Caltech Alumni Association Board (2016–17)

Executive Committee
David Tytell (BS ’99)  
President

Chris Bryant (BS ’95)  
Vice President

Anthony Chong (BS ’10)  
Treasurer

Satoshi Ohtake (BS ’00)  
Secretary

Lee Fisher (BS ’78)  
Past President

Directors
Jennifer Blank (MS ’88, PhD ’93)  
César Bocanegra (BS ’95)  
Jasmine Bryant (BS ’95)  
Laura Conwill (BS ’12)  
Kjerstin Easton (BS ’00, MS ’02, PhD ’06)  
Jennifer Lee (PhD ’10)  
Keith Karasek (BS ’74)  
Stephen Lichten (PhD ’84)  
Kent Noble (BS ’87)  
Carol Nottenburg (BS ’74)  
Sandra Ottensmann (BS ’05)  
Anneila Sargent (MS ’67, PhD ’77)  
Terry Yeh (BS ’89)

2017 Seminar Day Committee

Ira Moskatel (BS ’72)  
General Chair

Jennifer Blank (MS ’88, PhD ’93)  
Hannah Carbone (PhD ’99)  
Robert Gershman (BS ’82)  
Peter Groom (BS ’75)  
Jon Hamkins (BS ’90)  
Gregory Holk (MS ’91, PhD ’97)  
David Holtz (BS ’64)  
Peter Hung (BS ’08, MS ’12, PhD ’16)  
Julie Jester (BS ’14)  
Michael Krieger (BS ’63)  
Paul Levin (BS ’72)  
Oliver Loson (PhD ’14)  
Susan Murakami (BS ’75)  
Emilio Sovero (BS ’70, MS ’71, PhD ’77)  
Mike Stefanko (BS ’70)  
Gary Stupian (BS ’61)  
Daniel Whelan (BS ’79, MS ’81, PhD ’85)  
David Zobel (BS ’84)  
Elizabeth Emerald, Staff

Emily Fischer, Staff

Caltech Alumni Relations

Alexx Tobeck  
Executive Director, Caltech Alumni Association & Director, Alumni Relations

Emily Fischer  
Associate Director, Alumni Relations

Elizabeth Emerald  
Coordinator, Alumni Relations

Sherry Winn  
Coordinator, Membership

---

Front cover: By the renowned artist Don Clark for Invisible Creature who also created the Grand Tour poster for JPL as part of their series, “Visions of the Future”, this artwork was commissioned expressly to celebrate Caltech alumni and their broad impact on the world.
<table>
<thead>
<tr>
<th>Page</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Reunion Weekend Schedule</td>
</tr>
<tr>
<td>14</td>
<td>Seminar Day</td>
</tr>
<tr>
<td>15</td>
<td>Seminar Day Schedule</td>
</tr>
<tr>
<td>16</td>
<td>General Session</td>
</tr>
<tr>
<td>18</td>
<td>Seminar Day at a Glance</td>
</tr>
<tr>
<td>20</td>
<td>Abstracts</td>
</tr>
<tr>
<td>30</td>
<td>Information and Map</td>
</tr>
</tbody>
</table>
2017
REUNION WEEKEND
May 18–21
## AT A GLANCE SCHEDULE


<table>
<thead>
<tr>
<th>Day</th>
<th>Page</th>
<th>Events</th>
<th>Reunion Dinners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thursday</td>
<td>4</td>
<td>Class of 1967 Kickoff Luncheon, Tours, President’s Reception</td>
<td>'47, '52, '57, '62, '67</td>
</tr>
<tr>
<td>Friday</td>
<td>5</td>
<td>Half Century Club Luncheon, Caltech Women’s Network, Tours and Poster Sessions, Torchbearer Social, Caltech Fund Party, After Party</td>
<td>'67, '72, '77, '82, '87, '92, '97, '02, '07, '12, Flem's and Friends</td>
</tr>
<tr>
<td>Saturday</td>
<td>9</td>
<td>Seminar Day, Distinguished Alumni Awards, All Alumni Lunch, Class of 1957 Lunch, Tours and Poster Sessions, Family Activities, All Alumni BBQ, SURF, LGBTQ+</td>
<td>Page, Fleming, Avery, Lloyd</td>
</tr>
<tr>
<td>Sunday</td>
<td>13</td>
<td>Caltech Y Lunch, Athletics Hall of Honor, Alumni of Color Luncheon</td>
<td>Blacker, Ricketts, Ruddock, Dabney</td>
</tr>
</tbody>
</table>
**THURSDAY MAY 18**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:00 a.m.</td>
<td>Admissions Office Campus Tour and Information Session</td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Class of 1967 – Registration and Lunch</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>The Huntington Estate Tour</td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Gamble House Tour</td>
</tr>
<tr>
<td>6:00 p.m.</td>
<td>President’s Reception</td>
</tr>
<tr>
<td>7:30 p.m.</td>
<td>Reunion Dinners for Classes of ’47, ’52, ’57, ’62, ’67</td>
</tr>
</tbody>
</table>

### Admissions Office Campus Tour and Information Session
The best way to learn about Caltech today is to experience it firsthand. Caltech’s Admissions Office provides campus tours that offer an insider's perspective on what makes Caltech unique—from its innovative curriculum and student traditions to its world-class faculty and legacy of pioneering research.

- 10:00 – 11:15 a.m.  Tour
- 11:15 – 12:00 p.m.  Information Session

**Admissions Office, 383 S. Hill Ave.**
questions: (626) 395-6341; please specify Reunion Weekend

### Class of 1967 – Registration and Lunch
Kickoff celebration for the 50th reunion of the Class of 1967.

**Alumni House, 345 S. Hill Ave.**  |  $25

### The Huntington Estate Tour
One-hour private, docent-led outdoor tour. Guests welcome to stay and explore the gardens until closing.

