

# Physics and Astronomy

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## Dr. Däppen takes over as department chair

As Dr. Werner Däppen assumes the position of department chair, he looks to continue the recent growth of the department under the previous chair, Dr. Hans Bozler. Selected by a department committee, Dr. Däppen will hold the position for a three-year term.

“[Dr. Bozler] certainly was extremely successful with good hirings, and that momentum needs to be continued and preserved,” Dr. Däppen said.

Two new faculty members already joined the department, and another is expected to arrive in January. Dr. Däppen said he was pleased with the direction they will take the program.

“For the first time, we’re bringing in dearly needed gender representation, which has been lacking for several years,” he said. “[Physics] has been one of the few, very few, male-only departments, and now suddenly we have

two women.”

Dr. Jia Grace Lu, a nanotechnology specialist, and Dr. Elena Pierpaoli, a cosmologist, both joined the department after an extensive search last year. Dr. Däppen was particularly glad to see growth in the Astronomy program, something he said hasn’t happened much in his 15 years at USC.

“We have great hope that [Dr. Pierpaoli] can attract more students and increase the visibility of Astronomy,” he said.

In terms of his vision for the department, Dr. Däppen describes himself as a “congenital optimist” and has both long-term and short-term goals.

“We can always have the big dreams of increasing our visibility standings, getting new faculty, keeping the momentum of successful hirings,” he said. “To me, these are sort of obvious tar-

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## “Science, Serendipity and Truth” event a success

During the first event of the new Visions and Voices program at USC, physics professor Dr. Clifford Johnson joined colleagues from varied disciplines to discuss and explore the concept of uncertainty through informal conversation and performance.

The first of four such presentations coordinated by Dr. Johnson and K.C. Cole, a professor at the Annenberg School for Communication, included religion and legal scholar

Jonathan Kirsh and actress Chloe Webb, and attracted a large audience.

“We had a full house. Really full,” Dr. Johnson said. “The auditorium has a seat capacity of 220, and all of those were in use, with people standing at the sides and sitting on the floor. In view of the fact that I was prepared to live with the fact that only 10 or 15 people might show up, this was a pleasant bonus.”

First to present was Professor

Cole, who discussed the connection between uncertainty in physics and journalism.

The picture of what is going on can change radically depending upon the sources and the other filters that the journalist might be using, Professor Cole told the audience. Focusing on a particular angle of the story may bring clarity in one aspect, but will result in diffusiveness in another

cont. on page 4: **Science**

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## Profiles ★ Two new professors join Physics team

Cosmologist Elena Pierpaoli's arrival at USC not only marks a growing and developing Astronomy department, but also a move toward a more gender-balanced faculty. One of three new hires, two of which are female, Dr. Pierpaoli joined the Trojan family during the summer and began teaching a class this fall.

"I think it's a great opportunity to develop my field here," Dr. Pierpaoli said. "USC is so close to many different observatories."

Dr. Pierpaoli was born and educated in Italy. She studied physics as an undergraduate and became interested in cosmology in the following years. After taking research positions in Canada, at Princeton, and at Cal Tech, Dr. Pierpaoli is currently taking on the challenge of teaching her first full



Dr. Elena Pierpaoli is a member of the Planck satellite science team.



Dr. Jia Grace Lu's work with nanotechnology may lead to better chemical sensors.

The technology she deals with is small (think microscopic), but it's making an impact in the scientific world in a big way. The world of nanotechnology, electronic circuitry and gadgets on an incredibly tiny scale, is the field of expertise for new faculty member Jia Grace Lu.

Lu's work on nanotechnology is centered on nanotechnology is centered on nanowires, threads of metal oxide that are only billionths of a meter wide. Zinc oxide nanowires, Lu's specific focus, can be used to

detect chemical substances or gases with great precision.

