
Welcome to IRMMW-THz 2008

Welcome to the 33rd International Conference on Infrared and Millimeter Waves and the 16th International Conference on Terahertz Electronics – now formally merged into the *International Conference on Infrared, Millimeter, and Terahertz Waves*.

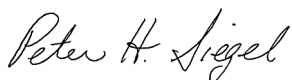
Preface

In the spirit of unification and revitalization we celebrate this year's conference theme, "*Terahertz for Life*." This theme emphasizes the broadening scope and continued longevity of our field. We also highlight this motif in bringing together several formerly disparate groups and technical application areas. At this year's conference you will find papers and presenters from the field of astronomy and astrophysics, where terahertz is being employed extensively in the quest for a basic understanding of the formation, composition and evolution of the universe and in the search for *life* in our own solar system and beyond. Also in support of space systems, terahertz sounding of the Earth's atmosphere are targeted at tracking and understanding those processes that determine the state of our continued *life* on this planet. In contrast you will hear from representatives in the *life* sciences, where terahertz is now finding a niche in chemistry, biophysics and medicine. You may even find terahertz coming into your daily *life*, as significant emphasis is now being placed on the use of terahertz imaging and spectroscopy for security applications. The theme of "*Terahertz for Life*" permeates this conference as we hope it will continue to permeate your own *life*.

On another level, this year's conference brings together technical teams whose focus and backgrounds have been on optical techniques and who must drop way down in frequency to work in this spectral range, and those who have come into this field from the radio and microwave communities, who are pushing up to shorter and shorter wavelengths. It is hoped that this merging of two regions in the electromagnetic spectrum will continue in future IRMMW-THz conferences, where we intend to encourage and to provide a unique and enduring forum for these two vibrant communities.

Finally, in highlighting the joining of different fields, different communities and different applications through a similar technical base, we emphasize the importance of cross-fertilization and a cross-disciplinary approach to research. We hope to expose you to individuals and to areas of study that will stimulate your creative spirits, and hope you will depart Pasadena with a refreshed outlook on your own work.

With that, we ask you to take advantage of our hospitality, participate in our growing community, connect with your colleagues, and carry forward *Terahertz for Life*.



Peter H. Siegel
Chair

2008 Conference Overview

Continuing the three year, three continent, conference rotation sequence started in 1999, IRMMW-THz 2008 takes place in the USA, on the grounds of the California Institute of Technology in Pasadena, California, between September 15th and 19th.

More than 550 abstracts from 33 countries were received and reviewed by this year's Local Organizing Committee (LOC). 462 of these are represented in the accompanying program. Listed are 257 oral talks, 194 posters, 8 plenary speakers and 3 very special opening presentations. Fifty-four invited Keynote speakers, generally appearing at the start of each oral session, will provide both overviews of special areas of interest and summaries of some of their latest work. Plenary speakers with outstanding accomplishments in their respective fields will present extended talks for the entire conference each morning between 9 and 10:30 am in the Caltech Beckman Auditorium. The topic areas span a wide range of interests from medical applications of microwaves to the origins of the universe. These include at least a few subjects that the attendee may not expect to encounter at this conference, apropos to our goals of expanding horizons and promoting cross-disciplinary research. We are privileged to have three influential and prominent members of our scientific community scheduled to open the conference on Monday morning with talks intended to inspire our current endeavors and project our applications into the future. The regular oral talks have been divided into three blocks of four parallel sessions (five on Wednesday) with only a morning block on Friday. Each block is 90 minutes long and contains either 4 or 5 presentations. Keynote talks are scheduled for twenty minutes with five minutes of discussion and regular talks are scheduled for fifteen minutes. The session blocks occupy time slots between 11-12:30, 2:00-3:30 and 4-5:30 pm. Breaks (lunch or refreshments) are placed between each block. Poster sessions are scheduled Monday to Thursday evening from 5:30 until 7 pm and will take place in the serene Dabney Garden, outside the registration and exhibitor's area.

