

STATE OF THE DEPARTMENT

Tu-nan Chang, Chair and Professor

It has been another good year for the Physics and Astronomy Department at USC. Many of our faculty, staff, and students have been recognized for their outstanding contribution and achievement as highlighted elsewhere in this Newsletter. In particular, our junior faculty have enjoyed a tremendously successful year, we anticipate a search for a new faculty member in the coming year, and the number of our Ph. D. candidates has increased noticeably.

On the alumni front, the department hosted a luncheon last year on December 2 for those in Southern California whom we were able to contact. Over twenty alumni showed up and had a great time together. Since we plan to schedule occasional alumni events like this, please watch out for the next notice and join us if you can. Ultimately, we would like to plan a reunion at USC for Physics and Astronomy Alumni. We welcome your suggestions and will also appreciate your help if you would like to volunteer time and effort for such an event.

I would also like to share with you the good news on the tremendous progress we have made this year on the upgrade of our undergraduate laboratories. As I have reported to you previously, our able technical staff, under the leadership of Ty Buxman, Director of the Undergraduate Affairs Office, started a systematic project about three years ago to upgrade the laboratory facilities. With this comprehensive planning in place, the College at USC has funded a proposal for a substantial equipment grant this year. As a result, we are able to upgrade most of the old equipment in the undergraduate labs (including oscilloscopes, multimeters, optical benches, and PCs) as well as initiate some new developments. We are also now prepared to implement a full scale multimedia instruction program as many of our faculty have chosen to integrate state-of-the-art technology into their lectures.

You will also find a reprint of an article on the history of the department, courtesy of Professor John Nodvik. Finally, I would like to thank those of you who have contributed generously to the department and I wish you a pleasant summer. Please stay in touch (213) 740-1133 and tnchang@usc.edu. ♦

DEPARTMENT THANKS DONORS

The Department of Physics and Astronomy would like to thank the following individuals for their generous support:

William Brewer

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*Have you visited the USC
Department of Physics and
Astronomy on the Internet lately?
For the latest Department news
please see:
<http://physics.usc.edu>*

FACULTY MEMBER RECEIVES RAUBENHEIMER AWARD

Assistant Professor **Stephan Haas** has been selected to receive the 2000 – 2001 USC College of Letters, Arts and Sciences prestigious *Junior Raubenheimer Award*.

The *Raubenheimer Award* was named in honor of the late **Alfred S. Raubenheimer**, former Vice President for Academic Affairs and Dean of Liberal Arts. It was established in 1980 by the President's Circle and is presented annually to exceptional senior faculty members within each of the College's three disciplines (humanities, natural sciences, and social sciences) for outstanding contributions in teaching, research, and service. Only one junior faculty member from all three disciplines is selected annually. In the past, the *Raubenheimer Award* has gone to several of our faculty, including current Department Chair **Tu-nan Chang**, **Nick Warner**, **William Spitzer** and **Peter Lambropoulos** and **Gene Bickers** (*Junior Award*).

Since his arrival in 1998, **Stephan** has become an integral member of the department. He is an enthusiastic and innovative instructor. Comments from his *Physics 100* students are outstanding. They include; "I think that Stephan Haas is the best teacher I've had at this school. He is incredibly enthusiastic and fun in his method of teaching. He has a way of explaining course material in a clear, understandable way, while grabbing and keeping each students attention through his humor and hands-on demonstrations." "You are such an awesome professor and person. I was fortunate to be in your class." "Professor Haas is brilliant. He really explained concepts very well. He is funny and courteous and I think he is a great professor."

Stephan is engaged in theoretical research on the physics of strongly correlated electrons in solids. Recently his interest has focused on microscopic modeling and phenomenology of the high-temperature superconductors, in particular the analysis of dynamical spectra and phase diagrams. He is also using a range of numerical approaches to study low-dimensional antiferromagnets, spin ladders, spin-Peierls systems, and other quantum magnets. Moreover, his research extends to disordered quantum systems, including segmentation and random exchange interactions in antiferromagnets, dirty superconductors, and systems with impurity-induced spin and charge textures. He is a member of our *Condensed Matter Physics* group which is currently investigating a range of topics, including the superfluidity of ^3He , electron transport at low temperatures, two-dimensional inversion layers in semiconductors, semiconductor physics and semiconductor device properties at low temperatures, magnetism at ultralow temperatures, electromagnetic properties of superconductors, and physics of nanoclusters. For more information on Dr. Haas and his research, please visit his web page at <http://physics.usc.edu/~shaas/>.