"We're working on how we can distinguish gases in a complex environment, not just a mixture of two gases," Lu said. "Ultimately, we want to develop an ultra-sensitive and highly selective chemical sensing system that mimics the

cont. on page 5: Pierpaoli

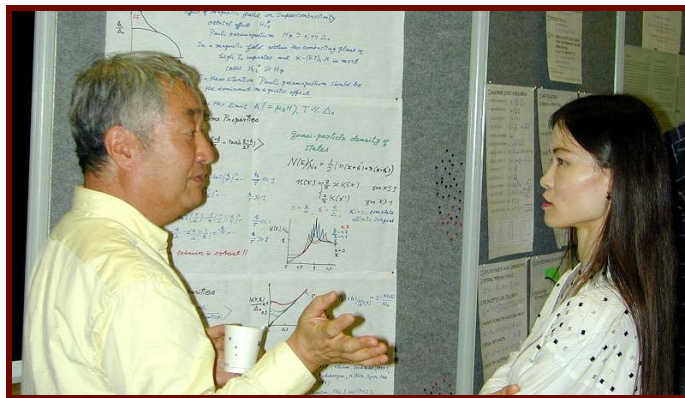
cont. on page 4: Lu

## Superconductivity honor awarded to Dr. Kazumi Maki

The John Bardeen Prize, considered to be the highest award in the field of superconductivity theory, was awarded to Professor Kazumi Maki for his recent work on the subject. Maki received the honor during the M2S 2006 conference, which took place from July 9-14 in Dresden, Germany.

"I am extremely happy, since I've had a close association with Professor John Bardeen during my student years in Kyoto in the sixties," Dr. Maki said. "I expected that I would get the Bardeen Prize sooner or later, but this year at Dresden was a bit of a surprise."

Dr. Maki took earlier work done on superconductors by John Bardeen, Leon Cooper and Robert Schrieffer, known as the BCS theory, and meshed it with Nobel Prize winner Alexei Abrikosov's own theory on superconductivity.



Dr. Kazumi Maki's field of expertise is unconventional superconductors.

"I started reading the original BCS paper in 1960, and in my PhD work I have succeeded in incorporating Abrikosov's theory of Type II superconductivity in the framework of the BCS theory," Dr. Maki said.

With this new information, he hopes to gain a better understanding of superconductivity.

"I am almost sure that many mysteries and puzzles surrounding high Tc cuprate superconductivity will be

resolved in the present framework," Dr. Maki said.

While applications of unconventional superconductors won't be feasible for another 30-40 years, according to Dr. Maki, scientists are already working with conventional superconductors in a number of real world appli-

cations. Doctors may soon be using superconductivity to measure heart or brain activity to detect problems in real time, while current methods take several hours.

In Japan, a railway company is using the concept of diamagnetism, a small magnetic field produced by superconductivity, to create a train system that floats on a magnetic field cushion. This could allow trains to travel be-

cont. on page 5: Maki

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## Department appoints new lab manager

In addition to the several new faces among the Physics faculty, a new staff member joined the team as lab manager. Ryan Griffith is now responsible for supervising the equipment room and staff and developing the 125L, 135L, and 150L series labs.

Griffith remembers always being interested in physics, even at a young age.

"I suppose what interests me most is the mystery," he said. "I have always been curious about how nature works and fascinated by how it can be described mathematically."

A graduate of Long Beach State with both a Bachelor's and Master's degree in Physics, Griffith has previous work experience with Boeing in Huntington Beach.

"My primary duties there were thermal properties testing on materials used on re-entry space vehicles and the analysis of space radiation on sensitive on-board electronics."

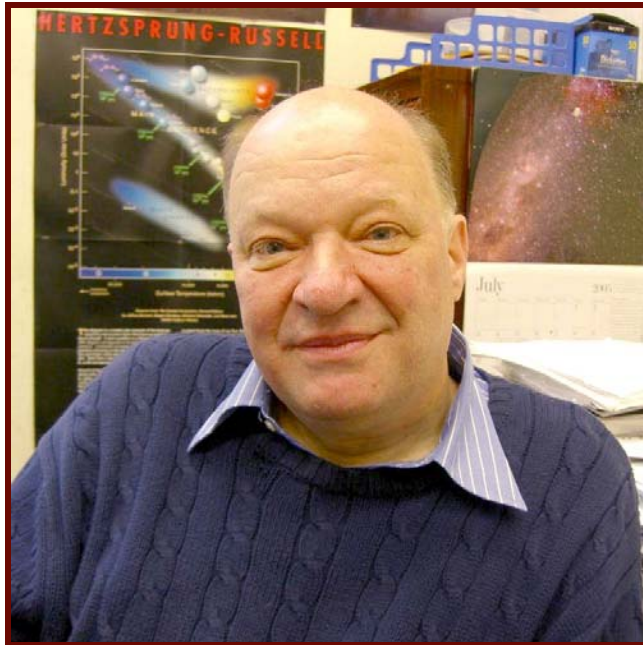
Although he is not currently involved in any active research of his own, Griffith tries to remain knowledgeable in the various topics that fascinate him.

