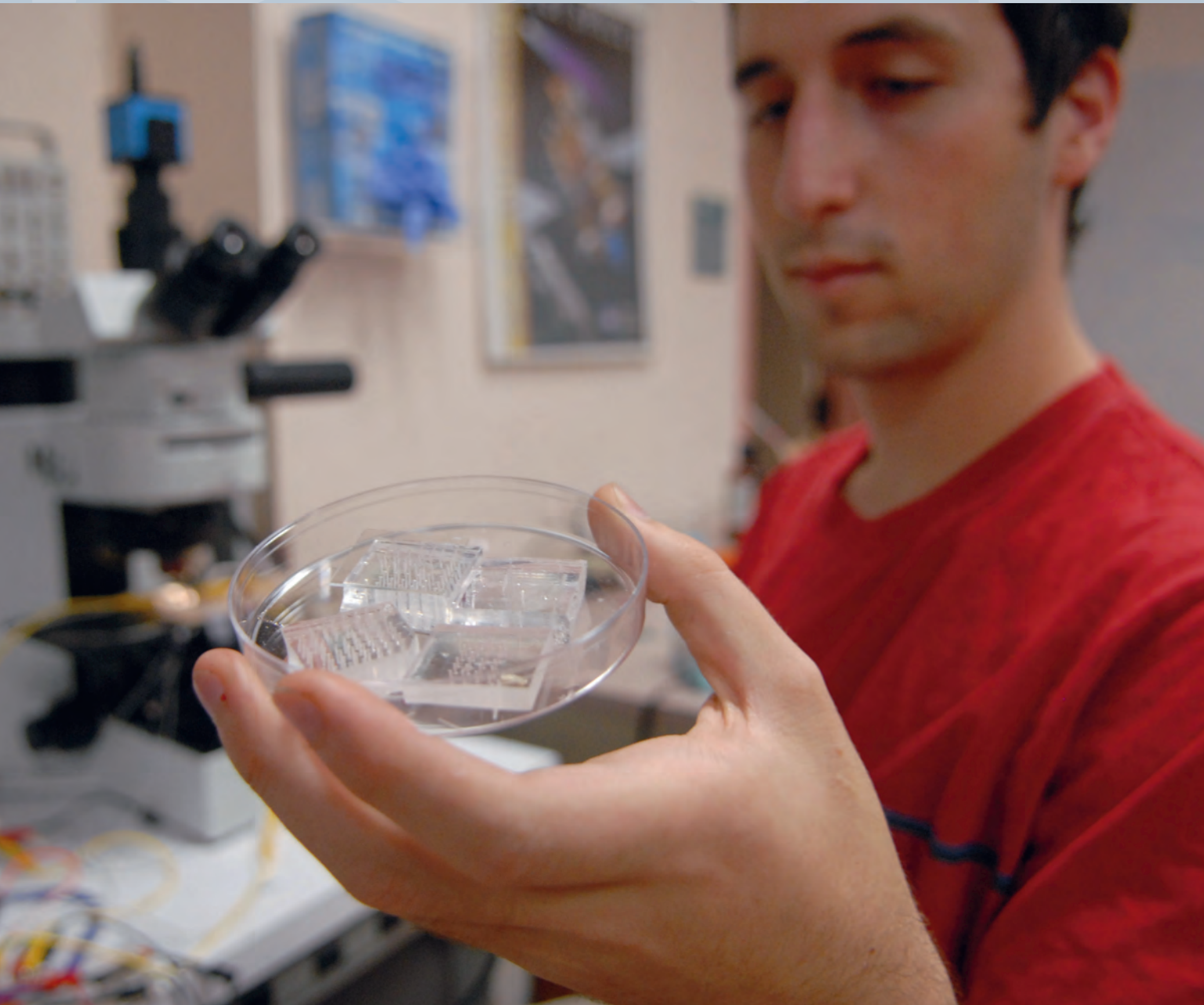


SURF

California Institute of Technology



Bravo to SURF

on another outstanding year! Since becoming president one year ago, I have spent much of my time meeting with students, faculty, alumni, staff, and many of our supportive and generous friends. From those conversations it is evident that what makes Caltech special is our tight-knit community of scholars who come together to explore science's most pressing questions. SURF provides students the opportunity to work with leading researchers on independent research projects and to fully engage in the process of scientific discovery. This summer 356 students did just that. Whether they were exploring the role of the hippocampus in learning or studying a Martian meteorite for magnetofossils, SURF students approach research with energy, passion, and creativity!

The core of SURF has always been found in the relationship between student and mentor. Now in its 29th year, SURF can boast of a new generation of mentors—those who are former SURFers themselves. This year, Dr. Antonio Rangel joined the rank of former SURFers who are now on the Caltech faculty. Along with Drs. Ken Libbrecht, Julia Kornfield, Mark Richardson, and John Dabiri, Antonio brings to Caltech a commitment to undergraduate research and first-hand experience of how SURF can impact one's scientific journey.

SURF is able to maintain its world-class status because of the support and dedication of many individuals. It takes over 1,000 people annually to make the SURF engine charge forward! This year donors have given generously and as a result the \$10 million endowment campaign is 93% complete, solidifying the SURF experience for generations to come. This accomplishment speaks volumes to the overwhelming support and success of the program. I'd like to extend my gratitude to all of the donors, faculty mentors, co-mentors, staff, alumni, and students who contribute so greatly.

Jean-Lou Chameau

President, California Institute of Technology





In the beginning,
I had nothing to offer but
blood, toil, tears, and sweat,
and believe me, this was quite
evident; in the end, though,
I came out of all this with a
little more perspective, a little
more ambition, and perhaps a
little more of those things we
call “brains”...and all, I would
hope, for the best.