The Department of Physics and Astronomy joins USC in congratulating Dr. Haas. His enthusiasm, creativity and skill have added much to the department's prestige. ♦

FACULTY RECOGNITION

Many of our faculty receive awards and honors throughout the year. Some of the recognition our faculty have been given include...

Werner Däppen was selected as *Faculty of the Month* by the **Mortar Board**, a senior honors society at USC, for March, 2001.

President Sample announced the appointment of **Robert W. Hellwarth**, Professor of Physics and Electrical Engineering as *University Professor*. This title is awarded to those professors whose multidisciplinary interests and significant accomplishments transcend any single field of study. Dr. Hellwarth's outstanding accomplishments bring honor to the University and the Department of Physics and Astronomy. We congratulate him and look forward to his continuing achievements.

Martin Gundersen, Professor and Chair of Electrical Engineering/Electrophysics and Professor of Physics, received the **2000 Germeshausen Award** of the International Power Modulator Symposium *For contributions to power modulator and radar transmitter technologies* at the June meeting in Norfolk, Virginia. The Symposium is a forum for research and development for repetitive pulsed power for laser, radar, accelerator and other applications, and is held every second year.

Additionally, **Dr. Gundersen** received a large research grant through the **Department of Defense Multidisciplinary University Research Initiative** program. The competition for MURI awards is intense with institutions submitting 416 applications from which 158 full proposals were made. DOD funded 48 of the proposals. His project will challenge limitations in achieving very high-power pulses of energy for short durations. He said, "We want to develop the switches, extrapolating from advances in solid-state switch technology. We also are interested in improved architectures for the pulse generators and in advancing some of the other elements such as energy storage."

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TWO DEPARTMENT FACULTY RECEIVE AWARDS

Eight General Education Teaching Awards were presented during a holiday reception on December 6, 2000 at the Town and Gown on campus. Two were awarded to our department faculty, **Dr. Gene Bickers**, Associate Chair, and **Dr. Werner Däppen**. They received the awards for their contributions to the General Education Program during the 1999 – 2000 academic year. They were chosen on the basis of statistics and student comments on evaluation forms, course syllabi and evidence of rigorous grading. Past General Education Award recipients from Physics and Astronomy include Professors **Ed Rhodes** and **Nick Warner**.

Professor Bickers taught *Physics 100*, an introductory course designed specifically for non-science majors who have little background in the sciences and mathematics. One of the primary goals of the course is to introduce the students to the most important and useful concepts of physics. Another is to expose the class to new ways of thinking about those things that have aroused one's curiosity. Comments on student evaluation forms indicate the high regard the students have for Dr. Bickers; "Dr. Bickers was an amazing professor. He made physics class fun and entertaining while explaining complicated ideas." "The instructor is great. One of the best professors at USC." "Dr. Bickers genuinely cares about his students. Even though I hate the subject of physics, Dr. Bickers make it bearable. Excellent teacher." "There isn't a thing I would change about his course and the way he taught. He was an amazing teacher. He explained the hardest things in the easiest way." "I'm a journalism major and I loved coming to physics."



Dr. Gene Bickers (left) and Dr. Werner Däppen receiving awards

Professor Däppen was recognized for his work in *Astronomy 100: The Universe!* Since he was trained both as a physicist and astronomer, Dr. Däppen employs a combination of both to show how the quest for the nature of the universe has helped the development of physics while physics has delivered the very concepts that can make the seemingly unfathomable things in the universe comprehensible. Student comments include; "The professor's dynamism and expertise made each and every class valuable." "Awesome enthusiasm about subject matter! Däppen really loves what he does! Also able to distill complex problems/ideas to average students." "Professor Däppen's enthusiasm is unparalleled. I have never had such an energetic professor who really cares about his students and the class." "He was a joy to be taught from." "This is the most interesting and educational class I have taken at USC and I thoroughly enjoyed it... the Professor is what I think all Professors should be. Thanks!"

