of all time.



**RIGHT** Master Chief Petty Officer John-117, the protagonist of *Halo* and a video game icon.

### A Division United

Through the Physical Sciences Division’s broad curriculum, students can ponder the ocean’s origins as well as the universe’s limits. The division’s departments share facilities, scholars, and ideas.

#### DEPARTMENTS

Astronomy and Astrophysics  
Chemistry  
Computer Science  
Geophysical Sciences  
Mathematics  
Physics  
Statistics

#### COURSE SAMPLING

Introduction to Computer Vision  
Linear Models and Experimental Design  
Nuclei and Elementary Particles  
Organometallic Chemistry  
Spacetime and Black Holes  
Statistical Thermodynamics  
Introduction to Stochastic Processes  
Quantum Mechanics

**7**  
Rhodes Scholars  
in the last 5 years  
(tied for the most  
American Rhodes Scholars  
in 2011)



“One reason I chose UChicago is that the atmosphere is very open and intellectual. There’s a special attitude toward the sciences here; people are encouraging and friendly. I have yet to meet a faculty member who isn’t excited to talk about their research and willing to have you help out.”

**Karmela Padavić, College Class of 2014,** physics and mathematics

**Found at UChicago:** An intellectually curious community. “People here come from very different backgrounds, so you can learn quite a bit from your peers. It’s a support system, but it also adds to your learning process. People genuinely want to talk about the material outside of class.”

## RESEARCH

# Explore the Unknown

We believe big ideas come from fresh viewpoints. That’s why undergraduates are valued members of UChicago research teams. Our College, graduate, and faculty scientists travel to Switzerland to experiment with the Large Hadron Collider—the world’s largest and highest-energy particle accelerator—to find the most fundamental elements in existence. They collaborate across fields to build micro-channel plate photodetectors, technologies that could lead to better cancer imaging. And they trek 300 feet underground at the Chicagoland Observatory for Underground Particle Physics to discover the nature of dark matter—a mysterious substance accounting for nearly a quarter of the universe. In all our varying endeavors, we’re driven by a single commonality: an insatiable intellectual curiosity.

### A Tradition of Collaboration



Our history of interdisciplinary research dates back to 1945, when the James Franck Institute and the Enrico Fermi

Institute were founded to continue the collaboration that began on the Manhattan Project. Today, our new Institute for Molecular Engineering, the first of its kind, will explore biomolecular engineering and nanotechnology to address societal problems, from energy supply and human health to clean water production and quantum computing.

**ABOVE (left)** Olufunmilayo Olopade, the Walter L. Palmer Distinguished Service Professor in Medicine and Human Genetics, researches developmental factors in cancer by partnering with specialists across University divisions; **(right)** Peter Onyisi, profiled below.

### An Accelerated Start



As early as day one, you’ll be a key player in the University’s expansive research efforts, pairing with professors and working in state-of-

the-art facilities on campus or in either of the two national laboratories we manage for the U.S. Department of Energy. You can pursue research in multiple laboratories throughout your College experience. Department-sponsored fellowships support students who continue research over the summer, and many have their findings published in prestigious journals.

“In the College, I worked as a research assistant at Fermilab, examining data and working on collider detectors. That’s largely what I’m still doing today. It’s nice to be able to pose a question, find the tools you need to be able to answer it, and then answer it. That’s been possible through the University.” —Peter Onyisi

**Peter Onyisi, AB’03,** physics and applied mathematics  
**Occupation:** Fermi Post-doctoral Research Fellow at the University  
**Searching for:** Why we have mass in the universe, through experiments on the Large Hadron Collider. In the College, he won the LeRoy Apker Award, one of the nation’s highest honors for young physicists.

### Innovative Approaches

UChicago researchers work outside the box, fostering uncommon partnerships to redefine fields of study—and create new ones. The result? Some of the world’s most important discoveries.

#### NATIONAL LABORATORIES

Argonne National Laboratory  
Fermi National Accelerator Laboratory (Fermilab)

#### UCHICAGO RESEARCH INSTITUTES

Computation Institute  
Enrico Fermi Institute  
Institute for Biophysical Dynamics  
Institute for Molecular Engineering  
James Franck Institute  
Kavli Institute for Cosmological Physics

#### UCHICAGO BREAKTHROUGHS

The structure of DNA  
Genetic links to cancer  
The mathematical theory of black holes  
Carbon-14 dating  
REM sleep  
The speed of light  
The first controlled, self-sustaining nuclear chain reaction  
Proof of the big bang

nearly  
**\$500**  
MILLION  
in sponsored research  
awards each year



“Having a background in physics is great, because you can really do anything with it. I’m an engineer, and I think I’m more prepared than a lot of people who got very focused degrees in electrical engineering. I have different ideas because I was trained to think outside the box.”

