



# 100 Years

### of "California Institute of Technology"

In 1920, the institution originally founded as Throop University was reimagined and renamed as the California Institute of Technology. With a new focus on science and engineering, and the addition of graduate students to the campus, it became a true research institute. In the ensuing 100 years, Caltech has evolved into a world-leading hub of research and education, led by a diverse community of scientists, engineers, students, and staff members who have made a transformative impact on Southern California and across the globe.

"One of the striking aspects of the modern founders of Caltech was the risks they took at the beginning, and the courage they had in their convictions. ... I think it's that courage that is important to maintain."

-Caltech president Thomas F. Rosenbaum (2014-present)

# 50 Years

### of Female Undergraduates

Women were admitted to Caltech as undergraduates for the first time in the fall of 1970. Stephanie Charles, Deborah Chung, Sharon Long, and Flora Wu received bachelor's degrees in 1973; all four graduated with honors and pursued careers in STEM fields. Female graduate students had been admitted to the Institute two decades earlier, with Dorothy Ann Semenow the first woman to receive a Caltech PhD (in chemistry and biology) in 1955.

"It had always seemed to me that it was up to Caltech, for its own good as well as the good of society, to encourage those who reached the point of college admissions to go to as good a place as they could. And Caltech was such a place."

-Caltech president Harold Brown (1969-1977) on the admission of women to Caltech, which became Institute policy during his tenure



# Who we are

Together, Caltech's students, faculty, and postdoctoral scholars work to expand knowledge of the universe, shift paradigms, launch new fields, and invent the technologies of the future.

Undergraduate Students

**Graduate Students** 

**Student Life** 

**Postdocs** 

**Faculty** 

Alumni

# Undergraduate Students

Caltech students come to the Institute from all over the United States and across the globe, bringing diverse experiences, perspectives, and passions. They share an unbridled sense of curiosity and an extraordinary aptitude for science, engineering, technology, and math.



**Class of 2023:** 

236

undergraduate students

44%

women

32%

historically underrepresented minority groups

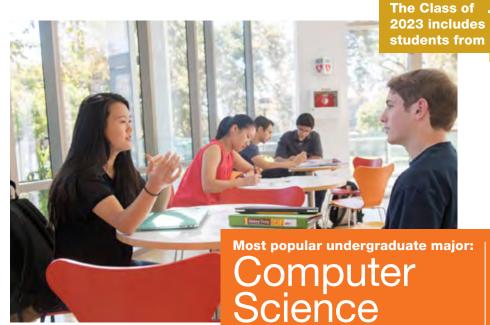
10%

first-generation college students

6%

first-year admission rate

\*measured by sex assigned at birth



| Student/faculty ratio:

countries.

3:1

"I have always wanted to use my education to make the world a better place. In addition to equipping me with the necessary foundational scientific principles, Caltech has shown me that meaningful interdisciplinary collaboration with my peers is key to achieving this goal."

- Rupesh Jeyaram (BS '20) Computer Science





Academic partnerships:

- Premed students work in area hospitals and train with practicing clinicians
- A dual-degree program is available for students from 13 select liberal-arts colleges
- Undergraduates can cross-register at Occidental College and ArtCenter College of Design
- Students can participate in ROTC through a joint program with USC
- Students can take part in collaborations with The Huntington Library, Art Museum, and Botanical Gardens

## **Undergraduate students** choose from

options (majors) among

academic divisions:

**Biology and Biological Engineering** 

**Chemistry and Chemical Engineering** 

**Engineering and Applied Science** 

**Geological and Planetary Sciences** 

**Humanities and Social Sciences** 

Physics, Mathematics and Astronomy

Research is an integral part of undergraduate education at Caltech. Students conduct hands-on research alongside some of the top faculty in the world and in some of the most innovative research facilities.



1/3

of Caltech undergraduates are involved in research throughout the academic year.