The Department of Physics and Astronomy is proud to have such superb professors on our faculty and join with the College of Letters, Arts and Sciences in congratulating Professors Bickers and Däppen for receiving the General Education Teaching Award. The outstanding instructional skills they exhibit, their enthusiasm and ability to generate true inquisitiveness among students, brings distinction to our university. ♦

FACULTY RECOGNITION

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Tu-nan Chang, Chair of the Department, who received a Distinguished Faculty Service Award from the USC Academic Senate last year (see, <http://www.usc.edu/academe/acsen/uscfaculty/service/chang.html>), started his two-year term as the **President** of the *OCPA* (Overseas Chinese Physics Association, see, <http://www.ocpa.org>) on January 1, 2001. He will also **co-chair** the Fourth International Conference of *Chinese Physicist Worldwide* to be held in Shanghai in the summer of 2003.

Dr. Itzhak Bars was selected as a **Charter Member** in the formation of the *California Section* of the *American Physical Society*. ♦

UNDERGRADUATE RESEARCH FUNDING

For the third successive year, the Department has received funding from the **Undergraduate Research Program** in the *Office of the Provost*. The goal of this competitive program is to improve undergraduate research by supporting and inspiring the students to participate in research programs.

Professor **Gerd Bergmann** was awarded the funds three years ago to support four undergraduate students working in his research laboratory during the summer. The next year, as well as this year, Professors **Bozler, Kresin, Bergmann** and **Warner** have been jointly awarded the funding to support several undergraduate students working with them. ♦

PHYSICS COLLOQUIUM

The Department of Physics and Astronomy continues to host an on-going colloquium every Monday at 4:15 p.m. during the spring and fall semester. Invited guests this year have included **David Weiss** from the Department of Physics, University of California, Berkeley, discussing *Cold Atoms in Optical Lattices*, **Tom Jordan** from the Department of Earth Sciences at USC speaking on *Deep South African Gold Mines as Natural Laboratories for Studying Earthquake Physics* and **John Bahcall** from the Institute for Advanced Study lecturing on *Solar Neutrinos: where we are, where we are going*.

In a very special event, leading physicist, **Stephen Hawking**, spoke at USC on March 21. He explained theories about the beginning and end of the universe at a public lecture sponsored by the *CIT-USC Center for Theoretical Physics*. The full-to-capacity Bovard Auditorium, including President Sample and other top university officials, were completely engrossed in Hawking's examination of the farthest reaches of the universe, in both space and time.

You are cordially invited to join us at the colloquium. For a schedule and the colloquium location, please see our department web site at <http://physics.usc.edu/Colloquia>. ♦

VITALY KRESIN PROMOTED TO ASSOCIATE PROFESSOR

Professor **Vitaly Kresin** has been promoted to *Associate Professor* in the Department of Physics and Astronomy. He has contributed much to both the department and University.

Dr. Kresin emigrated from the Soviet Union with his family at age 17. They settled in the San Francisco Bay Area where Vitaly chose University of California, Berkeley to further his studies. By that time, he had decided to major in physics. He credits a high school teacher back in Moscow for instilling a strong interest in the subject.

Vitaly completed his undergraduate work at *UC Berkeley* and graduated with an A.B. in Physics, High Distinction in General Scholarship. He continued on and received his Ph.D. from that university in 1991. He spent the next few years as a postdoctoral researcher at *Lawrence Livermore National Laboratory* in the Condensed Matter Division and also as a Research Consultant at *UC Berkeley*. He conducted his research in the field of metal nanoparticles.