**1151 Oxford Rd., San Marino**  |  $28
meet at The Huntington; transportation not provided

### Gamble House Tour
One-hour private, docent-led tour of an outstanding example of American arts-and-crafts style architecture.

**4 Westmoreland Place, Pasadena**  |  $13
meet at the Gamble House; transportation not provided

### President’s Reception
President Thomas F. Rosenbaum and Professor Katherine T. Faber welcome members of the classes of ’47, ’52, ’57, ’62, and ’67 back to Caltech at a special reception at their residence.

**President’s House**

### Reunion Dinners for Classes of ’47, ’52, ’57, ’62, ’67
Athenaeum, 551 S. Hill Ave.  |  $75
<table>
<thead>
<tr>
<th>Time</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 a.m.</td>
<td>Continental Breakfast: Start your day with fellow Techers and enjoy coffee and a continental breakfast in the garden of Alumni House.</td>
</tr>
<tr>
<td></td>
<td>*Alumni House, 345 S. Hill Ave.</td>
</tr>
<tr>
<td>9:30 a.m.</td>
<td>Campus Architectural Tour: Discover how architects developed a campus of great beauty to house academic buildings and high-tech laboratories so that scientists and engineers would become more aware of the aesthetic values of life.</td>
</tr>
<tr>
<td></td>
<td>9:30 a.m. Tour departs</td>
</tr>
<tr>
<td></td>
<td>*Alumni House, 345 S. Hill Ave.</td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td>Illustrated Lecture: Learn about the history of Caltech’s architecture from Romy Wyllie, author of <em>Caltech’s Architectural Heritage: From Spanish Tile to Modern Stone</em> and director of the Caltech Architectural Tour Service (CATS).</td>
</tr>
<tr>
<td>10:00 – 10:45 a.m.</td>
<td>Walking Tour: See Caltech from a new perspective (and discover some hidden treasures) through a walking tour led by members of CATS, a service provided by the Caltech Women’s Club. Tour will end at the Athenaeum.</td>
</tr>
<tr>
<td>10:00 – 12:00 p.m.</td>
<td>Admissions Office Campus Tour and Information Session: The best way to learn about Caltech today is to experience it firsthand. Caltech’s Admissions Office provides campus tours that offer an insider’s perspective on what makes Caltech unique—from its innovative curriculum and student traditions to its world-class faculty and legacy of pioneering research.</td>
</tr>
<tr>
<td></td>
<td>10:00 – 11:15 a.m. Tour</td>
</tr>
<tr>
<td></td>
<td>11:15 – 12:00 p.m. Information Session</td>
</tr>
</tbody>
</table>

*Admissions Office, 383 S. Hill Ave.
questions: (626) 395-6341; please specify Reunion Weekend*
**Caltech Women's Network**

Celebrate and be inspired by your vibrant Caltech network of fellow alumnae and current female students. Join us for this meaningful opportunity to connect with other extraordinary women by sharing experiences and perspectives, both personal and professional.

Remarks by Michaeleen Doucleff (BS '98), Science Reporter for NPR.

11:00 a.m. Reception
12:00 p.m. Lunch

*Alumni House, 345 S. Hill Ave. | $40*

---

**Half Century Club Luncheon**

The Half Century Club is a special group of Caltech undergraduate and graduate alumni who received their degrees 50 or more years ago. Members of the club are invited to join us for this year’s luncheon and induction of the Class of 1967.

12:00 p.m. Reception
12:30 p.m. Lunch
After Lunch Class of ’67 Group Photo

*West steps of the Athenaeum*

*Athenaeum, 551 S. Hill Ave.*

**Half Century Club members and guests | $30*”

*Members of the classes of ’47, ’52, ’57, ’62, and ’67 are offered one free ticket to the Half Century Club Luncheon.

---

**Computing and Mathematical Sciences**

*“Meeting of the Minds”*

1:30 p.m. – 3:00 p.m. Spotlight Talks

105 Annenberg

Presentations by faculty and students will highlight the latest cross-disciplinary research in CMS, including topics in machine learning and robotics.

3:00 p.m. – 5:00 p.m. Poster Reception

*Outdoor vicinity north of Annenberg Building*

Join faculty, students, and researchers for a discussion and poster session of ongoing research from undergraduates, graduate students, and faculty that explores the concept of “CS + x”: disrupting science and engineering with computational thinking. Research presented will be wide-ranging, featuring the intersection of fields such as quantum computing, molecular programming, machine learning, big data, robotics, and autonomous systems.
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00 p.m.</td>
<td><strong>The Huntington Estate Tour</strong></td>
<td>One-hour private, docent-led outdoor tour. Guests welcome to stay and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>explore the gardens until closing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1151 Oxford Rd., San Marino</td>
</tr>
<tr>
<td></td>
<td></td>
<td>meet at The Huntington; transportation not provided</td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td><strong>Torchbearer Social</strong></td>
<td>Torchbearers and guests are invited to a casual afternoon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>of conversation and camaraderie. Complimentary drinks and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>hors d'oeuvres.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Athenaeum Rathskeller, 551 S. Hill Ave.</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td><strong>Applied Physics/Materials Science Laboratories</strong></td>
<td>Take a self-guided tour and join us for a poster session on current</td>
</tr>
<tr>
<td></td>
<td></td>
<td>research. A small reception will be held in the Watson lobby with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>faculty and graduate student representatives.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Watson Laboratories</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td><strong>Electrical Engineering Laboratories</strong></td>
<td>Alumni and guests are invited to visit the Electrical Engineering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Laboratory for a self-guided tour and poster session where faculty</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and students will be available to discuss their current research</td>
</tr>
<tr>
<td></td>
<td></td>
<td>activities. Light refreshments will be served.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moore Laboratory / Lobby</td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td><strong>Gamble House Tour</strong></td>
<td>One-hour private, docent-led tour of an outstanding example of</td>
</tr>
<tr>
<td></td>
<td></td>
<td>American arts-and-crafts style architecture.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 Westmoreland Place, Pasadena</td>
</tr>
<tr>
<td></td>
<td></td>
<td>meet at the Gamble House; transportation not provided</td>
</tr>
<tr>
<td>5:30 p.m.</td>
<td><strong>Caltech Fund Party and Cocktails</strong></td>
<td>Connect with fellow alumni and the Class of 2017 at our cocktail</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reception honoring Techers who have contributed toward their</td>
</tr>
<tr>
<td></td>
<td></td>
<td>reunion and celebrating Caltech's community of supporters. Make</td>
</tr>
<tr>
<td></td>
<td></td>
<td>sure to snap a picture in our fun photo booth, and don’t miss the</td>
</tr>
<tr>
<td></td>
<td></td>
<td>opportunity for a group shot with your classmates. Hosted by</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the Caltech Fund.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Athenaeum Lawn, 551 S. Hill Ave.</td>
</tr>
</tbody>
</table>
CLASS REUNIONS