"What initially attracted me to physics was astronomy and astrophysics, but there are many areas that interest me," Griffith said. "I try to read many journal articles."

As far as his current position, Griffith said he's settling in and enjoying his work.

"I enjoy lab development. Also, I have met and worked with some great people in the department," he said.

In addition to his fascination with physics and the natural world, Griffith also spends a lot of time outdoors, hiking, swimming and playing other sports like racquetball and baseball.



Dr. Werner Däppen will hold the position of department chair for three years. His personal research involves studying the interior of the sun, essentially using it as a plasma physics laboratory.

**New Chair:** cont. from page 1

gets, and of course we should have them."

For the short-term, however, he stressed his hope for a good team dynamic among staff, faculty and administrators.

"One of my personal goals here is that I would like to create an environment where people like to be, and to practice physics, but also to have the best interpersonal relationships possible, so that we feel like a team," he said.

Dr. Däppen was born and raised in Zurich, Switzerland, where he started his career in physics and astronomy with the goal of becoming an astrophysicist. After a lengthy amount of post-doctoral work, he came to USC in 1991 as an associate professor.

"I didn't have any formal teaching experience," Dr. Däppen said. "But I loved it. I love to teach and to be around young people. Actually, that was something I was longing for. I wouldn't have been satisfied with a research-only career."

Dr. Däppen's personal research involves helioseismology and creating theoretical models about dif-

ferent qualities of the sun's interior.

"It's sort of the art of using solar vibrations a bit like you would use earthquakes to find out about the Earth's interior," he said. "We use vibrations of the sun to find out about the sun's interior."

His hobbies include travel, and he considers himself as "sort of a language buff." His mother spoke a Swiss/German dialect, and as a young man he taught himself Russian by reading books and listening to short-wave radio from Moscow.

"This is something that even now gives me joy, when I can open a Russian book, or magazine, or talk to a colleague," he said.

He's even taken a couple courses in Chinese at USC over the past few years, and jokingly referred to his progress as "infinitely slow." As for his new position as chair of the department, Dr. Däppen is prepared for any coming challenges.

"When my colleagues expressed that they would like to see me as chair, I felt a bit touched and, well, I didn't lobby for the position, but I felt ready for the job," he said. "I'm new at this, but I'm willing to learn."

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**Science:** cont. from page 1 aspect.

“She also talked about the sharp dependence on the observer, and the sources that a journalist uses,” Dr. Johnson said. “In fact, she said, a story is utterly meaningless if the reporter is not careful to make clear what their sources are.”

Dr. Johnson followed Professor Cole by expounding on uncertainty in quantum physics, similarly touching on the concept of diffusiveness.

“Simply put, there are quantities which are fundamentally unknowable in physics, in the right situation,” Dr. Johnson said. “It does not mean that there is a technical difficulty with learning that information, but rather it is

meaningless to even consider that quantity as existing.”

He went on to explain that humans often attempt to interpret this meaninglessness as “a result of our tendency to want to reconcile the world of the small with our world of big, classically behaving objects.”

The program then proceeded with a discussion of the tension between monotheism and polytheism by Jonathan Kirsh. His talk focused on the duality between the two, and included parallels to the wave-particle duality of physics.

“Jonathan’s larger point...[concerned] the uncertainty of religion,” Dr. Johnson said. “Religion claims to be about the

truth, and gets rather dogmatic about it, producing a number of the greatest crimes and injustices and other problems in our world today, in the past, and no doubt in the future. But that unwavering ‘truth’ obsession quickly melts away upon closer examination.”