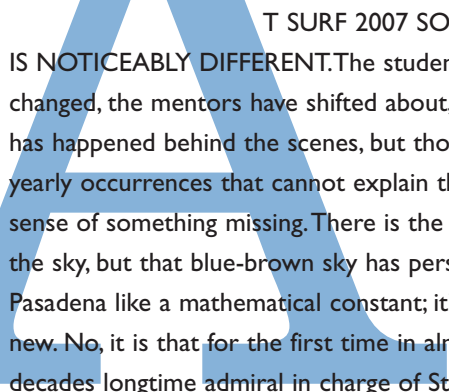
— Lisa Zang, SURF '07
David C. Elliot SURF Fellow

Dedication of SURF 2007

Carolyn Ash: Lodestar to Discovery Bay

by ANDREW KOSITSKY

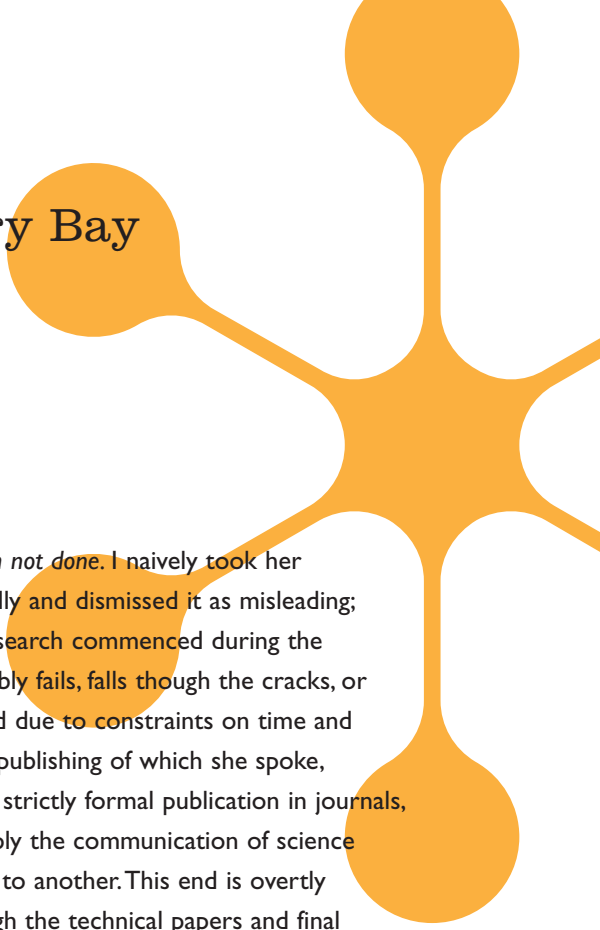
2007 Carolyn Ash SURF Fellow



AT SURF 2007 SOMETHING IS NOTICEABLY DIFFERENT. The students have changed, the mentors have shifted about, and much has happened behind the scenes, but those are yearly occurrences that cannot explain the strange sense of something missing. There is the void in the sky, but that blue-brown sky has persisted in Pasadena like a mathematical constant; it's nothing new. No, it is that for the first time in almost two decades longtime admiral in charge of Student-Faculty Programs (SFP) is not at her post. Carolyn Ash is no longer in charge of the flotilla of the 14 undergraduate research programs, with SURF as its flagship, no longer piloting us away from reefs or shallows.

But Carolyn Ash did not jump ship. She continues to be seen on campus by those who knew her. Like a beneficent spirit, her presence gives a little support here, advises there, all on behalf of the welfare of SURF and its affiliate programs. She is no longer directly in the public spotlight that shines on SFP, but her work with the program continues behind stage, in the wings, and in solidifying the foundations on which the SURF program has been built. So perhaps spirit is the wrong term for Carolyn's presence post-retirement—patron saint sounds more precise and accurate to me.

The year 2004 was my first SURF summer, and I continue to be trouble for the tirelessly hardworking staff that makes these wonderful summer experiences possible. Something Carolyn said during the orientation that year struck me and has remained with me ever since. *Research unpublished is as*



good as research not done. I naively took her comment literally and dismissed it as misleading; much of the research commenced during the summer inevitably fails, falls through the cracks, or is left unfinished due to constraints on time and resources. The publishing of which she spoke, however, is not strictly formal publication in journals, rather it is simply the communication of science from one mind to another. This end is overtly achieved through the technical papers and final presentations or posters, but there is a more subtle force Carolyn has fostered over the last few decades. By housing nearly 400 researching undergraduate students in the same dorms and giving them the opportunity to work with the over 1200 graduate students and over 300 professors at Caltech, a culture of scientific excellence and sharing is bred into each student. We're all on the same mission, plunging through the surf as we sail toward Discovery Bay, attempting to gain a foothold on uncharted territory.

Another brave soul, Candace Rypisi, now has command of the flotilla. Our continuing mission to research strange new subjects goes on. Nevertheless, Carolyn's lessons, spirit, and occasional divine intervention remain with it. I am pleased that SURF 2007 has been dedicated to Carolyn Ash. Carolyn, on behalf of the generation of students who have had the pleasure to work with you and reap such great rewards from your efforts, thank you. You will be missed and always remembered!