7:30 p.m. – 10:00 p.m.

Class of ’67 Buffet
Alumni House, 345 S. Hill Ave. | $60

Classes of ’72, ’77, ’82, ’87, ’92, ’97, ’02 Dinners
Flems and Friends Asynchronous Reunion ’74–’81
Athenaeum, 551 S. Hill Ave. | $75

Classes of ’07, ’12 Dinners
Hosted by the Caltech Alumni Association and the Caltech Fund.
Athenaeum, 551 S. Hill Ave. | Free for members of the classes of ’07 and ’12 and one guest.

10:00 p.m. – 1:00 a.m.

After Party @ Tom Mannion’s House
Join Tom Mannion and fellow young alumni for a late-night hangout with tasty bites and beverages. Make memories with your friends in our photo booth! Hosted by Caltech Fund.
400 S. Hill Ave. | Classes of ’92–’17

80TH ANNUAL SEMINAR DAY

SATURDAY, MAY 20
Full schedule and abstracts pp.14–29
SATURDAY MAY 20

The following Saturday events are open to all Reunion Weekend and Seminar Day attendees, unless otherwise noted.

10:00 a.m. – 12:00 p.m.

**Caltech Seismological Laboratory Exhibit Center**

Caltech, along with the U. S. Geological Survey, UC Berkeley, and the California Geological Survey, is coordinating earthquake monitoring efforts under the California Integrated Seismic Network (CISN). We will display the project’s exciting capabilities, including an Internet-based, real-time ground-shaking map called ShakeMap used by critical users of earthquake information and demonstrate the earthquake early-warning system currently under development, as well as other ongoing research.

*Seismo Lab Exhibit, First Floor*
*The Media Center, Room 269*

10:30 a.m. – 12:30 p.m.

**FAMILY ACTIVITY**

**Playdate**

Connect with other Techer families while the kids burn off some energy on the playground. Healthy snacks and beverages provided.

**Science and SWEets**

Join the Caltech Society of Women Engineers (SWE) in introducing your kids to the wonderful world of science. From interactive demos to liquid-nitrogen ice cream, there are plenty of activities for all Techer families. After all, does ice cream have an age limit?

*Tournament Park, South of Campus*

11:30 a.m. – 12:30 p.m.

**Linde + Robinson Laboratory for Global Environmental Science**

Renamed in honor of alumnus Ronald K. Linde (MS ’62, PhD ’64) and his wife, Maxine, the Linde + Robinson Laboratory for Global Environmental Science sets new standards in green design, with innovations from heating, cooling, and air-conditioning to a visionary repurposing of the historic solar telescope. Tour guests will learn about the building’s unique features and the groundbreaking research taking place here.

*60-minute tours depart from the East Patio at 11:30 a.m. and 1:00 p.m.*
*wheelchair access is via the north door*
SATURDAY MAY 20

11:30 a.m. - 1:30 p.m.

The Science of TV’s *The Big Bang Theory*

Now in its tenth season, CBS’s top-rated sitcom *The Big Bang Theory* features a group of brilliant young scientists and engineers living in Pasadena and (ostensibly) working at Caltech. Amazingly, even though the characters are 100 percent fictional, their techno-talk is 100 percent real. Find out what the show gets right as author Dave Zobel (BS ’84) speaks about his book *The Science of TV’s “The Big Bang Theory”* and answers questions.

*Caltech Store*

12:00 p.m. - 2:00 p.m.

Sherman Fairchild Library

Librarians will be discussing trends in scientific communication, digital publishing, and the changing role of the 21st-century research library. Please stop by with your questions.

12:00 p.m. - 2:00 pm

Caltech Y

Stop by the Caltech Y’s table to hear about current Y programs. Alumni are also invited to attend our luncheon on Sunday (see page 13).

*Beckman Mall*

12:30 p.m. - 2:00 p.m.

Graduate Student Poster Session

Graduate students from across divisions and options will present research posters on their cutting-edge science. Sponsored by the Graduate Student Council.

*Beckman Institute, Outside Courtyard*

12:30 p.m. - 2:00 p.m.

All Alumni Lunch

Reserve a tasty box lunch and join fellow alumni under the big tent, or bring your own picnic and spread your blanket on the lawn.

*Beckman Mall (Registration Tent) / $15*

12:30 p.m. - 2:00 p.m.

Class of 1957 Luncheon

*Tom Mannion’s House, 400 S. Hill Ave. / $30*
### The Joint Center for Artificial Photosynthesis
The Joint Center for Artificial Photosynthesis (JCAP) is the nation’s largest science-and-technology research program dedicated to the advancement of solar fuels. Established in 2010 as a U.S. Department of Energy (DOE) Energy Innovation Hub and led by Caltech, JCAP aims to find new and effective ways to produce fuels using only sunlight, water, and carbon dioxide. The center brings together world-class scientists and engineers under the roof of a newly renovated Jorgensen Laboratory building, outfitted with state-of-the-art facilities and instruments. For more information on JCAP, please visit our website: www.solarfuelshub.org.