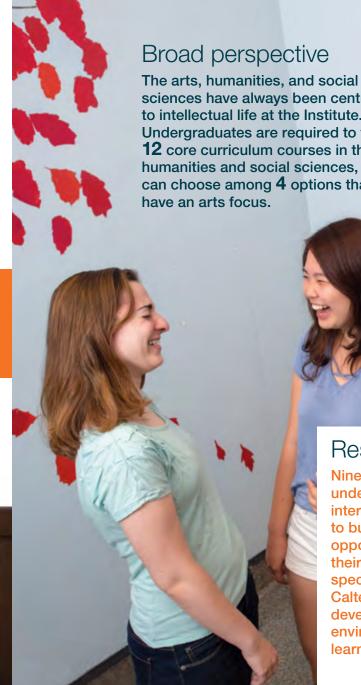
90%

of all Caltech undergraduates participate in SURF (the Summer Undergraduate Research Fellowships program), during which they spend 10 weeks working in labs on research projects. Through the Caltech-led **GROWTH** (Global Relay of Observatories Watching Transients Happen) collaboration, astronomyinclined undergraduates may spend up to 10 weeks at one of the network's partner institutions in Germany, Taiwan, India, Israel, Japan, or Sweden.

Students in the NASA/JPL **Summer Programs** live on campus and join a large community of undergraduate researchers.

"I spent the summer at Caltech developing an Al to track and identify cells in microscopy videos, helping pave the future of diagnosis technologies. I made so many incredible friends in my lab and was fortunate enough to co-author a few publications—a huge accomplishment having come into Caltech with no research experience at all!"

- Isabella Camplisson (BS '21) Computational and Neural Systems



sciences have always been central to intellectual life at the Institute. Undergraduates are required to take 12 core curriculum courses in the humanities and social sciences, and can choose among 4 options that

## Residential Experience

Nine student residences allow Caltech undergraduates to come together to share interests, perspectives, and passions, and to build unique experiences. Students have opportunities to take on leadership roles in their residences and to plan and organize special activities, events, and traditions. Caltech's Office of Residential Experience develops safe, engaging, and inclusive environments for all students that support learning and underscore personal growth.

## **Graduate Students**

Caltech's 1,300 graduate students pursue master's and doctoral degrees in 31 science and engineering degree options. The highly competitive graduate programs offer a combination of unparalleled research training along with strong but flexible curricula. Academics

Graduate students can enroll in Doctor of Philosophy and certain Master of Science degree programs. These programs weave together classroom education and research to develop students' abilities to independently formulate and conduct research programs. Graduate students work with faculty advisers and have opportunities to collaborate with scientists and engineers at JPL, LIGO, and other research centers around the world.

## The Graduate Student Council

(GSC) works to improve the academic, professional, and social experience of graduate students at the Institute. The GSC also oversees:

- The Everhart Lecture Series
- GSC teaching/mentoring awards
- The Graduate Research Spotlight Conference
- Educational and professional development workshops
- The Take a Professor to Lunch program
- The Graduate Student Underground Social Hour
- Club nights
- An off-campus spring formal
- Season-long intramural athletics leagues

## Housing

On the western edge of campus, the Catalina Apartments, or "the Cats," are a hub for Caltech's graduate community and provide housing for as many as 450 graduate students. Community events are frequently held in the Catalina recreation rooms, and residents also maintain a flourishing community garden.

Most popular options for graduate work are:

- ▶ chemistry
- physics
- electrical engineering
- → biology

"I'm interested in how innovative technology can make a dramatic difference in developing countries."

Daniel Mukasa
 First-year graduate student in materials science



## Joint Academic Programs

Caltech has MD/PhD programs with the USC **Keck School of Medicine, the UCLA David Geffen** 

> School of Medicine, and the Kaiser **Permanente Bernard J. Tyson School** of Medicine that allow students to carry out preclinical and clinical work toward an MD and pursue a PhD through research with a member of

the Caltech faculty.

An exchange program with the **Scripps Institution of Oceanography** at UC San Diego allows Caltech graduate students to conduct thesis research and receive credit for courses in this specialized field.

Fall 2019 Graduate Students:

269 students

/ O/ international

The top five countries from which these students come to Caltech are: China, Canada, India, South Korea, and Taiwan.





"Science is a collective story, one that we all tell together, and I'm beyond proud to represent my heritage while I participate in this grand endeavor."

- Shreyas Vissapragada Third-year graduate student in planetary science; 2019 recipient of a Paul & Daisy Soros Fellowship for New Americans

The **Center for Diversity** leads a range of programming and resources available to the entire campus.

The Career Development Center serves undergraduates, graduate students, postdocs, and alumni. The center provides career coaching, facilitates engagement with employers, and offers alumni mentoring and networking programs.