**Maggie Lacovara, AB’09**, physics, multidisciplinary engineer at Raytheon Company

**Best UChicago takeaway:** Problem-solving and communication skills. “I’ve been able to advance pretty quickly in my career. Having the confidence to propose new ideas to my bosses, even though I’m the new kid, has been a very useful skill.”

“To be a good scientist or a good engineer, the most important thing is to have critical thinking skills, to be able to analyze problems. That’s what a UChicago degree gives you.”

**Phil Lacovara, AB’86**, physics, founding president of Ambalux Corporation, a developer and producer of electro-optic products

**UChicago life lesson:** Broader thinking makes for better business. “In the solar energy business, you need to know about finance, public policy, tax laws. It’s extremely valuable to be able to think about all the different pieces.”

**ABOVE** Maggie Lacovara followed in the footsteps of her father, Phil Lacovara, when she graduated from the University of Chicago in 2009.



## CAREERS

# Discover Your Future

The University of Chicago experience is open-ended—our ample resources help you choose your own trajectory. The abundant opportunities on campus give you the flexibility to evolve with the ever-changing fields of science, technology, engineering, and mathematics (STEM). Our rigorous education and supportive faculty and staff lay the groundwork off which to catapult to your future.

### An Environment of Support



Advising services through the Chicago Careers in Science and Technology program offer career support

to help students find internships, externships, research assistantships, fellowships, and innovation competitions. Faculty mentors work with students from day one to ensure they have the resources they need. In the College, students intern at CERN, Pfizer, the U.S. Environmental Protection Agency, Google, and many other organizations. Through a network of more than 147,000 alumni, students gain advice—and often job offers—to launch successful careers.

**ABOVE** (left) Graduate students Chunxiao Song, in blue, and Xingyu Lu collaborate on research in the Gordon Center for Integrative Science as part of Professor Chuan He’s research group; (right) Scott Durchslag, AB’87, is the president of Expedia Worldwide and the former COO of Skype.

### Garnering Prestige



College students are top earners of Marshall, Churchill, and Rhodes Scholarships and Fulbright and National Science

Foundation Fellowships. Many go on to pursue graduate degrees around the world, and 80 percent who apply are admitted to their top choice school. UChicago graduates work as software engineers for Apple, researchers at NASA, professors, patent lawyers, and entrepreneurs in high-tech fields. Regardless of career choice, University of Chicago alumni are leaders in their fields.

“I love developing new medicines; that’s my passion. Having a high quality science education from UChicago was really key. Beyond understanding the scientific advances we’re making, in my role as CEO, I need to be able to lead people, collaborate, and understand the business aspects of what we do. All that came from my time at UChicago.”  
—John Maraganore

**John Maraganore, AB’84, SM’85, PhD’86**, all in biochemistry and molecular biology  
**Occupation:** CEO of Alnylam Pharmaceuticals; inventor of Angiomax®, an anticoagulant used in 750,000 angioplasty patients every year  
**Why he’s a UChicago lifer:** “I fell in love with the research-oriented culture of UChicago as an undergrad.”

### Professions in the Field

Students gain hands-on experience at prestigious institutions around the country and throughout the world, where many land full-time positions after graduation. Through Career Advising and Planning Services, students travel the United States to network with industry leaders, and employers visit campus to recruit their next innovators.

#### EMPLOYER PARTNERS SAMPLING

Adler Planetarium  
Argonne National Laboratory  
Bulletin of the Atomic Scientists  
Centers for Disease Control and Prevention  
CERN—The European Organization for Nuclear Research  
Environmental Law and Policy Center  
Fermi National Accelerator Laboratory (Fermilab)  
Google  
Museum of Science and Industry  
National Institutes of Health  
Pfizer Pharmaceuticals  
Smithsonian Institution  
U.S. Environmental Protection Agency  
U.S. Food and Drug Administration  
Wideload Games  
And many others

**90%**  
of recent alumni

*land full-time positions or enroll in graduate and professional programs within 10 months of graduation*



## ALUMNI LEADERS IN STEM

**Luis Alvarez, SB'32, SM'34, PhD'36**, Nobel laureate in physics, 1968, for his decisive contributions to elementary particle physics, in particular the discovery of a large number of resonance states, made possible through his development of the technique of using hydrogen bubble chamber and data analysis

**Robert Bell, SM'73**, research scientist in AT&T Labs Research; 2003 AT&T Science and Technology Medalist

**George David Birkhoff, PhD 1907**, mathematician; winner of the first Bocher Memorial Prize for his memoir *Dynamical Systems with Two Degrees of Freedom*, 1917; founder of the ergodic theorem