Given the distributed nature of the Caltech campus, special consideration has gone into the flow of events. Attendees should meet each morning at 8:30 am at the large Beckman Auditorium for the day's announcements followed by the Plenary session. At the conclusion of the Plenary session, attendees may flow directly south to the Dabney Garden for a brief refreshments break and then west and slightly south over to the lecture room area surrounding the Bechtel courtyard, where the individual sessions will take place. Four mid-sized lecture halls – Arms, Bridge, Gates and Kerckhoff (plus a fifth, Guggenheim, for the extra Wednesday afternoon session) have been reserved for the oral presentations. After the 11-12:30 morning session, lunch will be available for purchase at Caltech's Chandler and Broad Cafés or any of a number of nearby restaurants.

Following the 2-3:30 pm sessions, refreshments will be available in or around the Bechtel courtyard. At 5:30 pm the poster sessions will begin in the Dabney Garden where refreshments will be available.

In order to help key in talks, locations and times, each paper has both a designated 4 digit number keyed to a folder on the distributed electronic program, as well as a 4 or 5 digit code which gives the day (M,T,W,R,F), the session number (1,2,3,4,5-with Plenary as 1), the location (P-Plenary, A-Arms, B-Bridge, G-Gates, K-Kerckhoff, U-Guggenheim or D-Dabney Garden) and the paper sequence number (1-5 for orals, 1-50 for posters). As an example, M2A1.1126 stands for paper 1126 on Monday, session 2, Arms, first paper in the session. We hope the signage and volunteers from the LOC will help you quickly get accustomed to the logistics.

The conference registration, guest activities desk, exhibitors show and poster sessions will all be located in Dabney Hall and Gardens. Registration opens at 4 pm on Sunday September 14th with a "get to know one another" reception. Badge and program pick up, parking vouchers, late registration, ticket pick-up, late sign-up for guest program events, general information and computer access will be available until 7 pm on Sunday and beginning at 7:30 am on Monday, continuing through Thursday.

On Tuesday evening starting at 7 pm there will be a reception for all registered attendees and guests at the Pacific Asia Museum, one half block north of Colorado Blvd. (historic Route 66) on 46 N. Los Robles street in Old Town Pasadena, approximately 25 minutes by foot from Caltech.

On Thursday evening beginning at 7 pm the conference banquet will be held in the historic Caltech Athenaeum on the southeast corner of the main campus. Following the banquet, a special show with entertainer and Scientific American columnist, Dr. Michael Schermer, founder of the Skeptics Society and publisher of SKEPTIC Magazine, will take place in the Beckman Auditorium. All attendees and their guests are welcome.

Interspersed throughout the week a guest activities program, open to all via pre-registration, will offer afternoon trips to the nearby Huntington Gardens, Library and Museum, the Griffith Observatory and Planetarium, the Norton Simon Museum and the historic Gamble House. A special trip to the fabulous J. Paul Getty Center Museum and gardens in Los Angeles is set for Wednesday between 10:30 am and 4 pm. On Friday afternoon the conference will wind up with special guided tours of JPL starting at 1, 2 and 3 pm for pre-registered attendees.

Both the International Organizing Committee and the Local Organizing Committee sincerely hope this year's conference will leave you with technical ideas, a network of contacts, and memories that will endure for many years to come!

Your hosts,



Conference Organizers

Honorary Chair

Kenneth J. Button

Conference Chair

Peter H. Siegel

The **International Organizing Committee (IOC)** of the now International Conference on Infrared, Millimeter and Terahertz Waves was established in 2000 with the purpose of ensuring continued high-quality annual symposia following in the tradition of the long standing IRMMW conference series. The IOC is composed of a large number of technical experts spanning the topical categories contained within the conference and representing a wide number of participating countries. The current membership and participants in the 2008 conference are:

Martyn Chamberlain, *Durham University, UK*
Jean-Luis Coutaz, *University of Savoie, France*
Bruce Danly, *Naval Research Laboratory, Washington DC, USA*
Gian Piero Gallerano, *ENEA, Dip. Tecnologie Fisiche e Nuovi Materiali, Frascati, Italy*
TV George, *Office of Fusion Energy Sciences, Department of Energy, USA*
Armand Hadni, *University of Nancy, France*
Qing Hu, *Massachusetts Institute of Technology, USA*
Martin Koch, *Technische Universität Braunschweig, Germany*
Jean Leotin, *Laboratoire National des Champs Magnétiques Pulsés, Toulouse, France*
Alexander Litvak, *Inst. of Applied Physics Russian Academy of Sciences, Russia*
Neville Luhmann, *University of California, Davis, USA*
Robert Miles, *University of Leeds, UK*
Daniel Mittleman, *Rice University, USA*
Koji Mizuno, *Tohoku University, Japan (Chair)*
Mitsuhiro Motokawa, *Tohoku University, Japan*
George Neil, *Thomas Jefferson National Accelerator Facility, Virginia, USA*
Gregory Nusinovich, *University of Maryland, USA*
Michael von Ortenberg, *Humboldt University at Berlin, Germany*
Terry Parker, *University of Essex, UK (former Chair)*
Kiyomi Sakai, *NICT/SCAT, Japan*
Xuechu Shen, *Shanghai Institute of Technical Physics, China*
Liu Shenggang, *University of Electronic Science and Technology of China, Sichuan, China*
Peter Siegel, *California Institute of Technology, USA (Vice Chair)*
Richard Temkin, *Massachusetts Institute of Technology, USA (former Chair)*
Manfred Thumm, *Universität Karlsruhe and Forschungszentrum Karlsruhe, Germany*
Minh Quang Tran, *Ecole Polytechnique Fédérale de Lausanne, Switzerland*
Ken Wood, *QMC Instruments Ltd., Cardiff University, UK*
Xi-Cheng Zhang, *Rensselaer Polytechnic Institute, USA*

The Local Organizing Committee (LOC), who set-up and ran the conference was staffed by volunteers from the Submillimeter Wave Advanced Technology (SWAT) team at the California Institute of Technology Jet Propulsion Laboratory, including several visiting scientists and students who came for short periods between 2007 and 2008. They are:

Tomas Bryllert (visiting post-doctoral fellow, Sweden)
Goutam Chattopadhyay (JPL)
Ken Cooper (JPL)
Robert Dengler (JPL)
Andy Fung (JPL)
John Gill (JPL)
Nuria Llombart Juan (visiting post-doctoral fellow, Spain)
Hamid Javadi (JPL)
Choonsup Lee (JPL)
Karen Lee (JPL)
Robert Lin (JPL)
Ed Luong (JPL)
Frank Maiwald (JPL)
Agnese Mazzinghi (visiting student, Univ. of Florence, Italy)
Jason McNary (visiting post-doctoral fellow, USA)
Imran Mehdi (JPL)
Alex Peralta (JPL)
David Pukala (JPL)
Lorene Samoska (JPL)
Erich Schlecht (JPL)
Daryoosh Saeedkia (Visiting Associate, Caltech)
Alex Siegel (Caltech undergraduate)
Seth Sin (JPL)
Anders Skalare (JPL)
Jan Stake (visiting Professor, Chalmers Univ., Sweden)
Bertrand Thomas (visiting post-doctoral fellow, France/UK)
John Ward (JPL)

Reviewing assistance was also contributed by Caltech chemistry department students: Rogier Braakman and Matthew Kelley.

Our wonderful web pages, paper and registration databases, and this program book, are the brainchild of Caltech Engineering and Applied Science division staff members Marionne Epalle, Jessica Stephens and Briana Ticehurst.

The incredible guest program was put together and run by volunteers Ronnie Swire Siegel and Dale Yee.

Conference Hosts and Sponsors

This conference could not have been realized without the generous support of several key members of the Caltech and JPL communities. Special thanks are due to Caltech Anna Rosen Professor of Biology and Director of the Caltech Magnetic Resonance Imaging Center, Dr. Scott E. Fraser, Caltech Tomiyasu Professor of Electrical Engineering and Chair of the Division of Engineering and Applied Sciences, Dr. David B. Rutledge, Caltech Vice-President and Director of the Jet Propulsion Laboratory, Dr. Charles Elachi, Caltech President, Dr. Jean-Lou Chameau, Caltech Professor of Physics and Former JPL Chief Scientist, Dr. Thomas Prince, and JPL Instrument, Electronics and Sensors Manager, Dr. Martin Herman.