The **Caltech Y** offers numerous opportunities to participate in educational programs, outdoor adventures, community service, social activities, and cultural events.





The Caltech Beavers compete within the Southern California Intercollegiate Athletic Conference (SCIAC) in 16 NCAA Division III varsity sports.

There are more than 150 student clubs and sports organizations on campus. They range from juggling and alpine climbing to entrepreneurship and robotics.

2out of 3

Caltech undergrads play at least one musical instrument or sing with the Caltech Glee Club or Chamber Singers. 80%

of undergraduates participate in intercollegiate, club, intramural, or informal recreational activities.

The Caltech Symphony performs several concerts a year. Caltech musicians may also play with the Concert Band, the Caltech Jazz Band, or chamber music groups. These diverse, multigenerational groups include individuals from campus, JPL, and the local community.

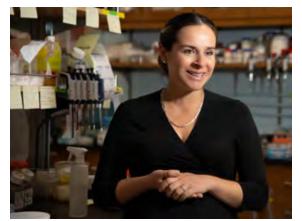
More than 500 early-career scientists and engineers conduct research in collaboration with faculty members on campus or at JPL.



## Caltech Postdoc Association (CPA)

Administered by postdocs in order to enrich the postdoctoral experience, the CPA's activities include:

- ► Social activities
- **▶** Biweekly hikes
- ► Postdoc Appreciation Week
- **▶** Career panels
- ► Networking activities
- ► Professional development workshops
- ► Opportunities to volunteer as science fair judges, visit area campuses as guest lecturers, and present at local schools' STEM fairs



"As a Latin American woman in science, it has been my dream to become a professor and to inspire a new generation of scientists in the U.S. and Latin America. This [Hanna Gray] fellowship is making that possible."

Elsy Buitrago-Delgado
 Postdoctoral Scholar, Biology, Howard Hughes
 Medical Institute Hanna Gray Fellow

## Honors

Postdoctoral alumni from Caltech have become leaders in academia, industry, and national laboratories. Former Caltech postdoctoral scholars have received 15 Nobel Prizes and 14 National Medals of Science and Technology.

"Being at Caltech opened my eyes. We economic theorists come up with problems that are real and relevant, but some of our solutions are impractical, with implicit assumptions of infinite time, resources, or data. It's nice to bounce problems off of each other and see whether they're interesting, or even solvable."

- Teddy Mekonnen

Linde Postdoctoral Fellow, Economics (2017-19)
now Assistant Professor of Economics at Brown University





#### 7 Nobel Laureates in Residence

**David Baltimore** (1975, Physiology or Medicine)

Rudy Marcus (1992, Chemistry)

David Politzer (2004, Physics)

Robert Grubbs (2005, Chemistry)

Kip Thorne (BS '62, 2017, Physics)

Barry Barish (2017, Physics)

Frances Arnold (2018, Chemistry)

### Caltech Faculty, Alumni, and Trustee Honors

**38** Nobel laureates (holding 39 Nobel Prizes)

**58** National Medal of Science recipients

**13** National Medal of Technology recipients

**37 percent** of faculty are members of the National Academies of Sciences, Engineering, and Medicine and/or are fellows of the American Academy of Arts and Sciences.



"The continued success of discovery at Caltech relies on our ability to take chances on people whose talent, drive, and creativity have the capacity to change the world."

- Caltech provost David A. Tirrell



Pauling Professor of Chemical Engineering, Bioengineering and Biochemistry, won the 2018 Nobel Prize in Chemistry.

"Being at Caltech has forced me to come out of my comfort zone and talk to scientists who come from different backgrounds and have very different perspectives. This is good for my science, because here my science can be more creative."

Shu-ou ShanAltair Professor of Chemistry



## Excellence in Teaching

The Feynman Prize for Excellence in Teaching annually honors a professor who demonstrates exceptional ability, creativity, and innovation in undergraduate and graduate classroom or laboratory teaching.



"Most students are willing to work very hard and dedicate substantial time and energy to learning if they know that what they are doing is worthwhile. That is why it is so important for them to know why a certain seemingly obscure mathematical concept or a physical phenomenon matters and where it fits in the grand scheme of things."