SURF Dedictees

- 1985 Dr. Ernest Swift
- 1986 Dr. Lee A. DuBridge
- 1987 Dr. Robert P. Sharp
- 1988 Dr. Ray D. Owen
- 1989 Dr. Hans W. Liepmann
- 1990 Dr. Fredrick H. Shair
- 1991 Dr. Lew Allen, Jr.
- 1992 Dr. John D. Roberts
- 1993 Dr. Robert E. Bacher
- 1994 Dr. Edward C. Posner
- 1995 Mr. Samuel P. Krown
- 1996 Dr. Edward B. Lewis
- 1997 Dr. Harold Brown
- 1998 Dr. Thomas E. Everhart
- 1999 Dr. Ward Whaling
- 2000 Dr. Terry Cole
- 2001 Dr. William M. Whitney
- 2002 Dr. Edward C. Stone
- 2003 Dr. Thomas A. Tombrello, Jr.
- 2004 Dr. Harry B. Gray
- 2005 Paul K. Richter
and Evalyn E. Richter
Memorial Funds
- 2006 Lew and Edie Wasserman
- 2007 Carolyn A. Ash

SURF STILL SUCCESSFUL?

“Of Course!”

say John Gee, SURF Board Chair,
and Fred Shair, SURF Administrative Committee Chair



John Gee



Fred Shair

by CSILLA FELSEN

*2007 Rose Hills Foundation SURF Fellow
and 2005 SURF Board Fellow*

After serving as secretary of the SURF Student Advisory Council two summers ago, I was invited to report on our activities at a SURF Board meeting and then to contribute ideas to a SURF Administrative Committee (AdComm) meeting. That is where I met John Gee and Fred Shair, respectively. I was immediately fascinated by the behind-the-scenes work that these two committee chairs coordinate to help the Student-Faculty Programs (SFP) office maintain such a smoothly running program. John Gee and Fred Shair are both wonderful to interact with so I was very happy last year to join them on the SFP Director Search Committee. Their engaging storytelling-approach made me look forward all the more to the 7:30 a.m. interviews we were conducting. For this Annual Report, Candace Rypisi, whom we selected as the new SFP Director, asked me to help her turn the tables and interview John Gee and Fred Shair about the latest progress of their committees. Please read on to see their fabulous updates and to read their answers to bonus questions such as what their projects would be if they could do a SURF.

What are the main SURF Board highlights for this year?

JOHN GEE: A major event for SURF 2007 has been the transition from Carolyn Ash to Candace Rypisi as Director of the Student-Faculty Programs office. Kirk Dawson and I served as members of the Search Committee, which Fred Shair chaired. Kirk Dawson, Fred Shair, and I have been meeting with Candace to assist in the transition and in future planning. Also, for the first six months of Candace's tenure, Carolyn Ash has been available as a consultant. Thus, the transition has been smooth, and with Candace's very good office staff, the future for SURF is very bright.

The SURF Board Development Committee, chaired by Carl Larson, has continued working with Mark Reinecke in the Caltech Development office. The committee has had a very successful year and is approaching its goal for the endowment.

Another topic of discussion has been the increasing role of co-mentors working with SURF students and mentors. The training program has been expanded and we are updating a process of using surveys to evaluate the interaction of students and co-mentors.

We have begun to increase the role of the Board Alumni Relations Committee. We are aiming to increase the number of alumni and SURF alumni who participate in SURF, for example as moderators and attendees on SURF Seminar Day.

Finally, the Board Executive Committee has been meeting frequently to begin planning for the next two years as Kirk Dawson takes over as Chair of the SURF Board.

Who are the new members of the SURF Board?

JG: The new board member for SURF 2008 will be Dr. Carol Carmichael. We are delighted that she has agreed to join us. Four members of the board, Gabrielle Adelman, Karen Carlson, Jim Cutts, and Sam Vodopia, will complete their first three-year terms as board members and all have agreed to serve a second three-year term.

What are the main SURF Administrative Committee (AdComm) highlights for this year?

FRED SHAIR: In addition to normal AdComm activities, members of the committee worked closely with the SURF Board to identify and recommend an excellent person to replace the retiring Director of the Student-Faculty Programs office. Members of the Search Committee were unanimously enthusiastic about the selection of Candace Rypisi.

AdComm items for the near future include:

- (1) Looking into the needs and opportunities associated with recognition and encouragement of outstanding co-mentoring, the focus of an AdComm sub-committee chaired by Jerry Houser,
- (2) Establishing a process of selecting a new AdComm Chair, and
- (3) Developing a better process by which the AdComm solicits and obtains timely information regarding various aspects of SURF so that we are better able to efficiently take advantage of new opportunities that may develop.



Why did you raise the stipends and what impact do you expect this to have on the SURF program?

FS: We raised the SURF stipend this year because it had been held constant for several years and an analysis by Professor Emeritus Ward Whaling showed that the cost of housing and food has been rising substantially. Ward's analysis indicated that the stipend should be \$6,000 and the AdComm agreed. One might have thought that because of the higher stipend, there would be fewer SURFers. However, during the past 30 years, we have found that while SURF maintains the highest of standards, and provides a truly unique opportunity for enthusiastic, bright, and appreciative undergraduates to grow professionally and personally, the money appears. Well, the money doesn't "just appear," but through good communication, many dedicated people who see, and help shape, the vision of SURF make it happen!

What is the current status of the endowment?

JG: The campaign for the \$10 million SURF endowment has been a great success. Slightly over \$10 million have been contributed. This consists of \$8.2 million for endowment and \$2 million in annual gifts. During the past three years there has been an anonymous fund for \$50,000 of matching grants to donors willing to contribute \$75,000, for a total of \$125,000, to endow a SURF stipend. At the present time, there are 20 matching grants available. During the coming months this should enable SURF to reach the goal of \$10 million for the addition to the existing endowment. We are all very thankful for the work of Carl Larson and his committee and for the support and work of Mark Reinecke in the Caltech Development office.