Financial sponsors include the Microsystems Technology Office of the Defense Advanced Research Program Agency, Dr. Gregory Kovacs, manager, Dr. Mark Rosker Program Manager, Dr. Paul Maki, ONR Liaison, the JPL office of the Chief Scientist, Dr. Dan McCleese, Chief Scientist, and JPL Instruments and Science Data Systems Manager, Dr. Tom Luchik and Deputy Manager Ms. Annette Larson.

Other significant contributors to the conference planning include:

Samantha Westcott, Caltech Grants Manager
Deborah White, Caltech Public Events Manager
Victoria Hidalgo, Caltech Athenaeum
Scott Robbins, Caltech Dining Services
Christina Aguilar, Caltech Travel
Marie Lara, Caltech Housing

A Short History of the Conference Series

The *International Conference on Infrared, Millimeter, and Terahertz Waves* (IRM-MW-THz), is the oldest and largest continuous forum specifically devoted to the field of ultra-high frequency electronics and applications. Appropriate to this year's theme, the first conference in this series was held at the Georgia Institute of Technology in Atlanta in 1974 under the co-sponsorship of the IEEE Society on *Microwave Theory and Techniques* and the *Optical Society of America*. The General Chair was James J. Gallagher of the Georgia Institute of Technology and the Program Chair was Kenneth J. Button of the MIT Francis Bitter National Magnet Laboratory. In his Foreword to the Conference Digest, Ken Button predicted that the Conference would "be the first of a long series because the submillimeter wave specialty has become well-defined and moderately well populated." This prediction was very prescient and the Conference has grown into a respected and self sustaining venue that has now spanned more than three decades, thanks, in large part, to the efforts of Ken Button. The first three meetings (1974, 1976 and 1978) were held bi-annually, but beginning with the 4th meeting in 1979 the conference series was renamed as the International Conference on Infrared and Millimeter Waves (IRMMW) and was held annually. The Conference also began to rotate between locations inside and outside the United States. Ken Button became the conference coordinator, and in 1979 he coupled the conference to the International Journal of Infrared and Millimeter Waves, which published the conference proceedings. The appeal of Florida in the northern hemisphere's winter time anchored the US series to an early December schedule, which remained through the 20th venue in 1995. When the conference was held outside of the United States, it was typically held in the fall or early spring. Between 1974 and 1999, the Conference was held in either the US or Europe, except for two meetings in Japan (1984 and 1994). Starting with the year 2000, when the Conference was held in China, it was decided to institute a three-way rotation for the Conference between Asia, Europe and the United States. The conference date settled to the September time frame as a good compromise between weather conditions in all three regions and lack of overlap with other popular meetings. This ternary schedule remains today and continues with the 2008 conference in the USA, which follows last year's venue in Europe. In 2004 an agreement to couple together the then-independent European based conference series, *International Conference on Terahertz Electronics*, with the IRMMW conference, resulted in the first joint conference held in Karlsruhe, Germany. The formidable series title now became: Joint 29th International Conference on Infrared and Millimeter Waves and 12th International Conference on Terahertz Electronics. The international organizing committee was greatly expanded to encompass both conference communities, and the joint event went through one complete three year cycle before the two series were merged here in Pasadena, California into the *33rd International Conference on Infrared, Millimeter, and Terahertz Waves*.