Bringing a close to the evening was actress Chloe Webb, who spoke about the uncertainty of the world in comparison to the assuredness of acting.

Stuff happens to us out there, Webb said. [Life] is uncertain. There’s a great deal of comfort to be had in the certainty of being an actor. You get the script in advance, so you know what’s going to happen in advance. You can prepare.

She followed her portion of the discussion by closing out the evening with a stylized performance of Abbott and Costello’s “Who’s on First?” routine, illustrating uncertainty in language.

In the face of all this ambiguity, evidenced across such a wide array of disciplines, Dr. Johnson said a common question seems to arise: How do we deal with the uncertainty of human life?

“Hope,” he said. “That’s the word that sustains it all. That is what keeps us going in the face of uncertainty.”

“Science, Serendipity and the Search for the Truth” will continue with events on Nov. 16, Feb. 15, and April 12. More information is available at <http://www.usc.edu/calendar>.

**Lu:** cont. from page 2

mammalian olfactory system.”

This sensory system offers an array of practical applications, from detecting explosives at airport checkpoints to sensing biological weaponry and nerve agents on the battlefield. A key advancement in nanowires from earlier chemical sensors is their ability to be reset and used again quickly. Previous sensors required elaborate and time-consuming procedures before they could be used again.

Lu’s interest and involvement in physics seemed almost sealed in stone due to familial ties in the field. Her grandfather, father and a number of other relatives all practiced physics in China.

“Usually they don’t encourage girls to do hard science, but I was fascinated by physics,” she said.

After moving to the United States when she was 14 years old, Lu pursued and completed undergraduate degrees in physics and electrical

engineering at Washington University in St. Louis. After receiving a doctorate in physics from Harvard, Lu spent time as an adjunct professor at University of California, Irvine before joining the Trojan faculty this fall.

“I was attracted to USC by the research dynamics and student quality,” Lu said. “So far, I like it here. It is slow to get a lab set up, but people have been very helpful to make it possible.” While Lu is not currently teaching, she plans to offer

## ***Question? Comments?***

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a course titled Science of Nanoscale Materials and Devices in the future.

In addition to her love of physics, Lu also enjoys table tennis, swimming, dance, and stamp collecting, when she finds a rare window of free time. Her other interests are wide-ranging, from classical music and impressionism to mythology and civilization.

Editor’s Note: Much of the information above was borrowed from an article on Lu published in USC College News by Tom Siegfried.



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## Women in Physics conference builds on inaugural success

In January 2006, 28 undergraduate women from throughout Southern California and one from Pennsylvania gathered at USC for workshops, tours, research talks, and discussions focused on showcasing current research and highlighting careers for women in physics. The Conference for Undergraduate Women in Physics returns for its second annual meeting in January 2007, with organizers increasingly confident about its growing size and impact.

Physics graduate students Katie Mussack and Amy Cassidy initiated the program in 2005 as a way to help female undergraduates majoring in physics transition successfully to the graduate level and eventually pursue a career in the field.

"I'd like the conference to give more female undergrads the motivation, encouragement, and resources to stay in physics," said Mussack. "It's important to provide them with an opportunity to connect with other women who are at the same stage they are and to meet positive role models of women at various stages of their physics careers."

With funding from the NSF (National Science Foundation), USC's WiSE (Women in Science and Engineering) program, the College Graduate Professionalism Initiative, and the Department of Physics and Astronomy, nearly twice as many applicants than last year will be accommodated.

"We have 68 applicants from across the nation," said Mussack. "We currently have funds to ac-



Conference attendees listen intently during a tour of Dr. Reisler's lab.

commodate 45, so we're working on securing more funding so we can accept everyone who applied, at no cost to the participants."

While Mussack and Cassidy originally developed and organized the conference, a committee of eight graduate and undergraduate students in the department, including Mussack and Cassidy, is now in charge of planning the event.

"We're excited to be working with such a great committee this year,"

Mussack said. "The three undergrads on the committee attended and one of the grad students served as a mentor to one of the small groups at last year's conference."