**Herbert Brown, SB'36, PhD'38**, Nobel laureate in chemistry, 1979, for the development of the use of boron- and phosphorus-containing compounds, respectively, into important reagents in organic synthesis

**Jocelyn Carter-Miller, MBA'81**, president of Tech Edventures, Inc.; former corporate vice president and chief marketing officer of Motorola

**Casey Cowell, AB'75**, chairman and president of Durandal Inc.; cofounder of USRobotics; University trustee

**James Cronin, SM'53, PhD'55**, UChicago professor emeritus in physics; Nobel laureate in physics, 1980, for the discovery of violations of fundamental symmetry principles in the decay of neutral K-mesons

**Clinton Davisson, SB 1909**, Nobel laureate in physics, 1937, for the experimental discovery of the diffraction of electrons by crystals

**Arnold Donald, MBA'80**, chair of Missouri Botanical Garden's board of trustees; former president and chief executive officer of the Juvenile Diabetes Research Foundation International; former chairman and CEO of Merisant

**Jerome Friedman, AB'50, SM'53, PhD'56**, Nobel laureate in physics, 1990, for pioneering investigations concerning deep inelastic scattering of electrons on protons and bound neutrons, which have been of essential importance for the development of the quark model in particle physics

**Martin Gardner, AB'36**, author and columnist of "Mathematical Games" in the magazine *Scientific American*

**Mack Gipson, Jr., SM'61, PhD'63**, first African American to obtain a PhD in geology; founding advisor of the National Association of Black Geologists and Geophysicists; former consultant to NASA

**Marvin Goldberger, PhD'48**, physicist; former president of California Institute of Technology

**John Grunsfeld, SM'84, PhD'88**, former astronaut and NASA chief scientist

**Warren E. Henry, PhD'41**, physicist and professor of magnetism and superconductivity; developed video amplifiers used in portable radar systems on warships in World War II; his demonstration of the proof of noninteracting paramagnetic ions is used in a number of physics texts

**Donald Hopkins, MD'66**, vice president of health programs, the Carter Center; former deputy director, Centers for Disease Control and Prevention; recipient of the MacArthur Fellows "genius" grant

**Edwin Hubble, SB 1910, PhD 1917**, astronomer who found first evidence for the big bang theory

**Donald Johanson, AM'70, PhD'74**, paleoanthropologist who discovered "Lucy," a skeletal link between primates and humans

**Ernest Everett Just, PhD 1916**, zoologist, biologist, and physiologist who advocated the study of whole cells under normal conditions, rather than breaking them apart in a laboratory setting

**Karen Katen, AB'70, MBA'74**, senior advisor to Essex Woodlands Health Ventures; former vice chairman of Pfizer, Inc.; former president of Pfizer Human Health; University trustee

**Ernest Lawrence, X'23**, Nobel laureate in physics, 1939, for the invention and development of the cyclotron and for results obtained with it, especially with regard to artificial radioactive elements

**Tsung-Dao Lee, PhD'50**, won the 1957 Nobel Prize in Physics with **Chen Ning Yang, PhD'48**, for the penetrating investigation of the so-called parity laws that led to important discoveries regarding elementary particles

**Deborah Mack, AB'76**, chief scientific consultant for Terranova Pictures; project director for the *Africa* exhibition at Chicago's Field Museum

**Myrtle Potter, AB'80**, CEO and president, Myrtle Potter & Company; former president and chief operating officer, Genentech; former president, Bristol-Myers Squibb

**Janet Rowley, LAB'42, PhB'44, SB'46, MD'48**, discovered the link between genetics and cancer; National Medal of Science recipient, 1998; Presidential Medal of Freedom recipient, 2009

**Carl Sagan, AB'54, SB'55, SM'56, PhD'60**, astronomer; author of *Contact*; educator

**George E. Smith, SM'56, PhD'59**, Nobel laureate in physics, 2009, for the invention of an imaging semiconductor circuit—the CCD sensor

**Roger Sperry, PhD'41**, Nobel laureate in physiology or medicine, 1981, for his discoveries concerning the functional specialization of the cerebral hemispheres

**Jack Steinberger, SB'42, PhD'49**, Nobel laureate in physics, 1988, for the neutrino beam method and the demonstration of the doublet structure of the leptons through the discovery of the muon neutrino

**Edward Lawrie Tatum, X'31**, Nobel laureate in physiology or medicine, 1958, for the discovery that genes act by regulating definite chemical events

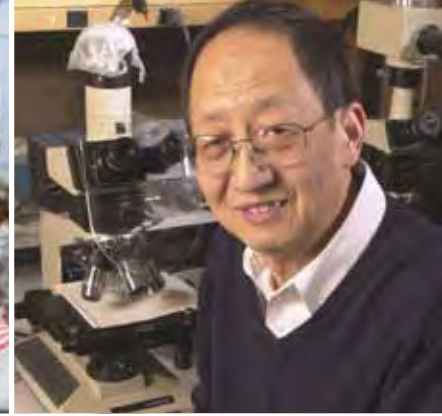
**Daniel Tsui, SM'63, PhD'67**, Nobel laureate in physics, 1998, for the discovery of a new form of quantum fluid with fractionally charged excitations