Is there a message you would like to convey to SURF donors?

JG: The response to SURF's endowment goal has been outstanding. The major gifts and the results of the matching gifts have been major features of the success of the campaign. I would like to say

a very special thank you to the donors who have provided this support. Also thank you to all of the SURF donors, large and small, through the 29 years of the SURF program. This strong support of SURF in donations and in time and effort has been very important in the growth of SURF and in keeping SURF as the best summer undergraduate research program.

If someone wants to get connected to and help SURF, what should he or she do to be more involved?

JG: Attend SURF Seminar Day, which will be on Saturday, October 20, 2007, this year. Contact myself or other members of the SURF Board. Contact the Student-Faculty Programs office.

I know that you have been working to improve co-mentor support; how are you going to achieve that goal?

FS: Since co-mentors (graduate students, postdocs, and permanent members of the technical staff) are playing an increasing role in SURF, it is important to recognize and encourage excellence in co-mentoring. But it is also important to take steps to help ensure that the co-mentoring experience enhances the professional development and goals of the co-mentors. Thus, we are working to determine how to encourage, recognize, and reward excellence in co-mentoring.



Who are some mentors on campus that co-mentors should look up to as good examples?

FS: Those with whom I'm familiar are: in chemistry, Jack Roberts (who has mentored over 100 SURFers), Robert Grubbs (who has mentored over 80), and Nate Lewis; in geological and planetary sciences, George Rossman and Joe Kirschvink; in engineering and applied science, David Rutledge, Richard Murray, Paul Bellan, and Melany Hunt; and in physics, math, and astronomy, Tom Tombrello (who has been mentoring undergraduates doing research since he first arrived at Caltech in the mid-1960s) and George Djorgovski. Many other faculty whom I know to have been excellent mentors have since retired. Some of them are in fields with few students, but were excellent mentors for those students whom they did mentor.

What is your favorite SURF story or memory?

JG: I am proud of the efforts of board members in the early days of the Caltech Campaign to ask for the inclusion of SURF as a line item. We contacted the Provost, the Vice Provost, and others about it. The final step in this effort was a Power Point presentation by John Glanville, then Chair of the SURF Board, for Bob McQuinn, Associate Vice President for Development. These efforts were the starting point for the success of the SURF Campaign.

FS: Your question raises a very important issue: Each SURFer represents a new chapter in the "Book of SURF." Each year many, actually most, such

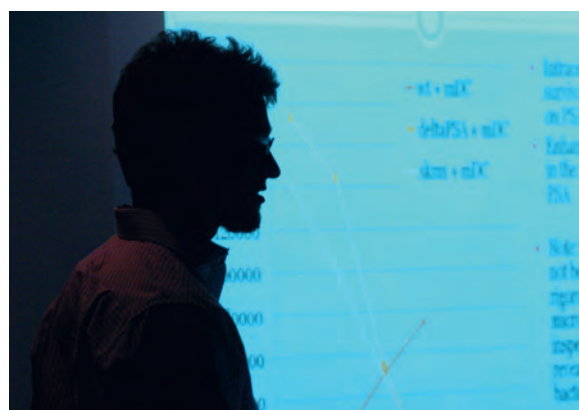
chapters are never shared in a systematic way with the rest of society. Also, all the Caltech faculty and JPL technical staff who have mentored SURFers might be encouraged to share their stories regarding support of SURFers and the SURFers themselves. SURF is now old enough to really have some great insights and stories expressed by those mentors! If students were to develop a program and maybe request some short stories from mentors, I'll bet you would be very happily impressed. And, it would be good for SURF to show others how important it is to involve undergraduates in the world-class research communities of the Campus and JPL.

We need a way that does not burden SURFers, mentors, co-mentors, or SURF staff, to put the unusual stories in an archive. We're open to suggestions!

If you could share your SURF story with anyone, whom would you want to share it with?

JG: I would share the SURF story with new faculty.

FS: During these times, when science, engineering, and mathematics play an increasing role in shaping our lives and the lives of our children and grandchildren, it is important for enthusiastic, bright, compassionate young researchers to communicate with the rest of society. My experience has been that often people you would not expect to be interested in hearing about the SURF experience are deeply interested, and sadly vice-versa happens too. However, my point is that I've stopped trying to decide on "what audience" should be addressed; all should.



Students at Caltech often have to pull many all-nighters. When was the last time you had to pull one and what was it for?

FS: The late Bob Sharp once told SURFers that they would do well to look for a vocation that, once in a while, pulled them awake at 4 am because they could not wait to get to work, whether it be to conduct a new experiment, analyze new data, compose a new song, write a new chapter, or think of a better way to teach a difficult concept. In other words, find something that allows you to express your own creativity, advance human knowledge, alleviate human suffering, create something beautiful, etc.

The last period of time that I pulled all-nighters was when I was conducting atmospheric tracer field studies for the California Air Resources Board to characterize the impact of pollutants released in the San Joaquin Valley upon vegetation on the slopes of the Sierra Nevada Mountains. With the help of a dozen Caltech undergraduates and one or two graduate students, we set up portable labs and monitored all night long. Other such studies involved the California coastal regions, and sometimes involved using the research vessel at the Naval Post Graduate School. These all-nighters usually yielded new interesting information and typically were a race between exhilaration and exhaustion.

If you were participating in SURF, what would your research project be?

