

APRIL 3, 2019 / 8 PM

TINY CHIPS FOR BRAIN-BODY-MACHINE INTERFACES

Azita Emami, *Andrew and Peggy Cherng Professor of Electrical Engineering and Medical Engineering; Investigator, Heritage Medical Research Institute; Executive Officer for Electrical Engineering*
Caltech Division of Engineering and Applied Science



Microscale implantable and wearable devices will one day transform the field of medicine. They enable continuous monitoring and closed-loop therapeutic systems that can help millions of patients suffering from chronic diseases such as diabetes and epilepsy. Current solutions are bulky, inefficient, hard to track, and do

not last very long inside the body. Azita Emami will discuss how to solve these problems and build microchips that can continuously and wirelessly monitor key biomarkers such as glucose. She will also present efficient personalized devices for future brain-machine interfaces.

THE VON KÁRMÁN LECTURE SERIES AT CALTECH

This monthly lectures series—which highlights exciting new developments in JPL's space research, exploration, and technology—made its debut on campus in July 2018.

Each lecture in the **Theodore von Kármán Lecture Series** is presented twice, once at the Lab and once on campus. For a full schedule of upcoming events, visit caltech.edu/public-events-series.

Each lecture is free and open to the public. No reservations are required.

APRIL 24, 2019 / 8 PM

CLOUDS AND CLIMATE TIPPING POINTS

Tapio Schneider, *Theodore Y. Wu Professor of Environmental Science and Engineering; Jet Propulsion Laboratory Senior Research Scientist*
Caltech Division of Geological and Planetary Sciences

Low clouds over subtropical oceans cool Earth's climate because they reflect most of the sunlight shining on them back to space. It is unclear, however, how the clouds themselves change with climate; this gives rise to large uncertainties in climate change projections. Tapio Schneider's lecture will show how advances in computing and satellite observations are enabling breakthroughs in the accuracy of climate projections. Such advances have already revealed a tipping point of the climate system: if greenhouse gas concentrations rise high enough, subtropical low clouds may melt away, triggering dramatic global warming.



MAY 29, 2019 / 8 PM

SUGARS: THE UNDERAPPRECIATED BUILDING BLOCKS OF LIFE

Linda Hsieh-Wilson, *Arthur and Marian Hanisch Memorial Professor of Chemistry*,
Caltech Division of Chemistry and Chemical Engineering

Sugars, also called glycans, are one of the four major classes of macromolecules that make up living systems (along with proteins, nucleic acids, and lipids). Glycans assemble into complex structures on the surfaces of cells, forming a thick, fuzzy coating that surrounds cells and modulates the ability of cells to communicate (with other cells). In her lecture, Linda Hsieh-Wilson will describe the development of new tools to help researchers uncover the roles of glycans in the brain, including their participation in neurological and psychiatric disorders such as Alzheimer's and autism.



On the cover: Kyle Pressel; top: Lia Halloran

THE EARNEST C. WATSON LECTURE SERIES

is named for Earnest C. Watson, who was a professor of physics at Caltech from 1919 until 1959. Spotlighting a small selection of the pioneering research Caltech's faculty is currently conducting, the Watson Lectures are geared toward a general audience, as part of the Institute's ongoing commitment to benefiting the local community through education and outreach. Through a gift from the estate of Richard C. Biedebach, the lecture series is able to highlight an assistant professor's research each season.

TIME & LOCATION Lectures are on Wednesdays at 8 p.m. in Beckman Auditorium, 332 S. Michigan Ave., Pasadena, CA 91125.

ADMISSION & SEATING A minimum of 700 seats are available on a free, no-ticket-required, first-come, first-served basis, beginning at 7:30 p.m. each lecture evening.

PARKING Parking is free, with no permit required, after 5 p.m. on weekdays and all day on weekends. There are parking structures at 341 and 405 S. Wilson Ave.

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For information about our assistive services, please call us at 626-395-4652, Monday through Friday, 10 a.m. to 4:30 p.m.

FRIENDS OF BECKMAN AUDITORIUM We invite you to join the Friends of Beckman Auditorium, a support group that helps Caltech's educational outreach programs. Membership includes priority seating for the Watson Lecture Series. For information, call the Friends Service Desk at 626-395-6400, Monday through Thursday, 10 a.m. to 2 p.m.

CALTECH ASSOCIATES Priority, reserved-section tickets are available to members of the Caltech Associates. For more information, call the Associates office at (626) 395-6392 or visit associates.caltech.edu to learn how to join.