 Ali Hajimiri
 Bren Professor of Electrical Engineering and Medical Engineering and winner of the 2019
 Feynman Prize for Excellence in Teaching The Center for Teaching, Learning, and Outreach (CTLO) supports teaching at Caltech through programs and consultations on course and curriculum design, inclusive practices, educational innovation, and instructional technology. Signature CTLO programs include the annual TeachWeek conference and cohort programs for faculty, graduate students, and postdocs.



## The Al Pioneer

Fei-Fei Li (PhD '05) co-directs the Stanford Institute for Human-Centered AI and the Stanford Vision and Learning Lab. In 2017-2018, she was chief scientist of AI and machine learning for Google Cloud. Li is also the co-founder and chair of AI4ALL, a nonprofit committed to increasing diversity in AI, with a focus on high school students.





## The Heart Doctor

Andrew Freddo (BS '10) is currently in the second year of his residency at the University of Colorado Denver, pursuing a combined program in internal medicine and pediatrics. He plans to continue specialized training in adult congenital cardiology, which focuses on adults who grew up with pediatric heart problems.



## The Fusion Physicist

Tammy Ma (BS '05) is an experimental plasma physicist at the National Ignition Facility within the Lawrence Livermore National Laboratory and a vital member of its fusion code breaking team. Ma has received both a Presidential Early Career Award for Scientists and Engineers, and a Department of Energy Early Career Award.

## The Brewer

Diego Benitez (PhD '05) is the founder of Progress Brewing, a small microbrewery in L.A. County's San Gabriel Valley. Benitez, who opened the brewery with a fellow chemist in 2012, specializes in what he calls "drinkable beers that the majority of people will like—not just beer geeks."



## The Game Designer

Naomi McArthur (BS '13) designs online behavior systems for Riot Games, the company behind League of Legends (LoL), a popular video game. She also co-founded the Fair Play Alliance, a cross-industry initiative that spans more than 70 gaming companies dedicated to the interchange of research and best practices that help ensure fair play and reduce disruptive behavior.



# What we do

Caltech research provides solutions to the most complex global challenges of the 21st century. The discoveries Institute researchers make today will help fight disease, maximize environmental resources, advance quantum science, and mitigate the impact of natural disasters in the future.

Stay up to date with Caltech's latest discoveries at caltech.edu/news.

Research

**Research Centers** 

Instrumentation

JPI

Tech Transfer and Partnerships

**Community Connections** 

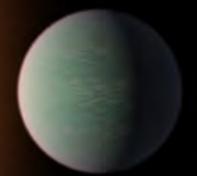
**Public Programs** 

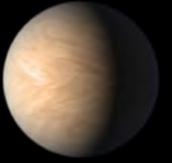
## Research

Caltech's contributions to science, engineering, technology, and society are made possible by the individuals recruited to join the Institute's community and the problems they choose to explore. The discoveries and solutions that emanate from campus and JPL are shaped by a combination of focus, intensity, and fearlessness.

# Next-generation Astronomy Caltech researchers have developed innover

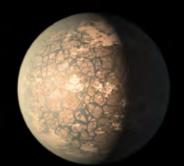
Caltech researchers have developed innovative technologies to peer into the fabric of the universe. In recent years, they have **discovered** a new class of supernovae and ancient galaxies, and, through LIGO, have advanced studies of black holes and other high-energy cosmic objects through the study of dozens of gravitational-wave signals detected over the past five years.

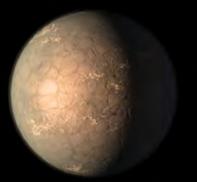














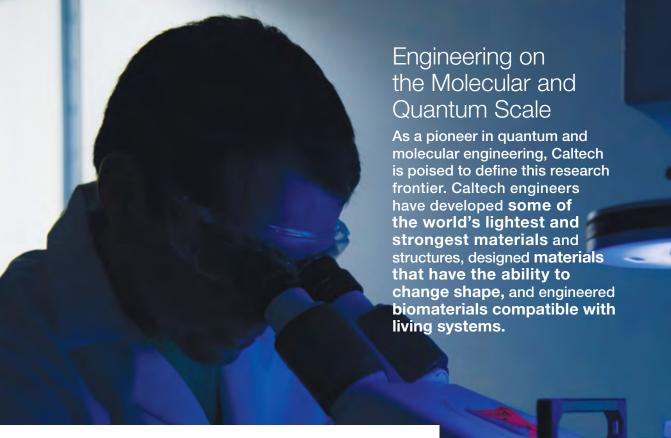
## Understanding Our World and Other Planets

Caltech has brought together once-discrete disciplines, such as astronomy, geology, biology, and chemistry, to answer fundamental questions about our planet and beyond. To that end, Caltech researchers have imaged earthquakes like 2019's Ridgecrest sequence with **unprecedented resolution**, and have used data from NASA's Spitzer telescope to reveal a system of **seven Earth-sized planets** orbiting the nearby star TRAPPIST-1.