Past and Future Conferences

Conference Designation	Date	Location
IRMMW-THz 2010 (35th)	September 6-10, 2010	Rome (Italy)
IRMMW-THz 2009 (34th)	September 21-25, 2009	Busan (Korea)
IRMMW-THz 2008 (33rd/16th)	September 15-19, 2008	Pasadena, CA (USA)
IRMMW-THz 2007 (32nd/15th)	September 2-7, 2007	Cardiff (UK)
IRMMW-THz 2006 (31st/14th)	September 18-22, 2006	Shanghai (China)
IRMMW-THz 2005 (30th/13th)	September 19-23, 2005	Williamsburg (USA)
IRMMW2004/THz2004 (29th/12th)	September 27-Oct. 1, 2004	Karlsruhe (Germany)
IRMMW 2003 (28th)	September 29-Oct. 3, 2003	Otsu (Japan)
IRMMW 2002 (27th)	September 22-26, 2002	San Diego, CA (USA)
IRMMW 2001 (26th)	September 10-13, 2001	Toulouse (France)
IRMMW 2000 (25th)	September 12-15, 2000	Beijing (China)
IRMMW 1999 (24th)	September 6-10, 1999	Monterey, CA (USA)
IRMMW 1998 (23rd)	September 7-11, 1998	Colchester (UK)
IRMMW 1997 (22nd)	July 20-25, 1997	Wintergreen (USA)
IRMMW 1996 (21st)	July 14-19, 1996	Berlin (Germany)
IRMMW 1995 (20th)	December 11-14, 1995	Orlando, FL (USA)
IRMMW 1994 (19th)	October 17-20, 1994	Sendai (Japan)
IRMMW 1993 (18th)	September 6-10, 1993	Colchester (UK)
IRMMW 1992 (17th)	December 14-17, 1992	Pasadena, CA (USA)
IRMMW 1991 (16th)	August 26-30, 1991	Lausanne (Switzerland)
IRMMW 1990 (15th)	December 10-14, 1990	Orlando, FL (USA)
IRMMW 1989 (14th)	October 2-6, 1989	Wuerzburg (FR Germany)
IRMMW 1988 (13th)	December 5-9, 1988	Honolulu, HI (USA)
IRMMW 1987 (12th)	December 14-18, 1987	Orlando, FL (USA)
IRMMW 1986 (11th)	October 20-24, 1986	Tirrenia, Pisa (Italy)
IRMMW 1985 (10th)	December 9-13, 1985	Orlando, FL (USA)
IRMMW 1984 (9th)	October 22-26, 1984	Takarazuka (Japan)
IRMMW 1983 (8th)	December 12-17, 1983	Miami Beach, FL (USA)
IRMMW 1982 (7th)	February 14-18, 1983	Marseille (France)
IRMMW 1981 (6th)	December 7-12, 1981	Miami Beach, FL (USA)
IRMMW 1980 (5th)	October 6-10, 1980	Wuerzburg (FR Germany)
SUBMM 1979 (4th)	December 10-15, 1979	Miami Beach, FL (USA)
SUBMM 1978 (3rd)	March 29-April 1, 1978	Guildford (UK)
SUBMM 1976 (2nd)	December 6-11, 1976	Puerto Rico (USA)
SUBMM 1974 (1st)	June 5-7, 1974	Atlanta, GA (USA)

Information for Presenters and Session Chairs

Official Language

The official language of the conference is English, which should be used for all printed material presentations and open discussions.

Information for Presenters

Oral presentations

Each oral session room will contain a computer equipped with a projector. Presenters should only use the session room computer for their presentation.

Presenters should bring a USB Memory-Stick with their presentation files in ppt (MS PowerPoint) or PDF format, suitable for display, and should load and preview their presentations on the conference computers before the session is scheduled to start. (The conference organizers can provide a memory stick for file transfer if needed.)

All presenters should be present 10 minutes before the start of the session, and should immediately inform the session chair of their arrival.

It is very important for the smooth running of the program that speakers do not take more than the allocated time for their presentation. The conference runs parallel sessions and it will assist the delegates in planning the program of talks they wish to see if all sessions run according to the common published schedule.

All sessions are 90 minutes long

Four or five talks are assigned to each session. In most, but not all, sessions there will be an opening 25 minute keynote presentation followed by four 15 minute regular oral talks.

Time allocations for talks is as follows:

Plenary	45 minutes (40 minute presentation plus 5 minutes for discussion)
Invited keynote	25 minutes (20 minute presentation plus 5 minutes for discussion)
Contributed	15 minutes (12 minute presentation plus 3 minutes for discussion)

Each session has 5 extra minutes for speaker change out, introductions and spillover.