JG: My project would be in mechanical engineering, some aspect of the DARPA vehicles, or seismology and earthquake engineering.

FS: When I listen to the SURFers during the Doris Perpall speaking competitions, I find myself getting excited about projects in several fields, especially nano-science with overlapping fields of biology, chemistry, materials science, and chemical engineering; cosmology; and neuroscience.

If you were to choose a book that could act as an inspiration for, or initiation into, the SURF program and research conducted through Caltech, what would it be?

JG: I would recommend the SURF Annual Report and the SURF Seminar Day program. These booklets provide an outstanding description of SURF and the diversity of the research projects and the talent of the SURF students.

FS: My wife, a retired librarian, tells me that over 50,000 books are published each year. The trick is to find out which ones to read. Even if 0.1% of the books were really good, that would mean reading about one book a week. That's easy to do, but which books? I now depend upon a close-knit group of friends who have similar values to make recommendations. Those are just the new books, but what about the "old books"? Here are a few of my favorites: "*Genius*" *The Life and Science of Richard Feynman* by James Gleick; *The Character of Physical Law* by Richard P. Feynman; *E.O. Wilson in Search of Nature* by E.O. Wilson; *Advice on Dying—and Living a Better Life* by the Dalai Lama; and *Victory Secrets of Attila the Hun* by Wess Roberts.

If you were told to redefine or create a SURF logo, what should it be and why?

FS: I would go with a beautiful wave showing its beauty, power, and mystery because SURF represents "the wave of the future." To me, SURF conjures up a beautiful dynamic phenomenon, which was present long before humans and will be here long after humans. It represents the timeless quest to understand Nature. And, as long as young people with a dream of better understanding Nature want to learn from world-class mentors who have a vision, there will be SURF.

“I think the SURF program is one of the most valuable resources Caltech has to offer.”

— Dr. Antonio Rangel



How the SURF student became a mentor

WHEN ANTONIO RANGEL CAME TO CALTECH in 1990 as an undergraduate he was clear on what he wanted to study: Applied Physics. How then did this former aspiring physicist end up back at Caltech as an associate professor of economics? The answer is simple: a class spurred his interest; a supportive mentor encouraged his scholarship; and SURF provided a framework for it all to come together!

In the winter term of 1991, Antonio took EC11: Principles of Economics with Professor John Ledyard. In that class he realized that he loved being able to apply the analytical skills he learned from science in order to examine real-world social problems. By the end of the class, Antonio had approached



Dr. Ledyard and together they designed a SURF project for the summer. The goal of the project, entitled “CCRE: A Computerized Barter Exchange,” was to design a computerized market that would allow project managers at the Jet Propulsion Laboratory to allocate resources in the design of the Cassini Mission. The resources in this case, mass and power, were finite and project managers needed a way to effectively handle the multiple requests by various constituencies for more resources. An electronic marketplace model would allow managers to allocate resources and provide a place for the constituents to trade with each other. The project gave Antonio “a taste for unusual economic problems not in the mainstream of the profession.”

In many ways Antonio exemplifies the quintessential SURF student. As the Mr. and Mrs. Victor V. Veysey SURF Fellow, not only did he present his work at SURF Seminar Day but he also attended and presented at the 6th National Conference on Undergraduate Research. His hard work earned him the Sigma Xi Award in 1993. Sigma Xi is an international honor society of scientists and engineers that

recognizes scientific achievement. And in 1994, his research resulted in a co-authored paper in the *Journal for Organizational Computing*.

Antonio’s SURF project convinced him that his passion was for economics. After graduating from Caltech he earned a Ph.D. in Economics from Harvard and went on to Stanford as an assistant professor. In 2003, he opened the Stanford Neuroeconomics Lab to study the neural basis of economic decision-making. However, it was his alma mater that was becoming the leading place for neuroeconomic research and in 2006 Antonio returned to Caltech as an associate professor.

This summer Antonio conducted his second SURF—this time as a mentor. “My SURF mentor, Dr. Ledyard, was inspiring and encouraging to young scholars. He understood both worlds of science and social science and that appealed to me,” Antonio recalls. He hopes to do the same as a mentor: “I want to inspire students to become scientists. Science is fun. Students’ passion for discovery is something that I want to support and nurture.” For Lindsay King, the 2007 J. Kent Clark SURF Fellow, Antonio has done just that. “He is very excited and passionate about the work we are doing. He



provides a lot of one-to-one interaction and this is something I was looking for in a mentor. I have a lot of ownership over my project but he is always there challenging me and pushing me to do good work.”

Lindsay, who is well-known on campus as a member of the women’s basketball team, is a rising senior studying biology. “I love neuroscience and want to take advantage of any opportunity to understand how the brain impacts behavior.” Her SURF project this summer examined how visual information factors into economic decision-making. The hypothesis is that for each choice the brain assigns a value to help the decision-making process and that an image, rather than text, amplifies the value assigned. Eventually, the use of fMRI will allow researchers to understand how visual information is used by the brain to compute economic values.

Lindsay will continue her work with Dr. Rangel over the next academic year. She plans on writing a senior thesis based on the work she started this summer. Additionally, she will conduct a preceptorship at the Children’s Hospital of Los Angeles. There she will be matched with a mentor in neurology and neuropathology. Ultimately, Lindsay hopes to attend

graduate school and study public health. “I’d like to eventually develop a drug education program for kids that is based on the science behind choices and addiction.”

On the similarities between doing a SURF and playing basketball, Lindsay has this to say: “They both are a big commitment and to get good results you need to work hard!”