CALTECH TICKET OFFICE (100-6)
1200 E. California Blvd., Pasadena, CA 91125-9200 (Located in the Keith Spalding Building at the corner of California Blvd. and Wilson Ave.)
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2018-2019

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SINCE 1922, THE EARNEST C. WATSON LECTURE SERIES HAS BROUGHT CALTECH'S MOST INNOVATIVE SCIENTIFIC RESEARCH TO THE PUBLIC.

OCTOBER 31, 2018 / 8 PM

SPACE SOLAR POWER: A NEW BEGINNING

Sergio Pellegrino, *Joyce and Kent Kresa Professor of Aerospace and Civil Engineering; Jet Propulsion Laboratory Senior Research Scientist; Co-Director, Space-Based Solar Power Project*
Caltech Division of Engineering and Applied Science

In 1968, Peter Glaser, the father of space solar power, envisaged kilometer-scale space systems comprising solar collectors and transmitting antennas that would beam power to the earth from geostationary orbit, but that dream has remained elusive. Until now. In his talk, Sergio Pellegrino will discuss the Caltech Space Solar Power Project's pursuit to conceive, design, and demonstrate a scalable vision for a constellation of ultralight, modular spacecraft that collect sunlight, transform it into electrical power, and wirelessly beam that electricity to the earth. The basic module of this future solar power system is a giant coilable structure that elastically deploys after launch into orbit, and is made of paper-thin materials of high stiffness.



NOVEMBER 28, 2018 / 8 PM

WORLD'S DEEPEST-PENETRATION AND FASTEST OPTICAL CAMERAS

Lihong V. Wang, *Bren Professor of Medical Engineering and Electrical Engineering*
Caltech Division of Engineering and Applied Science

In his talk, Lihong Wang will discuss the development of photoacoustic tomography, which allows scientists to peer deep into biological tissue. He will also talk about his lab's development of compressed ultrafast photography that records 10 trillion frames per second. At 10 orders of magnitude faster than commercially available technologies, it can capture light propagation, the fastest phenomenon in the universe.

FEBRUARY 27, 2019 / 8 PM

— Robert F. Christy Lecturer —

MY HALF-CENTURY ROMANCE WITH CALTECH AND WITH BLACK HOLES, WORMHOLES, TIME TRAVEL, AND GRAVITATIONAL WAVES

Kip Thorne (BS '62), *Richard P. Feynman Professor of Theoretical Physics, Emeritus,*
Caltech Division of Physics, Mathematics and Astronomy

When Kip Thorne arrived at Caltech as a freshman in 1958, the “warped side of our universe”—objects and phenomena made from warped space and time—was a far-out speculation. In his talk, Thorne will describe how he and colleagues transformed a portion of that warped side (black holes and gravitational waves) into firmly established and observed phenomena, and discuss what they have learned about another portion (wormholes and time travel). He will also speculate on future warped-side discoveries about the birth of our universe and of the laws that govern it.



JANUARY 16, 2019 / 8 PM

— Biedebach Memorial Lecture —

THE LONG-RUN BEHAVIOR OF RANDOM WALKS

Omer Tamuz, *Assistant Professor of Economics and Mathematics*
Caltech Division of the Humanities and Social Sciences

Random walks—trajectories formed by successions of random steps—have been studied for more than a hundred years as important models in physics, computer science, finance, and economics, and as interesting mathematical objects in their own right. Still, many simple questions remain unanswered, and are the subject of current research. In his talk, Omer Tamuz will describe some classical results, introduce random walks on groups and graphs, present some open questions regarding their long-run behavior, and talk about the solution of a longstanding problem as well as a surprising connection to economics.



FEBRUARY 13, 2019 / 8 PM

PLANT GROWTH: HOW STEM CELLS MAKE STEMS

Elliot M. Meyerowitz, *George W. Beadle Professor of Biology; Investigator, Howard Hughes Medical Institute*
Caltech Division of Biology and Biological Engineering

Plants are the dominant source of our food, clothing, shelter, and many pharmaceutical drugs, yet we know very little about how they live and grow. Elliot Meyerowitz's laboratory studies the collections of stem cells that create stems, leaves, and flowers, focusing on the spiral phyllotaxis pattern, in which successive leaves or flowers appear at angles of roughly 140 degrees. In his talk, Meyerowitz will describe how this pattern forms, answering questions that long have intrigued mathematically inclined biologists and revealing surprising modes of communication between plant stem cells.