## Sustainability 2.0

Caltech works to invent new methods for high-precision observation, measurement, and analysis of Earth's environment and the interconnected forces that have shaped it over millennia. Fueled by a \$750 million pledge by Stewart and Lynda Resnick, Institute researchers will investigate ways to develop efficient solar fuels and a smart electricity infrastructure; measure, model, and potentially mitigate climate change; effectively manage water resources; and create ways to improve soil fertility in a changing climate.



# Scientific Revolution Through Advanced Computing

Caltech leverages computational expertise across disciplines to redefine the ways scientists and policymakers alike approach problems in fields from economics to bioengineering. Institute scientists have engineered computer networks that **transfer data at record speeds**, transformed data analysis methods to **protect individuals' privacy**, and combined computer science with other disciplines to advance DNA computing, synthetic biology, and algorithmic game theory.

## Biology and Health

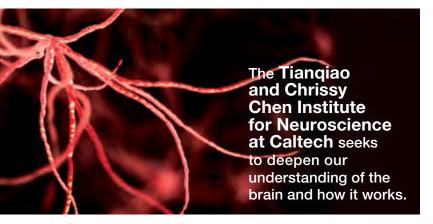
Caltech researchers use advanced techniques to study the brain and body at their most fundamental levels, and have developed therapies to fight diseases such as HIV/AIDS and cancer, harnessed gut bacteria for novel disease therapies, and advanced neural prosthetic implants to allow paralyzed patients more natural movement.



Pamela J. Bjorkman, David Baltimore Professor of Biology and Bioengineering, studies immune recognition of viral pathogens.

## Research Centers

Caltech's cross-disciplinary research centers and institutes bring together scientists and engineers to add innovative and diverse perspectives to the most important scientific questions of our time.

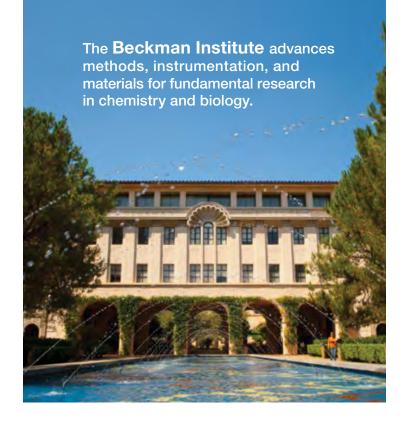


The Richard N.
Merkin Institute for
Translational Research,
established in 2019, will
help Caltech scientists
and engineers transform
their breakthroughs into
advances in human health.



"At Caltech, collaboration outside of your specific discipline is easy. You can walk out your door and talk to a theoretical computer scientist or a learning person or a vision person. You can live at the intersection of disciplines."

 Aaron Ames, Bren Professor of Mechanical and Civil Engineering and Control and Dynamical Systems



The Center for Autonomous Systems and Technologies (CAST) works to create the next generation of autonomous systems, advancing the fields of drone research, autonomous exploration, and bioinspired systems.

The **Kavli Nanoscience Institute** advances cross-disciplinary research in the areas of nanoscience and nanotechnology.

The Donna and Benjamin M. Rosen Bioengineering Center encourages intensive, fruitful collaborations among bioengineering researchers.

The Resnick Sustainability Institute fosters advances in energy science and technology through research, education, and communication.

A \$750 million pledge from Stewart and Lynda Resnick in 2019 supports innovative research into the most pressing challenges in environmental sustainability.