“I want to inspire students to become scientists. Science is fun. Students’ passion for discovery is something that I want to support and nurture.”

Thank You, Carolyn Ash and David Goodstein

In 1989, SURF founder Fred Shair announced that he was leaving Caltech to become Dean of Natural Sciences at Cal State Long Beach. He strongly believed that Carolyn Ash was the best person to take over the SURF program. Fortunately, Vice Provost David Goodstein agreed too! Under Carolyn's leadership SURF continued to grow and evolve, to become the premier program that it is today! Carolyn has had a truly remarkable career indeed. This spring Caltech honored Carolyn's legacy with a campus celebration.

Over a hundred students, faculty, alumni, staff, and friends attended to share their gratitude and well-wishes.

Carolyn isn't the only SURF lynchpin to retire. This summer Vice Provost David Goodstein also announced his retirement. For over 20 years David has provided supervision, leadership, and support to the development of SURF. His integrity, insight, and courage have been critical to Caltech and to the growth of undergraduate research. Thank you, David, for years of guidance and vision!



Carol Casey Honored

This year Caltech awarded the first annual Thomas W. Schmitt Staff Prize to SURF's very own, Carol Casey, Associate Director of the Student-Faculty Programs office. The award is given in

recognition of a staff member whose "contributions to the Institute embody the values and spirit that enable faculty members and students to achieve excellence in research and education." While many faculty, alumni, students, and staff wrote letters nominating Carol for the award, perhaps Dr. Harry Gray sums it up best: "Carol has been a tower of strength for all who love students and want to see them succeed." But that's not the only recognition Carol has received this year. Carol was also named as one of two Honorary Members by the

Caltech Alumni Association, in recognition of "her contributions to the undergraduate research experience including positive attitude, commitment, and creativity." In response to the accolades, Carol commented: "These recognitions are much appreciated, and they wouldn't have been possible without my fabulous co-workers. Jason, Candace, and Carolyn have made it a joy to come to work every day! I am very proud to be part of such a wonderful team that is so dedicated to serving our students."

New Director Takes the Plunge

by FRED SHAIR

Administrative Committee Chair



In addition to the normal Administrative Committee (AdComm) activities, this year members of the AdComm worked closely with the SURF Board to identify and recommend an excellent person to replace the retiring Director of the Student-Faculty Programs office.

Following Carolyn Ash's retirement announcement, the Vice Provost asked me to chair the Search Committee. Twelve members of the Caltech community served on the committee with me.

The Search Committee also worked closely with Dlorah Gonzales, Director of Employment, and greatly benefited from her experience and hard work. It was my sense that members of the Search Committee were unanimously enthusiastic about the selection of Candace Rypisi. In summary, the Search Committee developed a strong and transparent search process. Using this process, the Search Committee worked hard to find an excellent person to fill this very important position!

Search Committee Members

STEVE FRAUTSCHI, *Professor of Theoretical Physics; SURF AdComm*

GEOFF BLAKE, *Professor of Cosmochemistry and Planetary Sciences and Professor of Chemistry; Chair, MURF AdComm*

MELANY HUNT, *Professor and Executive Officer of Mechanical Engineering*

BILL WHITNEY, *Member of the JPL Technical Staff and Deputy Manager, JPL Education Office; SURF AdComm and SURF Board*

JOHN GEE, *Chair, SURF Board*

KIRK DAWSON, *Vice Chair, SURF Board*

ROBERT MCQUINN, *Associate Vice President, Development*

JERRY HOUSER, *Director, Career Development Center; SURF AdComm*

ASHISH MAHABAL, *Staff Scientist in Computational Astronomy; Co-Mentor Advisory Committee*

BEN GOLUB, *Student Representative*

CSILLA FELSEN, *Student Representative*

ABDUL AHAD TARIQ, *Alternate Student Representative*

Increasing the SURF Award

The SURF award for 2007 was raised to \$6000 (from \$5000) to keep the award among the most attractive summer research opportunities available anywhere. The SURF Administrative Committee asked Professor of Physics, Emeritus, Ward Whaling to conduct an inflation analysis to better understand the increasing costs faced by SURFers since the last award raise in 2001. Among his findings: room and board in the Houses has increased by 43% for Caltech students, and by a whopping 138% for students from other colleges.

Spotlight on SURF Alumni

Edray Herber Goins

DRAY HERBER GOINS ('94 BS MA/PH; SURF '92, '93) has spent more than 15 years with the SURF program. As an undergraduate, he conducted research in areas as diverse as mathematics and history. He worked under Professor W.A. J. Luxemburg during the summer after his sophomore year in various problems related to number theory, only to spend the following summer working under Professor Douglas Flammig (with help from postdoctoral fellow Bryant Simon) chronicling the history of African-American students at Caltech.

The latter project proved to be of great interest to the Institute. Dr. Goins published his results in a series of ten articles in the *California Tech* in 1994. These articles introduced African-American alumni such as Charles McGruder ('65 BS PH), a fellow physicist with whom Dr. Goins converses regularly; James Lu Valle ('40 PhD CH/MA), a sprinter who competed in the Olympics with Jesse Owens; and Grant Venerable ('32 BS CE), the first black student ever to graduate from Caltech. Dr. Goins was awarded the Rodman W. Paul History Prize in 1994, an honor "awarded to a junior or senior who has displayed unusual interest in and talent for history."