*Tour times 1:00 p.m. and 1:30 p.m.*  
*Sign-up during Seminar Day registration on Saturday for this 30-minute tour; participation limited to 30 per tour*

### Board Game Social
Game on! Match wits with fellow Techers and gamers in games of knowledge, strategy, conquest, and chance. Players of all levels welcome. Settlers of Catan, Dominion, Ticket to Ride, and more will be provided—or bring one of your favorites. All gamers are welcome!

*Caltech Store Lounge*

### SURF Reunion
Since 1979, more than 4,000 Caltech students have participated in the Summer Undergraduate Research Fellowship (SURF) program. If you were a SURFer, or are a friend of the program, please join us to reconnect with former classmates, chat with current SURF students, and learn about what’s new in undergraduate research at Caltech.

*Parson-Gates Lawn / open to all*

### All Alumni Barbecue
Bring the family to the big tent for ribs, chicken, vegetarian fare, and all the fixings.

*Beckman Mall (Registration Tent) / $25*

### Page House Reunion

*Page Courtyard / $25 dinner  
questions: jackf.lloyd@gmail.com*
**Fleming House Reunion**  
6:00 p.m.  Reception  
6:30 p.m.  Dinner  
*Fleming House | $50  
questions: catyeo@caltech.edu*

**Caltech LGBTQ+ Social**  
Join the Caltech Center for Diversity and the campus LGBTQ+ student organizations PRISM and oSTEM for an evening of cocktails, hors d’oeuvres, and intimate conversation. We will hold a short program highlighting this year’s achievements and the work of LGBTQ+ student organizations. Alumni, students, faculty, and friends are welcome to attend!  
*Alumni House, 345 S. Hill Ave.*

**Avery House Reunion**  
Avery Library  
*questions: pvasired@caltech.edu*

**Lloyd House Reunion: Casino Night**  
*Lloyd House Lounge  
questions: dyurk@caltech.edu*
### SATURDAY MAY 20

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00 p.m.</td>
<td>Fleming House Reunion</td>
<td>Fleming House</td>
<td><a href="mailto:catyeo@caltech.edu">catyeo@caltech.edu</a></td>
</tr>
<tr>
<td></td>
<td>6:00 p.m. Reception</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6:30 p.m. Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7:00 p.m.</td>
<td>Caltech LGBTQ+ Social</td>
<td>Alumni House, 345 S. Hill Ave.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Join the Caltech Center for Diversity and the campus LGBTQ+ student organizations PRISM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and oSTEM for an evening of cocktails, hors d’oeuvres, and intimate conversation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>We will hold a short program highlighting this year’s achievements and LGBTQ+ student</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>organizations. Alumni, students, faculty, and friends are welcome to attend!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 p.m.</td>
<td>Avery House Reunion</td>
<td>Avery Library</td>
<td><a href="mailto:pvasired@caltech.edu">pvasired@caltech.edu</a></td>
</tr>
<tr>
<td></td>
<td>Avery House</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:00 p.m.</td>
<td>Lloyd House Reunion: Casino Night</td>
<td>Lloyd House Lounge</td>
<td><a href="mailto:dyurk@caltech.edu">dyurk@caltech.edu</a></td>
</tr>
<tr>
<td></td>
<td>Join us for an evening of cocktails, hors d’oeuvres, and intimate conversation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>We will hold a short program highlighting this year’s achievements and the work of</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>LGBTQ+ student organizations. Alumni, students, faculty, and friends are welcome to</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>attend!</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### SUNDAY MAY 21

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:00 p.m.</td>
<td>Caltech Y Lunch</td>
<td>Caltech Y Offices, 505 S. Wilson Ave.</td>
<td><a href="mailto:caltechy@caltech.edu">caltechy@caltech.edu</a></td>
</tr>
<tr>
<td></td>
<td>Open to all alumni who have fond memories of the Y and want to get updated on current activities. Stop by to enjoy good food, chat with friends, and share your favorite Y memory. Visit our centennial pictorial retrospective at <a href="http://www.caltechy100.org">www.caltechy100.org</a>.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caltech Y Offices, 505 S. Wilson Ave.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>directly north of the Caltech Credit Union</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>contact: (626) 395-6163; e: <a href="mailto:caltechy@caltech.edu">caltechy@caltech.edu</a></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Caltech Athletics Hall of Honor</td>
<td>Ramo Auditorium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Celebrate and commemorate the rich history of intercollegiate athletics at Caltech as</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>we celebrate the achievements of our 2016–2017 scholar-athletes and induct the fourth</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>class into our Hall of Honor. Hosted by the Department of Athletics, Physical Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Recreation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ramo Auditorium</td>
<td>Free</td>
<td></td>
</tr>
<tr>
<td></td>
<td>learn more at: gocaltech.com</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00 p.m.</td>
<td>Caltech Alumni of Color Luncheon</td>
<td>Alumni House, 345 S. Hill Ave.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Black Ladies Association of Caltech and the Caltech Center for Diversity would like</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>to invite all alumni of color to join us for a luncheon. Sponsored by BLAC (Black</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ladies Association of Caltech).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Blacker House Reunion</td>
<td>Blacker House Residence</td>
<td><a href="mailto:mole-vp@blacker.caltech.edu">mole-vp@blacker.caltech.edu</a></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Ricketts House Reunion: Beer &amp; Brats</td>
<td>Ricketts Courtyard</td>
<td><a href="mailto:jlarson@caltech.edu">jlarson@caltech.edu</a></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Ruddock House Reunion</td>
<td>Tom Mannion’s House, 400 S. Hill Ave.</td>
<td><a href="mailto:secretary@ruddock.caltech.edu">secretary@ruddock.caltech.edu</a></td>
</tr>
<tr>
<td>5:00 p.m.</td>
<td>Dabney House Reunion</td>
<td>Dabney House Courtyard</td>
<td><a href="mailto:dabney-socialvp@googlegroups.com">dabney-socialvp@googlegroups.com</a></td>
</tr>
</tbody>
</table>
The 80th Annual