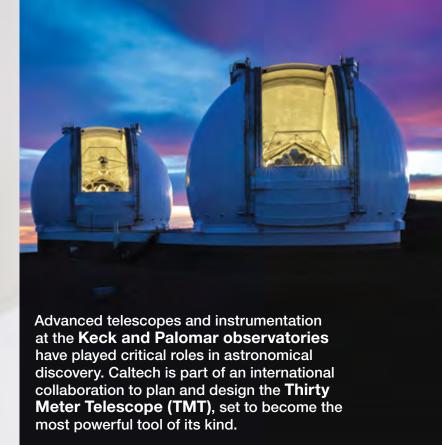
## Instrumentation

Caltech has a rich history in the development of instruments to tackle complex phenomena. The need for novel instrumentation intensifies with each discovery that pushes the frontiers of human understanding.

The Institute's research-grade wind tunnels are used to study fluid mechanics and to simulate conditions for hypersonic aircraft. Caltech's Center for Autonomous Systems and Technologies houses a real-weather wind tunnel in an enclosed aerodrome, focused on testing the stability and capabilities of drones and robots.

A state-of-the-science atmospheric chamber facility in the Ronald and Maxine Linde Center for Global Environmental Science is used to study the photochemical reactions of gaseous and particulate pollutants.

The Laser Interferometer Gravitational-wave Observatory (LIGO), which is operated by Caltech and MIT, made the first direct detection of gravitational waves, ripples in space and time, in 2015. Two vears later, LIGO measured gravitational waves produced during the collision of two neutron stars. This was validated by other observatories that captured infrared, X-rays, and other types of light from the same event.



Caltech scientists have designed a mass spectrometer that can measure the temperatures at which biological materials were formed.

Caltech's
Seismological
Laboratory is
renowned for
geophysical
exploration and is
the epicenter of
earthquake research.

The Jet Propulsion Laboratory (JPL), which is managed by Caltech for NASA, is the preeminent U.S. center for robotic space exploration. The campus and lab engage in collaborations and joint appointments of faculty, lecturers, and visitors who together

push the frontiers of space and Earth science.

NASA facilities at Caltech

IPAC

NASA Exoplanet Science Institute (NExScI)

Herschel Space Observatory

Galaxy Evolution
Explorer (GALEX)

Active missions include:

Mars Science Laboratory

Juno

Aquarius

GRAIL

NuSTAR

6,500

employees at the La

Caltech faculty started JPL in

1936

JPL is located

6 miles

from campus at the base of the San Gabriel Mountains

Mars 2020, NASA's next Mars rover, is set to launch in the summer of 2020. The mission, with Caltech geochemistry professor Ken Farley as project scientist, is part of **NASA's Mars Exploration** Program, a long-term effort to explore the Red Planet. The mission addresses high-priority science goals for Mars exploration, including central questions about the potential for life on Mars.



# Tech Transfer and **Partnerships**

With a tradition of innovation and entrepreneurship, Caltech ranks among the leading research institutions in its ability to translate scientific and engineering knowledge to the commercial sector. Caltech also continues to maximize its societal impact through partnerships with industry, the creation of new ventures, and the transfer of intellectual property.

In 2019: 1,969 active U.S. patents licenses (including options) material transfer agreements

Caltech's Office of Technology **Transfer and Corporate** Partnerships (OTTCP) helps scientists and engineers on campus and at JPL transfer the fruits of their research to the commercial sector.

In 2019, more than 130 companies sponsored or made a donation to support research at Caltech.

Between 2014 and 2019, Caltech led its peers with more than 1,000 U.S. patents issued.

The corporate partnerships team within OTTCP promotes the transfer of knowledge created by Caltech researchers through mutually beneficial relationships between industry and the Institute.

Mory Gharib (at right), the Hans W. Liepmann Professor of Aeronautics and Bioinspired Engineering at Caltech, and Jason Beith, lead designer of Caltech startup Foldax, with the long-lasting, inexpensive Tria heart valve they developed for patients with aortic valve disease



#### **HIGHLIGHTS:**

- ▶ Amgen and Caltech's ongoing partnership focuses on the biological sciences, specifically drug discovery, drug delivery, and diagnostics.
- ▶ Dow has enduring ties with Caltech; the two entities collaborate on projects that range from sustainability to materials chemistry to applied physics.
- ▶ Amazon Web Services has partnered with Caltech to launch a Center for Quantum Computing that will bring together the world's foremost quantum computing researchers and engineers in order to accelerate development of quantum computing hardware and software.
- ▶ Disnev Research collaborates with Caltech to work on robotic and artificial intelligence technologies that will more smoothly interact with humans.