Poster Sessions

There will be 90-minute poster sessions Monday, Tuesday, Wednesday and Thursday starting at 5:30 pm. These sessions will take place in the Dabney Garden. All poster presentations have been allocated to one of these evening sessions.

Each poster will have a numbered display area available which is approximately 1 m high and 1 m wide. Materials necessary to mount posters to the display boards will be available.

Posters should be set up by 5:00 pm on the day of the allocated session and be taken down again before noon the following day. The poster sessions will run until 7:00 pm each day. During this time, the presenters are expected to make themselves available at their display board.

Posters not taken down by noon on the day following the session will be removed by conference staff.

Information for Session Chairs

Session Chairs should arrive at the session room at least 15 minutes before the start of the session and should check the attendance and preparedness of all speakers in the session according to the schedule. Since the first author or corresponding author is not always the speaker, the session chair should make sure they know who is to be introduced to present the talk.

It is very important that the sessions run on schedule. Chairs must ensure that speakers do not take up more than their allotted time. The session Chair should warn each speaker when they have 2 minutes in which to finish. The Chair should ask speakers to conclude promptly if they begin to overrun, in which case the period set aside for questions should be shortened so that the next speaker begins on time. Regular oral talks are especially tight this year and have been allocated only 15 minutes with no more than one extra minute for questions or comments. Keynote talks are a maximum of 25 minutes including questions or comments.

Chairs should assure that all speakers are present before the start of the session. If a speaker is not present the chair should immediately inform the room monitor. It is possible that last minute substitutions can be inserted into the program, even at the start of a session.

In contrast to last year, missing speakers will be filled in by sequentially moving forward remaining talks in the session. Session chairs should make this clear to their audiences before the start of the session. Every effort will be made to minimize these program shifts.

Internet Access

Caltech campus will have Guest Access available for wireless enabled laptops in almost all locations. There will also be a few general purpose computers available in the registration area at Dabney Hall. The authentication settings for Guest Access are Open access, No Encryption, no IEEE 802.1x authentication. SSID=Caltech Guest. HTTPS, SSH and limited VPN are supported.

Refreshments

Tea, coffee and soft drinks will be served during session breaks either in Dabney Garden (morning) or Bechtel Mall area (afternoon). Refreshments will also be available at the poster sessions. Several lunch options will be available on campus for attendees on a cash purchase basis.

Exhibition

An exhibition will take place throughout the day from Monday to Thursday in the Dabney Hall area where the posters and registration desks are placed. There will also be a morning coffee break in this same location (following the Plenary session).

Exhibitors

EMCORE Corporation
FEMTOLASERS, Inc.
Loeffler Technology GmbH
Microtech Instruments, Inc.
Picometrix
Springer
TOPTICA Photonics Inc
T-Ray Science, Inc.
Tydex, J.S. Co
Virginia Diodes, Inc.
Wasa Millimeter Wave AB

Guest Program

In addition to the Sunday evening registration reception at the Caltech Dabney Garden, the Tuesday night reception at the Pacific Asia Museum, the Thursday evening banquet at the Caltech Athenaeum and the Friday afternoon tours of JPL, four additional outings have been planned for guests and conference attendees. **Please review the events below and then register at our Guest Program counter in Dabney Hall on September 14 & 15, 2008. Guaranteed placement only if registered before June 30, 2008.**

Huntington Library & Gardens

Monday September 15th, 1:00–5:00 pm

Lunch at the Pasadena Huntington Gardens cafe and/or Tea Room, followed by an afternoon at the fabulous Huntington Library, Art Collections and Botanical Gardens (less than 2 miles from the Caltech campus). The Huntington has 120 acres of exotic plants, a first class art collection and a world renowned collection of rare manuscripts.

TRANSPORTATION

Bus: A conference bus will be available for this event. The bus cost per person is \$10. Please confirm the exact schedule and departure locations at the Guest Program desk on September 14th or 15th in the Dabney Hall registration area.

Tentative schedule:

12:00 Noon Departure from the Hilton Hotel. Drop off at The Huntington Library and Gardens.