SEMINAR DAY

Saturday, May 20
### SEMINAR DAY SCHEDULE

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:15 a.m.</td>
<td><strong>Registration, Check-In, and Refreshments</strong>&lt;br&gt;Beckman Mall, Registration Tent&lt;br&gt;Check in and pick up name badges and room assignments, then proceed to Gates Annex for light refreshments.</td>
<td>Beckman Mall, Registration Tent</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td><strong>Session I</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td><strong>Session II</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td><strong>Session III – General Session</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:30 p.m. - 2:00 p.m.</td>
<td><strong>All Alumni Lunch</strong>&lt;br&gt;Beckman Mall (Registration Tent)</td>
<td>$15</td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td><strong>Session IV</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td><strong>Session V</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td><strong>Session VI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4:45 p.m. - 5:30 p.m.</td>
<td><strong>Wine and Cheese Reception</strong>&lt;br&gt;Seminar Day Attendees&lt;br&gt;Gates Annex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5:00 p.m. - 7:00 p.m.</td>
<td><strong>All Alumni Barbecue</strong>&lt;br&gt;Beckman Mall (Registration Tent)</td>
<td>$25</td>
<td></td>
</tr>
</tbody>
</table>

**THERE’S EVEN MORE!** For more events and activities on Seminar Day, browse the schedule on pp. 9–12.
First presented in 1966, the Distinguished Alumni Award is granted in recognition of a particular achievement of significant value, a series of such distinctive achievements, or a career of noteworthy accomplishment. It is the highest honor the Institute bestows upon a graduate.

**Regina E. Dugan**  
(PhD ’93, Mechanical Engineering)  
*Vice President of Engineering, Building 8, Facebook*  
For her sustained record of leadership and innovation in technology and business. Throughout her career—as the first woman to become the director of DARPA, and as an executive in technology—Dugan has spearheaded groundbreaking initiatives in the fields of cybersecurity, social media, and advanced manufacturing methods.

**Alexei V. Filippenko**  
(PhD ’84, Astronomy)  
*Professor of Astronomy, UC Berkeley*  
For his contributions to astronomy and his work to enhance the public’s interest in science. Filippenko contributed significant research that led to the discovery of cosmic acceleration. A prolific author, mentor, and noted speaker, his publication record has made him one of the most recognized and cited astronomers working today.
Eric Betzig (BS ’83, DAA ’16)
Group Leader, Janelia Research Campus,
Howard Hughes Medical Institute
Nobel Prize in Chemistry, 2014

Eric Betzig studied physics at Caltech and completed his doctoral studies at Cornell, where his thesis involved the development of near-field optics – the first method to break the diffraction barrier in light microscopy. He then went on to AT&T Bell Labs in Murray Hill, NJ, where he further refined the technology and explored many applications, including high-density data storage, semiconductor spectroscopy, and super-resolution fluorescence imaging of cells. In 1993, Betzig was the first to image single fluorescent molecules under ambient conditions and determine their positions to better than 1/40 of the wavelength of light. Tiring of academia, he then served as vice president of research and development in his father’s machine-tool company, developing a high-speed motion-control technology based on an electrohydraulic hybrid drive with adaptive-control algorithms. After commercial setbacks, he returned to science through research at his own company, which eventually led to the invention and demonstration of the super-resolution technique PALM by him and his fellow Bell Labs expatriate, Harald Hess. Since 2005 Betzig has been a group leader at the Janelia Research Campus, part of the Howard Hughes Medical Institute, developing new optical-imaging technologies for biology. Notably, in 2014, he shared the Nobel Prize in Chemistry for using fluorescent molecules to bypass the inherent resolution limit in optical microscopy.
<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Beckman Auditorium</th>
<th>Ramo Auditorium</th>
<th>Baxter Lecture Hall</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>Session I</td>
<td>Beckman Auditorium</td>
<td>Climate Goals and Computing the Future of Clouds</td>
<td>The NASA Mars 2020 Rover Mission</td>
<td>An Archaeological Road Trip with the Keck Telescopes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T. Schneider</td>
<td>K. Williford</td>
<td>E. Kirby</td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td>Session II</td>
<td>Beckman Auditorium</td>
<td>Simulating the Quantum World on a Classical Computer</td>
<td>How Flies Fly</td>
<td>Living with a Comet: 20 Years on the Rosetta Mission</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>G. Chan</td>
<td>M. Dickinson</td>
<td>M. Hofstadter (PhD ’92)</td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Session III</td>
<td>Beckman Auditorium</td>
<td>Distinguished Alumni Awards and General Session</td>
<td>Welcome</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Welcome</td>
<td>Welcome</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chris Bryant (BS ’95)</td>
<td>Thomas F. Rosenbaum</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vice President</td>
<td>President, Caltech</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Caltech Alumni Association</td>
<td>Sonja and William Davidow</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Presidential Chair and</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Professor of Physics</td>
<td>Presentation of the Distinguished Alumni Awards</td>
</tr>
<tr>
<td>12:30 p.m.</td>
<td></td>
<td>Beckman Auditorium</td>
<td>All Alumni Lunch: Beckman Mall, Registration Tent / $15</td>
<td>All Alumni Lunch: Beckman Mall, Registration Tent / $15</td>
<td>All Alumni Lunch: Beckman Mall, Registration Tent / $15</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Graduate Student Poster Session: Beckman Institute, Outside Courtyard</td>
<td>Graduate Student Poster Session: Beckman Institute, Outside Courtyard</td>
<td>Graduate Student Poster Session: Beckman Institute, Outside Courtyard</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Session IV</td>
<td>Beckman Auditorium</td>
<td>The Role of Attention in Simple Choice</td>
<td>Climate Goals and Computing the Future of Clouds</td>
<td>An Enormous 3D Jigsaw Puzzle of the Cell’s Innermost Sanctuary Gatekeeper</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>A. Rangel (BS ’93)</td>
<td>T. Schneider</td>
<td>A. Hoelz</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>Session V</td>
<td>Beckman Auditorium</td>
<td>The NASA Mars 2020 Rover Mission</td>
<td>Listening to the Dance of Black Holes</td>
<td>Large Deep Earthquakes That Hit Afghanistan Every Decade</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>K. Williford</td>
<td>A. Weinstein</td>
<td>Z. Zhan (PhD ’14)</td>
</tr>
<tr>
<td>4:00 p.m.</td>
<td>Session VI</td>
<td>Beckman Auditorium</td>
<td>The Science of the Solar System: New Approaches to Learning Online and on Campus</td>
<td>The Role of Attention in Simple Choice</td>
<td>How Flies Fly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M. Brown</td>
<td>A. Rangel (BS ’93)</td>
<td>M. Dickinson</td>
</tr>
<tr>
<td>155 ARMS</td>
<td>201 E. BRIDGE</td>
<td>153 NOYES</td>
<td>119 KERCKHOFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
<td>-----------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turning Back the Aging Clock in the Powerhouse of the Cell</td>
<td>Predicting the Future: What Mathematics Has to Say About the Possibility, and How the Answer Shapes Our Lives</td>
<td>An Empire of Exchange: Contract Enforcement and Long-Distance Trade in Late Imperial China</td>
<td>An Enormous 3D Jigsaw Puzzle of the Cell's Innermost Sanctuary Gatekeeper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Hay</td>
<td>M. Effros</td>
<td>M. Dykstra</td>
<td>A. Hoelz</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listening to the Dance of Black Holes</td>
<td>Large Deep Earthquakes That Hit Afghanistan Every Decade</td>
<td>The Book We Can't Read…Yet</td>
<td>Flat Metasurface Optics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Weinstein</td>
<td>Z. Zhan (PhD '14)</td>
<td>V. Wilkie</td>
<td>A. Faraon (BS '04)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**General Session**