Even after graduation, Dr. Goins' involvement with SURF continued. He returned to Caltech in 2001 as a Taussky-Todd Postdoctoral Fellow in Mathematics, and soon became a SURF advisor for several Caltech undergrads. Harlan Kadish ('06 BS

MA) completed projects entitled "A Generalization of a Theorem of Gauss for Fermat Curves of Exponent 7" in 2003 and "On the Torsion Subgroups of Q-Curves" in 2004. Davin Maddox ('05 BS MA) completed projects entitled "Heron Triangles and Elliptic Curves" in 2002 and "On the Ranks of Elliptic Curves" in 2003. Charles McBrearty ('06 BS CS) completed a project entitled "Representations of $GL_3(F_2)$ " in 2004. All three alumni are doing quite well: Davin is now a graduate student in mathematics at UCLA, Harlan is a graduate student in mathematics at the University of Michigan, and Charles is a graduate student in computer science at Harvard.

Dr. Goins looks forward to continuing his involvement with SURF in the future. He has donated funds in the past, volunteered as a session moderator, and attended SURF Seminar Day as recently as the summer of 2007. SURF inspired him to choose a career as a professor of mathematics, and continues to inspire him to learn more about the cultural impact of African-American scientists.



Highlights of Summer 2007



I'm not sure how often freshmen have the opportunity to work in the laboratories of Nobel laureates at other schools, but just among my close friends I have seen this happen twice here at Caltech thanks to SURF!

Caleb Ng
 SURF '05, '06
 Amgen Scholar '07

Allied Programs

In addition to SURF, the Student-Faculty Programs office administers an array of undergraduate research programs. In total, 538 Caltech and non-Caltech students conducted research on campus, at JPL, or at other U.S. and international institutions. Several of these programs are coordinated in collaboration with the JPL Education Office. Here's a look:

MURF

- Laser Interferometer Gravitational-Wave Observatory (LIGO) SURF
- Caltech Amgen Scholars Program
- NASA Undergraduate Student Research Program
- NASA Space Grant
- NASA Planetary Geology and Geophysics Undergraduate Research Program
- Caltech-IIT Kanpur Exchange
- Caltech-National University of Singapore Exchange
- Caltech-Hong Kong Universities Exchange
- Caltech-Cambridge Exchange
- Howard Hughes Medical Institute EXROP

Awards and Prizes

The Doris S. Perpall Speaking Competition was endowed by Robert C. Perpall (BS '52, MS '56) in memory of his late wife, Doris Perpall. The prize encourages students to prepare excellent SURF presentations. The 2006 winners were: Po-Ling Loh, Alexander Huth, Evan Gawlik, and Arturo Pizano.

SURFers 2007

<i>Class Level</i>	<i>Percent</i>
Pre-Freshman	2%
Freshman	30%
Sophomore	34%
Junior	30%
Senior	4%
Women	31%
Minorities	6%
Average GPA*	3.44

* Caltech students only, excluding pre-freshmen and freshmen

CALTECH SEMINAR SERIES

ROBERT H. GRUBBS

Victor and Elizabeth Atkins Professor of Chemistry; Nobel Laureate

Fundamental Research to
Commercial Products: Applications
of Olefin Metathesis Catalysts

NADIA LAPUSTA

Assistant Professor of Mechanical Engineering and Geophysics

Seismic Simulations

STEPHEN L. MAYO

Bren Professor of Biology and Chemistry

Protein Design Automation

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Dark?

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Rise of the Machines: Exploring
Space With Intelligent Robots

SURFers 2007

<i>Division</i>	<i>Total # of Students</i>	<i>CIT Students</i>	<i>Non-CIT Students</i>	<i>Mentors</i>
Biology	48	40	8	21
Chemistry and Chemical Engineering	63	50	13	26
Engineering and Applied Science	94	75	19	43
Geological and Planetary Sciences	21	18	3	12
Humanities and Social Sciences	11	9	2	8
Physics, Mathematics, and Astronomy	50	40	10	29
Jet Propulsion Laboratory	52	22	30	34
Off Campus	12	11	1	12
International	5	5	0	5
TOTAL	356	270	86	190



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Inventing Your Future:
What Are Your Options?

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Secrets of the Polished Professional:
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Graduate School: The Nuts and
Bolts of the Application Process

JONIE WATANABE TSUJI
Career Counselor, Caltech Career Development Center

CONFERENCES

SFP Seminar Days

Four different Seminar Days, held on August 14, 15, 16, and October 20, provide a great opportunity for all summer students to give oral or poster presentations about their research projects. These sessions are attended by peers, faculty, mentors, alumni, donors, friends, and family.

Southern California Conference on Undergraduate Research (SCCUR)

SCCUR is a one-day conference held each November on a college or university campus in the Los Angeles area. Over 500 student participants attend for a day of presentations and discussions on undergraduate research and

scholarship. Eleven SURFers attended the 2006 conference at Occidental College and presented their research findings. SCCUR 2007 will be held at California State University, Los Angeles.

National Conference on Undergraduate Research (NCUR)

The mission of NCUR is to promote undergraduate research and scholarship done in partnership with a faculty mentor. Each year we send the Doris S. Perpall Speaking Competition finalists. NCUR 2007 was held at Dominican University of California and Po-Ling Loh, Evan Gawlik, and ZeNan Chang attended and presented their work.

SPECIAL EVENTS

Huntington Tour

Thirty students were treated to a special “behind-the-scenes” tour of the Huntington Library, Art Collections, and Botanical Gardens. Afterward, Dr. and Mrs. George Boone hosted a lovely reception in their sculpture garden at their home. What a treat for everyone involved!

JPL Picnic

The JPL Education Office hosted an all-American BBQ for all Caltech and JPL summer students. Although the day competed for the hottest day of the summer, students didn’t mind. They enjoyed playing Frisbee, sharing research stories, and resting in the shade!