12:45 pm Departure from Caltech campus (please visit Guest Program desk in Dabney Hall for exact location). Drop off at The Huntington Library.

3:15 pm Early departure from The Huntington Library parking lot front entrance. Drop off at Caltech and the Hilton Hotel.

4:15 pm Last departure from The Huntington parking lot front entrance. Drop off at Caltech and the Hilton Hotel.

Taxi service: Taxi cabs can be arranged on your own on the day of the trip: www.yellowcabpasadena.com, tel. 1-800-750-4400 or 1-888-248-9222. The approximate cost is \$12.00 one-way from Caltech campus.

Drive your own car: Parking is free.

Admission Fee: \$15.00 per person with payment at the site on the day of entry.

Food: Lunch and snacks are available for purchase at The Huntington Café (no reservations needed). A delightful traditional English Tea (tea, sandwiches, and dessert buffet) is available at the Rose Garden Tea Room at a cost of \$24.95 plus tax. *Seating is limited and must be reserved by phone 1-626-683-8131 well in advance.*

Griffith Observatory

Tuesday September 16th, 1:00–5:00 pm

Afternoon trip to the recently refurbished Griffith Observatory and Samuel Oslen Planetarium (30 minutes by conference bus from Caltech campus).

TRANSPORTATION

Bus: A conference bus will be available for this event. *Guaranteed seating only if registered by June 30, 2008.* The bus cost per person is \$20. Please visit the Guest Program desk on September 14th or 15th in the Dabney Hall registration area for the exact location.

Tentative schedule:

1:00 pm Departure from Caltech (please visit Guest Program desk in Dabney Hall for exact location). Drop off at Griffith Observatory.

4:15 pm Departure from Griffith Observatory. Drop off at Caltech.

Taxi service: Taxi cabs can be arranged on your own on the day of the trip: www.yellowcabpasadena.com tel. 1-800-750-4400 or 1-888-248-9222. The approximate cost is \$40.00 one-way from Caltech campus.

Drive your own car: Beware that parking is limited and may require an uphill walk from available spaces. Parking or meter fees may be imposed.

Admission Fee: Admission to the museum is free. The planetarium show cost is \$7.00 per person and tickets must be purchased on site. We plan to make the 2:45 pm showing. *Seating may be limited.*

Food: Lunch and snacks can be purchased at the Griffith Observatory Cafeteria.

Getty Center of Los Angeles

Wednesday September 17th, 10:30 am – 4:00 pm

A fabulous trip to the multibillion dollar Getty Center of Los Angeles with breathtaking 360 degree views, unprecedented architecture and gardens, and a large collection of western art spanning the middle ages to present day. The Getty is approximately 45 minutes from Caltech campus and the trip will depart at 10:00 am from Caltech campus with pick up at the Hilton Hotel and return to Caltech around 4 pm.

TRANSPORTATION

Bus: A conference bus will be available for this event. To guarantee seating, please sign up on the trip registration page. The bus can take 55 people maximum. The bus cost per person is \$25 round-trip. Please confirm the exact schedule and pick up locations at the Guest Activities desk on September 14th or 15th in the Dabney Hall registration area.

Tentative schedule:

10:00 am Pick up will be from Caltech and the conference hotels. You must reserve a pick up location at the trip reservation page or at the Guest Activities desk on September 14/15.

3:00 pm Departure from The Getty Center with drop offs at the Sheraton, Westin, and Hilton hotels and Caltech at 4:00 pm.

Taxi service: Taxi service: Taxi cabs can be arranged on your own on the day of the trip: www.yellowcabpasadena.com tel. 1-800-750-4400 or 1-888-248-9222. The approximate cost is \$80.00 one-way.

Drive your own car: Parking is \$8.00.

Admission Fee: Admission to the Getty is free.

Food: A number of low and higher cost restaurants and cafés are open at the Getty for lunch and snacks.