Ira Moskatel (BS '72)  
*General Session Chair*

**Keynote**

Eric Betzig (BS '83, DAA '16)  
*Group Leader, Janelia Research Campus*  
*Howard Hughes Medical Institute*  
*Nobel Prize in Chemistry, 2014*

**Predicting the Future: What Mathematics Has to Say About the Possibility, and How the Answer Shapes Our Lives**  
E. Kirby  
|<br> |<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>|<br>
Garnet Chan  
*Bren Professor of Chemistry*  
*Chemistry and Chemical Engineering*

**SIMULATING THE QUANTUM WORLD ON A CLASSICAL COMPUTER**

Quantum mechanics is the fundamental theory underlying all of chemistry, materials science, and the biological world, yet solving the equations appears to be an exponentially hard problem. Can we simulate the quantum world using classical computers? I will discuss why simulating quantum mechanics is not as hard as it first appears and give some examples of how modern-day quantum-mechanical calculations are changing our understanding of practical chemistry and materials science.

Michael Dickinson  
*Esther M. and Abe M. Zarem Professor of Bioengineering*  
*Biology and Biological Engineering*

**HOW FLIES FLY**

Insects were the first animals to evolve active flight and remain unsurpassed in many aspects of aerial endurance and agility. By exploiting cutting-edge experimental methods and modern genetics, my lab is attempting to identify the neurobiological and biomechanics specializations that underlie the flight capabilities of flies and other insects. Principles garnered from flies provide insight into how miniature brains can accurately process information and are being used in current attempts to engineer small autonomous flying vehicles.
# AN EMPIRE OF EXCHANGE

*Contract Enforcement and Long-Distance Trade in Late Imperial China*

The emergence in early modern Europe of institutions that favored court enforcement of legally sanctioned property rights seems quaint and improbable from the perspective of a massive land empire. How did the scale of the Qing Empire—China’s last imperial dynasty—change the strategies of traders and officials seeking to govern commerce across large spaces within the same jurisdiction? How did the Qing Empire’s solutions to these problems create a legacy that survives into the 21st century?

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>I</td>
<td>Peter Groom</td>
</tr>
<tr>
<td>3:00 p.m.</td>
<td>V</td>
<td>Greg Holk</td>
</tr>
</tbody>
</table>

---

# PREDICTING THE FUTURE

*What Mathematics Has to Say about the Possibility, and How the Answer Shapes Our Lives*

Wouldn’t it be great if you could predict the future? The ability to know what is going to happen before it occurs would change your life. In this talk, I will discuss what mathematics has to say about predicting the future and how that prospect affects everything from Wall Street to your mobile phone.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:00 a.m.</td>
<td>I</td>
<td>Emilio Sovero</td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>IV</td>
<td>Paul Levin</td>
</tr>
</tbody>
</table>
### FLAT METASURFACE OPTICS

For hundreds of years, most optical elements like lenses and polarizers have been fabricated using carefully polished pieces of glass or crystals and assembled in optical systems such as cameras and microscopes. In this talk I discuss how nanotechnology enables new ways to make optical components using fabrication processes already developed in the semiconductor industry. These nano-patterned structures, named optical metasurfaces, allow for extreme miniaturization of optical systems with applications in consumer electronics and medical devices.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>10:00 a.m.</td>
<td>Paul Levin</td>
</tr>
<tr>
<td>V</td>
<td>3:00 p.m.</td>
<td>Emilio Sovero</td>
</tr>
</tbody>
</table>

### TURNING BACK THE AGING CLOCK IN THE POWERHOUSE OF THE CELL

Most cells contain many mitochondria, which produce the bulk of a cell's energy supply. Each mitochondrion carries a circular genome, mtDNA, the products of which are required for energy production. Because mtDNA has limited repair capacity and mutation rates are high, the amount of mutant mtDNA increases throughout life. A cell dies when the amount of mutant mtDNA passes a threshold, which contributes to aging and degenerative diseases such as Alzheimer’s and Parkinson’s, as well as age-related muscle loss. We show that cellular housecleaning to selectively remove mutant mtDNA can be achieved, thus reversing an important component of aging.