Dr. Gene Bickers, associate vice provost for undergraduate programs, former physics chair, and one of the faculty sponsors of the project, strongly praised Mussack and Cassidy for their initiative. Along with faculty sponsor Dr. Clifford Johnson and

cont. on page 6: Conference

### Pierpaoli: cont. from page 2

course, Physics 152.

"I actually prefer to teach physics," she said. "What I was more formally taught was physics. I may teach astronomy eventually, maybe at the graduate level."

While Dr. Pierpaoli continues to teach undergraduate courses in the department, she also plans to continue her own research projects.

"I like teaching, but in the broader sense, research is my first passion," Dr. Pierpaoli said. "I've always interacted with students. When I was not teaching in class, I involved students in my research."

Her research is concerned with dark matter particles, dark energy and their relationship to the history and composition of the universe.

"Cosmology has had some amazing discoveries in the past 10 or 15 years," she said. "I would like to be a part of future discoveries."

Much of Dr. Pierpaoli's spare time is spent caring for her two young children, a 5-year-old and a 2-year-old. If she does manage to find a few hours of freedom, she has plenty of hobbies to keep herself occupied.

"I like to sail, I play the flute, I've done volunteer work," she said. "I like hiking too. I like the mountains a lot."

When asked how she was settling in to her new teaching position, she replied with a grin, "I have the impression that I'm doing fine, but you'll have to ask my students about that."

### Maki: cont. from page 2

tween Tokyo and Osaka (about 250 miles) in one hour.

"However, perhaps the most useful application is the storage of electricity," Dr. Maki said. "A giant superconducting coil can store electricity in the form of a magnetic field. The energy saved from this would be enormous. Also, from an environmental standpoint, this should be much better than hydroelectric dams constructed for this purpose all over the world."

Dr. Maki has also been awarded for his work in the past, receiving the Nishina Memorial Prize in 1972 and the Alexander von Humboldt U.S. Senior Scientist Award in 1986-87.

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**Conference:** cont. from page 5

others in the department, Dr. Bickers provided inspiration, advice and support as the event developed.

“The success of the 2006 conference is entirely due to the leadership of Katie and Amy, and their work has now attracted NSF funding,” Dr. Bickers said. “Strong grass roots organizations such as that at USC are an important component of efforts to increase the representation of women in science and engineering on a national scale.”

## Past and Future

Following the 2006 conference, the response among participants who were exposed to career opportunities they didn't know existed overwhelmed Mussack and Cassidy.

“Many became interested in research areas that they don't have at their schools, and several who hadn't considered grad school as an option before the conference became excited about the idea of going,” Mussack said. “Overall, the participants left the conference excited about being physicists and optimistic about their future.”

The 2006 conference also served as a successful way to build a sense of community among the undergraduate women who attended.

“Last year's conference did a great job of creating a network of fe-



Several attendees share a meal with faculty sponsor Dr. Clifford Johnson at Upstairs Cafe.

male physicists throughout Southern California,” she said. “In our six-month follow-up survey, seven out of 13 respondents are still in contact with someone they met at the conference.”

Mussack and Dr. Bickers both expressed hope that the 2007 conference will continue to develop and expand that community. However, even with the success of their premier conference, the organizers still see plenty of room for improvement.

“We'd like to do a little more with the careers portion of the conference,” Mussack said. “We're putting together a panel of people who work in industry, government labs, etc., to talk to the participants about opportunities available for physicists and what it's like to work in different fields.”

Included among the speakers

already lined up for the 2007 conference, which takes place on January 13-14, are Frances Hellman (UC Berkeley), Gail Hanson (UC Riverside), Grace Lu (USC), and Beverly Hartline (White House Office of Scientific and Technology Policy). Representatives from University of Michigan and Yale University also expressed interest in attending the 2007 conference with the intention of developing similar events in the coming years. The organizing committee is confident that the 2007 conference will serve as a model for the potential development of a network of regional events.

“We are really excited about expanding the influence of the conference for female physicists throughout the country,” Mussack said.



A group of conference participants, along with co-founder Amy Cassidy (left), enjoy dinner at Cuidad in downtown Los Angeles.

### **Funding for UWIP '07**

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USC's WiSE Program

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### **Planning Committee**

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### **Faculty Sponsors**

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