SURFSAC EVENTS

Thanks to the hard work and dedication of the SURF Student Advisory Council, students enjoyed a full array of social activities this summer! The SURFSAC, led by Chair Parvathy Menon, Vice Chair Peter Hung, and Secretary Andrea Dubin, coordinated weekly events such as Chillin’ on the Olive Walk every Monday; Sports every Tuesday; Outdoor Movies every Thursday; and trips to the beach,

museums, or ice skating on the weekends. A special thanks to the Moore-Hufstedler Fund and Campus Life for their generous support of SURFSAC events.

Keeping with tradition, Wednesday nights were reserved for SURFSAC Suppers. These weekly restaurant outings bring together faculty mentors and students for informal conversation. We thank Dr. Catherine Jurca, Master of Student Houses, for her continued generous subsidy of these dinners.

Statistics From the 2007 Graduating Class

Total number of B.S. graduates	171
Of these, the number graduating with honors	88 (51%)
Total number of B.S. graduates who have done a SURF	127
Of these, the number graduating with honors	73 (57%)
Percentage of B.S. graduates who have done a SURF	(74%)
Number of prizes awarded to B.S. graduates	114
Of these, the number of prizes awarded to SURFers	101 (89%)



The SURF Campaign Swells



We are delighted to report that this year we've made significant progress toward the SURF Campaign! Many generous and supportive friends have contributed to the goal of increasing the SURF endowment by \$10 million. Thanks to the hard work and dedication of the SURF Board Development Committee led by Carl Larson and the efforts of Mark Reinecke and the Caltech Development Office, we have raised \$8.2 million for the endowment and an additional \$2 million in annual gifts.

It is with great appreciation that we acknowledge the creation of the following endowments this year.

NEW SURF SCHOLAR ENDOWMENTS
Kiyoo and Eiko Tomiyasu SURF Scholars

NEW SURF FELLOW ENDOWMENTS
Hannah Bradley SURF Endowment
Class of '52 SURF Endowment
Richard T. Jones SURF Endowment
James J. Morgan SURF Endowment
Franz and Anne Nierlich SURF Endowment
Captain Pradeep B. Suklikar SURF Memorial Endowment
Harold and Mary F. Zirin SURF Endowment

Endowment Matches Still Available!

Three years ago a very supportive alumnus and his wife offered \$2 million as a matching challenge to other SURF donors. They will match up to \$50,000 for those who contribute gifts or pledges of \$75,000! The full cost of a SURF endowment is \$125,000. Matches are still available and if every available match is taken advantage of we will reach our original campaign goal of \$10 million for the SURF Endowment.

Honor Roll of 2007 SURF Donors

Endowment

Thanks to the generosity of many committed donors, gifts to the SURF endowment will ensure students the opportunity to conduct research for generations to come. Scholar endowments provide support for five students annually in perpetuity. Fellow endowments provide support for one student annually in perpetuity.

GIFTS TO SURF SCHOLAR ENDOWMENTS

LARSON SURF SCHOLARS
Mr. and Mrs. Carl V. Larson

KIYO AND EIKO TOMIYASU
SURF SCHOLARS
Dr. and Mrs. Kiyomi Tomiyasu

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ENDOWMENT
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One hundred percent of gifts to the annual fund go to funding SURF awards. Gifts at the \$5,000 level and above have a SURF student named in the donor's honor.

GIFTS TO ANNUAL AWARD FUND

Gifts of \$5,000 or more

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Dr. and Mrs. Fredrick H. Shair
Mrs. Laura Steinman
Mr. Byron M. Sugahara

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SURF Endowments

2007

SURF Scholar Endowments

Kiyo and Eiko Tomiyasu SURF Scholar Endowment

SURF Fellow Endowments

Hannah Bradley SURF Endowment

Class of '52 SURF Endowment

Richard T. Jones SURF Endowment

James J. Morgan SURF Endowment

Franz and Anne Nierlich SURF Endowment

Captain Pradeep B. Suklikar SURF Memorial Endowment

Harold and Mary F. Zirin SURF Endowment

2006

Brenda and Louis J. Alpinieri SURF Endowment

Robert F. Connelly SURF Endowment

Kirk and Marjory Dawson Family SURF Endowment

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Larson SURF Scholar Endowment

Joanna Wall Muir SURF Endowment

Ernest R. Roberts SURF Endowment

Soli Deo Gloria SURF Endowment

Nellie Bergen and Adrian Foster Tillotson
SURF Endowment

Mary Vodopia SURF Endowment

Frank W. Wood SURF Endowment

2004

Heather and Paul Haaga SURF Endowment

Thomas Lauritsen SURF Endowment

2003

David C. Elliot SURF Endowment

Doris Everhart SURF Endowment

2002

Ray Owen SURF Endowment

SURF Board SURF Endowment

2001

Marcella Bonsall SURF Endowment

Rossum Family SURF Endowment

2000

Dr. Terry Cole SURF Endowment

Thomas C. Hays SURF Endowment

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Alain Porter Memorial SURF Endowment

1999

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J. Kent Clark SURF Endowment

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Øistein and Rita A. Skjellum SURF Endowment

Rita A. and Øistein Skjellum SURF Endowment

1998

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1996

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1995

The Associates SURF Endowment

Shirley and Carl Larson SURF Endowment

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1994

Arthur Rock SURF Endowment

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1993

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1992

Edward W. Hughes SURF Endowment (1992)

Arthur E. Lamel Memorial SURF Endowment

1991

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1990

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1989

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