# **Community Connections**

Caltech's outreach programs bring the excitement of scientific discovery to the local community. A vibrant and generous philanthropic community enables Caltech to take risks, provide an exceptional educational experience, and support high-impact research.

## **Explore Caltech**

This annual **open house event** presents family-friendly booths and short talks that celebrate science and engineering with the local community. Learn more at **explore.caltech.edu.** 

## Astronomy on Tap

Caltech astronomers share the wonder of discovery with the public through informal, monthly talks at Pasadena pubs,

complete with entertaining trivia quizzes and lively discussions.

# Educational Outreach

Caltech's **Science Nights** program features
demonstrations by
undergraduates, graduate
students, and postdocs at
schools across the San Gabriel
Valley. Caltech undergrads also
bring the language of computer
science to life for third, fourth,
and fifth graders in Pasadena
elementary schools.

To propel this extraordinary culture of innovation even further, in 2016, Caltech launched *Break Through: The Caltech Campaign*, the most ambitious initiative in the Institute's history. The campaign will help ensure that the Institute's scholars and researchers are able to pursue knowledge and discovery for generations to come.

## Caltech Associates

The intellectually curious, globally focused business and community leaders, entrepreneurs, and educators who join the **Caltech Associates,** the Institute's oldest and most constant support group, do so in order to seed groundbreaking innovations and elevate the impact of Caltech's transformative discoveries.



# Public Programs

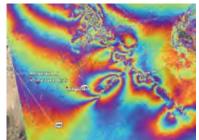
For more than 50 years, Caltech's public programs have drawn members of the greater Los Angeles community to campus to connect with Caltech, celebrate the sciences and the arts, and interact with each other. These programs and lecture series serve to introduce audiences to world-class scientists, artists, and speakers, making Caltech one of Southern California's acknowledged cultural centers.



The CaltechLive! performing arts series highlights diverse cultural expression and creativity. The 2019–2020 season includes performances ranging from award-winning a capella group Naturally 7 (left) to a one-woman show on "The Life and Times of A. Einstein."

Caltech's Signature Lectures are free and open to the public, and are geared toward a general audience as part of Caltech's commitment to bring science education to the local community. Many past lectures are available online at Caltech's YouTube channel.

- Named for the late Caltech professor Earnest C. Watson, who founded the series in 1922, the **Watson Lectures** (monthly during the school year) present campus and JPL researchers who share their work with the public.
- The monthly **Theodore von Kármán Lecture Series**, presented by JPL's Communications and Education Directorate, highlights exciting new developments in JPL's space research, exploration, and technology.





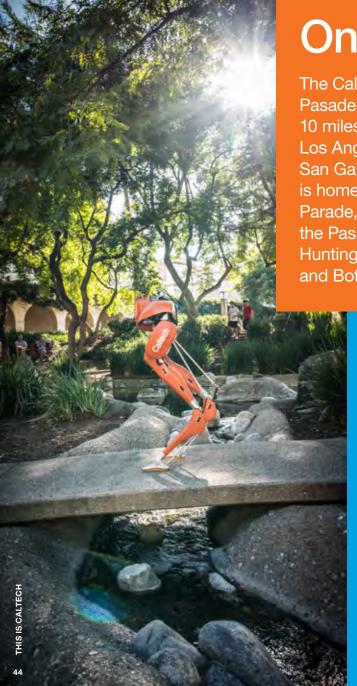


Why does quantum matter matter?









# On the Map

The Caltech campus is located in Pasadena, California, a vibrant city 10 miles northeast of downtown Los Angeles and minutes from the San Gabriel Mountains. Pasadena is home to the Tournament of Roses Parade, the Norton Simon Museum, the Pasadena Playhouse, and The Huntington Library, Art Museum, and Botanical Gardens.



**AVERAGE HIGH TEMPERATURE:** 

 $77^{\circ}$ F

124-acre campus



Produced by Caltech's Office of Strategic Communications

Caltech 1200 East California Blvd., Pasadena, CA 91125

#### **CAMPUS TOURS**

Prospective students are encouraged to visit campus and see life at Caltech firsthand. To find out more, visit admissions.caltech.edu

A self-guided walking tour is available at caltech.edu/documents/19/Walking\_Tour-REV.pdf

Architectural tours offer visitors and residents an up-close-and-personal perspective on Caltech. For reservations and information, call **626-395-4656**.

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