**James Dewey Watson, PhB'46, SB'47**, Nobel laureate in physiology or medicine, 1962, for discoveries concerning the molecular structure of nucleic acids and its significance for information transfer in living material

**Frank Wilczek, SB'70**, Nobel laureate in physics, 2004, for the discovery of asymptotic freedom in the theory of the strong interaction

**J. Ernest Wilkins, Jr., SB'40, SM'41, PhD'42**, a PhD in mathematics at age 19; second African American elected to the National Academy of Engineering

**OPPOSITE** (left to right from top) Janet Rowley, LAB'42, PhB'44, SB'46, MD'48; John Grunsfeld, SM'84, PhD'88; Daniel Tsui, SM'63, PhD'67; Myrtle Potter, AB'80; James Cronin, SM'53, PhD'55; Edwin Hubble, SB 1910, PhD 1917, photo courtesy of the Archives, California Institute of Technology; Karen Katen, AB'70, MBA'74; Tsung-Dao Lee, PhD'50, and Chen Ning Yang, PhD'48, photo courtesy of AIP Emilio Segre Visual Archives; Donald Johanson, AM'70, PhD'74; Marvin Goldberger, PhD'48, photo courtesy of the Archives, California Institute of Technology.







# THE UNIVERSITY OF CHICAGO

## Office of College Admissions

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“They do things at a very high level here. Undergraduate courses are advanced and challenging, and they strike a good balance between teaching the fundamentals and demonstrating the experimental applications. If you’re a smart person, you can really show that here.”

**William Letsou, SB’11**, chemistry

**Extracurriculars:** Playing viola in the University Chamber Orchestra, tutoring ESL students at William H. Ray Elementary School in Hyde Park, and studying polymer healing at the nanoscale through atomic force microscopy, a technique used in viewing surfaces that are several micrometers in size.

“We treat undergraduates as our colleagues, along with our grad students, postdocs, and professional engineering staff. Undergraduates work to discover dark matter, understand dark energy, and look for the Higgs boson and supersymmetry, as well as to design cutting-edge electronics. College students can be the ones to ask the most interesting questions in science.”

**Henry Frisch**, professor in physics and member of the Collider Detector at Fermilab collaboration

**Current research:** Searching for new states of matter, such as supersymmetric particles, to find signs of extraspatial dimensions.

## University Resources

**Division of the Physical Sciences** advances the fields of astronomy and astrophysics, chemistry, computer science, geophysical sciences, mathematics, physics, and statistics through cutting-edge research and scholarship.

[psd.uchicago.edu](http://psd.uchicago.edu)

**Division of the Biological Sciences** discovers and creates new knowledge of living systems, preserves and communicates knowledge through education, and nurtures and sustains a community of scholars.

[www.bsd.uchicago.edu](http://www.bsd.uchicago.edu)

**Career Advising and Planning Services** guides students and alumni through their career development process with preparation, opportunities, and connections.

[caps.uchicago.edu](http://caps.uchicago.edu)

**Institute for Biophysical Dynamics** aims to meet the challenges of achieving a molecular-level understanding of the structure, diversity, and function of biological entities.

[ibd.uchicago.edu](http://ibd.uchicago.edu)

**Institute for Molecular Engineering** will explore innovative technologies that address fundamental societal problems through modern advances in nanoscale manipulation and the ability to design at a molecular scale.

[molecularengineering.uchicago.edu](http://molecularengineering.uchicago.edu)

**Computation Institute** is both an intellectual nexus and resource center for those building and applying computational platforms for science.

[www.ci.anl.gov](http://www.ci.anl.gov)

**Enrico Fermi Institute** studies the physics of elementary particles, quantum field theory, theoretical astrophysics and solar physics, plasma physics, cosmology, and general relativity.

[efi.uchicago.edu](http://efi.uchicago.edu)

**James Franck Institute** is the premier institute in the United States for interdisciplinary research at the intersection of physics, chemistry, and materials science.

[jfi.uchicago.edu](http://jfi.uchicago.edu)

**Kavli Institute for Cosmological Physics** develops innovative approaches that combine physics and astronomy to further our understanding of the birth and evolution of the universe.

[kicp.uchicago.edu](http://kicp.uchicago.edu)

**Toyota Technological Institute at Chicago** is an affiliated academic computer science institute, dedicated to basic research and graduate education in computer science.

[ttic.edu](http://ttic.edu)

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