<table>
<thead>
<tr>
<th>Session</th>
<th>Time</th>
<th>Chair</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>9:00 a.m.</td>
<td>Robert Gershman</td>
</tr>
<tr>
<td>IV</td>
<td>2:00 p.m.</td>
<td>Daniel Whelan</td>
</tr>
</tbody>
</table>
The human body is built of approximately 37 trillion cells that each sequester their genetic information in a compartment called the nucleus. Massive channels called nuclear-pore complexes (NPCs)—which are nature’s largest macromolecular machines—perforate the membrane barrier that surrounds the nucleus and tightly regulate access to the enclosed genetic information. Because of this central role, it is not surprising that NPC dysfunction is associated with a diverse set of currently untreatable human diseases, including many neurodegenerative disorders. A detailed understanding of how these massive gatekeepers function would be a prerequisite for the development of any cures. However, the enormous size of the NPC represents a massive challenge to such studies and has hampered them for more than half a century. I will present the results of my group’s concerted effort over the past dozen years that has led to the highest-resolution snapshot of the NPC’s architecture to date. Our innovative approach revealed the precise positioning of the NPC’s approximately 10 million atoms, providing therapeutically important clues and opening the door for the development of novel treatments for NPC-associated diseases.
Evan Kirby
Assistant Professor of Astronomy
Physics, Mathematics and Astronomy

AN ARCHAEOLOGICAL ROAD TRIP WITH THE KECK TELESCOPES

The Keck telescopes have gone on an archaeological road trip to the most remote neighborhoods of our galaxy. These neighborhoods are peppered with mini-galaxies-within-a-galaxy that are sparsely populated with just handfuls of stars. Although these galaxies used to harbor supernovae that produced most of the elements in the periodic table, those factories were shuttered long ago. Keck uncovers the history of these ghost towns—and their defunct manufacturing operations—by discovering what the few surviving stars are made of.
THE ROLE OF ATTENTION IN SIMPLE CHOICE

Neuroeconomics studies the computations made by the brain in different decision situations, the way in which the underlying neurobiology implements and constrains those computations, and the way they affect the quality of decisions. This talk describes recent fMRI, eye-tracking, and mouse-tracking experiments designed to examine the role that attention plays in how the brain computes and compares values at the time of making a simple choice (e.g., apple vs. orange) or a more complex choice (e.g., apple vs. cake).

CLIMATE GOALS AND COMPUTING THE FUTURE OF CLOUDS

When climate goals such as the 2°C warming threshold of the Paris Agreement will be reached depends strongly on how low clouds respond to global warming—an effect that is highly uncertain. Improved computational and observational tools can now reduce this uncertainty. This talk will explain why clouds are difficult to model and how new computational and observational tools have brought us to the cusp of rapid progress in this area.
LISTENING TO THE DANCE OF BLACK HOLES

Black holes are the sites of the strongest gravitational fields in the universe. In pairs, they orbit each other, and the rapidly changing gravity produces vibrations of space itself, which travel to us as gravitational waves. As the pair loses all of its orbital energy, the two black holes merge into one, emitting an incredible burst of gravitational waves. LIGO (the Laser Interferometer Gravitational-Wave Observatory), operated by Caltech and MIT, have designed, built, and operated two huge detectors that can now “hear” these vibrations from the warped parts of the universe. Come listen!

THE BOOK WE CAN’T READ…YET

On February 8, 1587, Mary, Queen of Scots—cousin and rival queen to Elizabeth I—approached the executioner’s block, clutching a 15th-century prayer book. This book, later inscribed by her grandson James II, ranks high among The Huntington’s treasures. Still in its original binding, the volume is more than a beautifully decorated book; it is an iconic object. Already 100 years old in Mary’s hands, the book cannot be safely opened today because with time the binding glue has hardened and the fabric cover has deteriorated. This talk explores the challenges currently facing The Huntington’s conservators and curators—and our hopes for a technology that will allow us to read Mary’s book and others like it.
THE NASA MARS 2020 ROVER MISSION

Mars 2020 will be the first NASA mission since Viking to visit Mars with an objective to seek signs of extraterrestrial life. Since Viking, however, the focus of Mars exploration has shifted to the possibility of ancient, rather than extant life, and Mars 2020 will use diverse analytical techniques to guide the collection of samples with potential to contain preserved ancient biosignatures. Analogous efforts to understand the earliest records of life on Earth demonstrate the importance of eventual analysis of carefully selected martian samples in Earth-based laboratories in order to understand whether Mars was ever inhabited.

Zhongwen Zhan (PhD ’14)
Assistant Professor of Geophysics
Geological and Planetary Sciences

LARGE DEEP EARTHQUAKES THAT HIT AFGHANISTAN EVERY DECADE

Magnitude 7+ earthquakes hit a particular spot of Afghanistan every 10 to 15 years and cause hundreds of casualties each time. This intense activity is puzzling compared with the slow tectonic movements measured in this area. In this presentation, I will show that these events probably occur on the same fault 200 km below the Earth’s surface, loaded by a piece of heavy slab sinking through the mantle.
Mike Brown
Richard and Barbara Rosenberg Professor of Planetary Astronomy
Geological and Planetary Sciences

THE SCIENCE OF THE SOLAR SYSTEM
New Approaches to Learning Online and on Campus

This spring, Mike Brown is teaching his course about the solar system online as a "massive open online course" (MOOC) and on campus with a small group of undergraduate students and TAs. For the first time, he's also teaching a cohort of about 500 Caltech alumni and friends online. This session welcomes all Seminar Day attendees, including participants in the online course, to meet up in person, hear scientific updates about the latest discoveries in the solar system, and discuss how the ways we teach science are changing with new technologies and approaches, at Caltech and online. Among other awards and honors, Professor Brown is the recipient of the Richard P. Feynman Prize for Excellence in Teaching at Caltech, the Kavli Prize in Astrophysics, and is the author of the best-selling memoir, How I Killed Pluto and Why It Had It Coming.