Norton Simon Museum of Art and the Gamble House

Thursday September 18th, 12:30–2:00/4:00 pm

A double treat with visits to the world-class Norton Simon Museum of Art and the historic Gamble House (Greene and Greene, c. 1908) celebrating its 100th anniversary. Both are located in Pasadena only 10 minutes by car from Caltech campus. For those who want to squeeze in one activity without interfering with the technical sessions, a return bus from the Norton Simon will bring attendees back to the campus in time for the Thursday afternoon session. The Gamble House can only be visited by reserving a one hour tour starting at 3:30 pm. *Space is limited to the first 45 people who sign up.*

TRANSPORTATION

Bus: A conference bus will be available for this event. *Guaranteed seating is available only to those registered by June 30, 2008.* The bus cost per person is \$15. Please confirm the exact schedule and pick up locations at the Guest Program desk on September 14th or 15th in the Dabney Hall.

Tentative schedule:

12:00 noon Departure from the Hilton Hotel. Drop off at the Norton Simon Museum.

12:45 pm Departure from Caltech. Drop off at the Norton Simon Museum.

1:45 pm, 2:30 pm, 3:15 pm, 4:30 pm Departures from the Norton Simon Museum, dropping off at Caltech and the Hilton Hotel. The 3:15 pm pick up at Norton Simon will also drop off visitors who have 3:30 pm tour reservations at the Gamble House. The 4:30 pm bus will pick up Gamble House visitors after their tour and return them to Caltech and the Hilton Hotel.

Taxi service: Taxi cabs can be arranged on your own on the day of the trip: www.yellowcabpasadena.com, tel. 1-800-750-4400 or 1-888-248-9222. The approximate cost is \$13.00 one-way from Caltech campus.

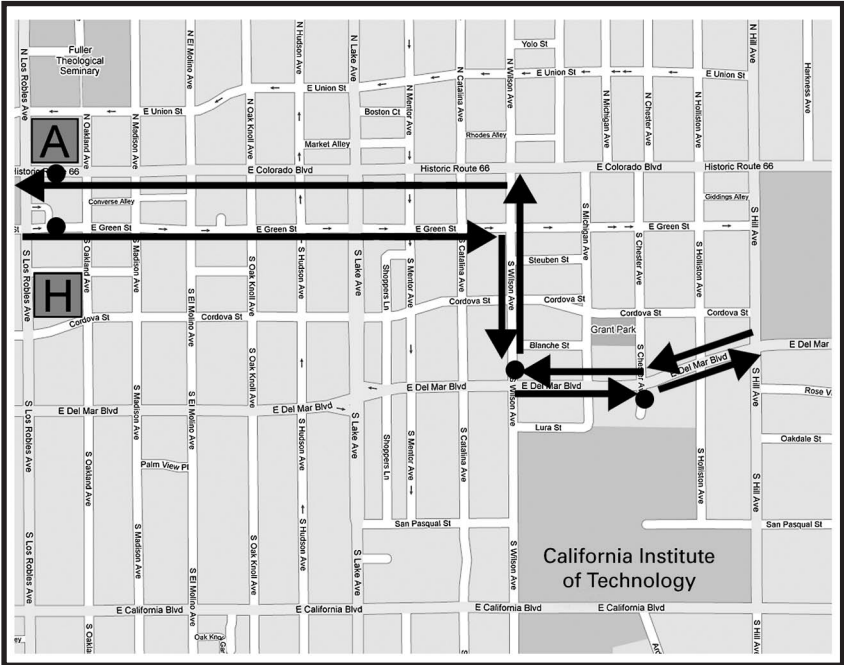
Drive your own car: Parking is free.

Admission Fee: Norton Simon Museum: \$8.00 per person can be purchased at the museum. Gamble House Tour: \$12.50 per person, limited to the first 45 people who reserve before June 30, 2008.

Food: Lunch and snacks can be purchased at a small lunch counter at the Norton Simon Museum. There is no food available at The Gamble House.

Pasadena ARTS Bus Route

ARTS Bus Route



Pacific Asia Museum & the Pasadena Museum of California Art



Hilton Pasadena



Pasadena ARTS Bus Route 10. Fare = \$0.50/ride.
Approximately every 15 minutes 6 am – 8 pm