Graduate Student Spotlight Talks

Featuring short TED-style research presentations by graduate students chosen from a campus-wide competition. Sponsored by the Graduate Student Council.

Each session will feature two different students.
Daniel Magley (BS ’19)
Doris S. Perpall SURF Speaking Competition, First Place

A SELF-POWERED ELECTRO-OSMOTIC LOCOMOTIVE IMPLANT

Self-propelled locomotive implants with an onboard power supply would have a significant impact in enabling in-vivo medical diagnostics and treatment. Previously investigated propulsion methods have power requirements several magnitudes higher than the capabilities of modern batteries and fuel cells, which cause them to require external power sources. In this work, we performed a proof of concept to test the application of electro-osmosis for propelling locomotive implants with onboard power supplies. The demonstrated device required a maximum of 3.63 μW to maintain steady-state velocity. Such efficiency makes this the first method demonstrated that could allow for constant operation under the power requirements of a modern glucose-biofuel cell.

Ciara M. Ordner (BS ’18)
Doris S. Perpall SURF Speaking Competition, Second Place

SYNTHESIS OF CHIRAL TETRAHYDROPYRANS BY A TANDEM SAKURAI ALLYLATION/INTRAMOLECULAR 6-EXO-TET CYCLIZATION

Heterocycles are ubiquitous in a variety of bioactive natural products, many of which have found use as potential drug targets. The potency of these molecules with regard to treating disease is often dependent upon their chirality. While several methods have been developed to synthesize a variety of chiral heterocycles, we propose a new method that utilizes chiral allylsilane substrates and proceeds through a stereospecific cascade reaction. We report on the development and optimization of this cascade reaction and envision using this method to access a variety of other chiral heterocycles, including tetrahydrofurans, piperidines, pyrrolidines, and butyrolactones.
First Aid Station
Open Saturday, May 20
8:30 a.m. – 5:00 p.m.
Millikan Library Lounge

PARKING

Thursday, May 18 – Friday, May 19
Street parking is available at the following locations.
(Two hour limits are not in effect these days.)

- Hill Ave.
  between California and Del Mar Blvds.
- Holliston Ave.
  between San Pasqual St. and Del Mar Blvd.
- Holliston Parking Structure
  with permit

Guests can get their free parking permit at the pay station located on the third floor near the east stairwell.
1. From the main screen, select All-Day Permit or Weekly Permit
2. Press the # button
3. Enter code 2224033

This code will be valid all day on May 18 and 19. Users will not be charged.

Saturday, May 20 – Sunday, May 21
Parking is available in the following Caltech structures and lots (permits are not necessary on these days):

- California Blvd. (underground)
- Wilson Ave.
- Holliston Ave.
- Parking Lots 12 and 13, entrance on Wilson Ave.
- Tournament Park Lot, entrance on Wilson Ave.

Public Events
Ticket Office
K. SPAULDING
CALTECH STORE
**Childcare**
For children ages 2–12.

**Kids Klub Pasadena**  
Child Development Center & Preschool  
380 S. Raymond Ave.  
Pasadena, CA 91105  
(626) 795-2501, ext. 305  
kidsklubcdc.com

Mention “Caltech” to receive a 20% discount and have the $35 per child initiation fee waived. Applications must be submitted by Friday, May 12 at 5:00 p.m. Download and complete an application at kidsklubcdc.com by clicking on About Us and then Forms.

Already a Kids Klub member? Please call (626) 795-2501 no later than Monday, May 15 by 5:00 p.m. to make reservations.

*Note: Kids Klub is an independent service, not directly affiliated with the Institute. Caltech and the Caltech Alumni Association assume no liability or responsibility for the service listed above.*

**Weekend Attire**
Reunion dinners at the Athenaeum require traditional evening attire. A jacket for gentlemen is recommended but not mandatory. Reunion Weekend and Seminar Day are casual; comfortable clothing and walking shoes are recommended.

**Wireless Access**
Free wireless internet is available throughout the weekend.  
Visit: alumni.caltech.edu/wireless

**Caltech Store**
Thursday – Friday  
8:30 a.m. – 5:30 p.m.  
Saturday  
11:00 a.m. – 6:00 p.m.  
Alumni Association members receive a 20% discount on all merchandise with the exception of computer products.

Pick up copies of the ever-popular books *Legends of Caltech, More Legends of Caltech, and Techer in the Dark*, along with others by alumni authors.

bookstore.caltech.edu  
(800) 514-2665

**Convenience Store**
Thursday – Friday  
10:30 a.m. – 1:00 a.m.  
Saturday  
11:00 a.m. – 8:00 p.m.  
Sunday  
12:00 p.m. – 1:00 a.m.  
Located next to Chandler Dining Hall  
(626) 395-8012

**Red Door Café**
Thursday – Friday  
7:30 a.m. – 5:30 p.m.  
Winnett Student Center
Now Taking Nominations for the
2018 Distinguished Alumni Awards

Submit your nomination for next year’s awardees! Our nomination process is open now through August 23, 2017.

Selections are made by the President of Caltech based on recommendations from a committee comprising faculty, staff, and alumni; the President’s recommendations are confirmed by the Board of Trustees.

For more information, and to submit a nomination, to go: alumni.caltech.edu/daa-nominate

Mark your calendars now for

81st Annual Seminar Day
May 19, 2018

2018 Reunion Weekend
May 17 -20, 2018


Interested in volunteering to help out with your class reunion? Drop us a line at reunion@alumni.caltech.edu.
Alumni College
November 4, 2017

2018 Reunion Weekend
81st Annual Seminar Day
May 17-20, 2018

Enjoy the weekend? Have a suggestion?

Give us your feedback at:
reunion.caltech.edu/evaluation