Vitaly began his career at USC in 1994. He stated, "USC offered me the opportunity to teach, which I enjoy a lot, and to continue and expand my research and work with graduate students. It is particularly gratifying to teach students who are curious and like to ask questions." This year Vitaly is teaching *Physics for the Life Sciences (Physics 135)*. He has put a lot of effort into making the case that physics is a great human endeavor to understand the world around us, and not a collection of formulas invented by professors to torture students. Comments on student evaluation forms indicate the high regard the students have for Dr. Kresin's instructional abilities; "He's my best professor so far at USC!... Made physics interesting. Applied physics to everyday life." "An excellent teacher... I admire his ability to communicate and connect with students and I appreciate his patience." "Bravo to Dr. Kresin! He is a wonderful teacher and obviously understands that physics can be enjoyable for non-majors."

Vitaly enjoys alternating upper-division classes with the lower-division ones. He believes a source of his success as an instructor is that he truly likes explaining things. Next spring, he is scheduled to teach *Conceptual Physics (Physics 100)* for the first time, and is readying himself for the challenge of teaching this large and very important general education course.

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UNCONVENTIONAL SUPERCONDUCTIVITY

Professors Stephan Haas and Kazumi Maki

The phenomenon of **superconductivity** was first observed about 90 years ago by the research group Heike Kamerlingh-Onnes at the University of Leyden. They discovered that various metals, such as mercury or lead, become perfect conductors when cooled down below a critical temperature which depends on the specific properties of the material. Furthermore, these compounds were found to expel magnetic fields in this special phase. Onnes was awarded the Nobel Prize in physics in 1913. However, a theoretical explanation of this intriguing effect had to wait for about half a century. It was ultimately given by John Bardeen, Leon Cooper, and Robert Schrieffer who explained that an effective attraction between electrons is responsible for the unusual low temperature superconducting state of these materials. For this achievement, they jointly received the Nobel Prize in 1972. While their theory could have been the culminating point for the field of superconductivity, the discovery of the entirely new class of *high-temperature superconductors* stirred up the physics community in 1986. These materials are complex ceramic compounds, containing layers of copper and oxygen as well as less common elements, such as yttrium, barium, and lanthanum. So far, superconductivity had only been observed at ultra-low temperatures in the range of liquefied helium, a few degrees Kelvin above absolute zero temperature. In contrast, the new ceramic high-temperature superconductors, discovered by Georg Bednorz and Alexander Müller (Nobel prize 1987), have transition temperatures in the range of liquid air. Although this may still seem very cold, it is a relatively high temperature compared to liquid helium, putting it closer towards the range of technological applications, such as magnetically levitated trains and electrical transmission cables.

During the last ten years more novel types of unconventional superconducting compounds with high transition temperatures and exotic properties have been found, challenging our theoretical understanding of the origin, nature, and restrictions of superconductivity in these materials. Experiments strongly suggest that there are fundamental differences between the physical properties of the conventional low-temperature materials, discovered almost a century ago, and these new classes of superconductors. Apart from the fact that the superconducting transition temperatures dramatically differ by orders of magnitude between these categories, probably the most significant distinction between conventional and unconventional superconductors is found in the symmetry of their order parameters. Conventional superconductors are well described by a so-called s-wave order parameter which implies isotropic attractive forces between electrons in all spatial directions. The situation in unconventional superconductors appears to be much more complex. For example, the high-temperature superconductors have a $d_{x^2-y^2}$ -wave order parameter, implying a strong directional dependence of their electron-electron interactions. Other newly discovered classes of superconductors with unconventional order parameters include heavy-fermion materials, organic compounds, and most recently MgB₂. Earlier this year, this very common material has been found to become superconducting at 39 Kelvin. The plethora of new materials with exotic properties makes one wonder how many more interesting superconductors are waiting to be discovered.

Our condensed matter theory group at USC has contributed to this field on

many different levels, including the construction and analysis of theories for mechanisms leading to unconventional superconductivity, the numerical simulation and testing of microscopic models, and the development of a comprehensive phenomenological description of anisotropic superconductors. Let us highlight our activities in this field by discussing a prominent example of the past year.

Imaging impurity bound states of unconventional superconductors In a pure superconductor, pairs of electrons propagate freely without scattering effects. However, impurities introduced by the replacement of atoms in the crystal lattice can break these pairs and localize electrons around the impurity sites. The local density distribution of these electrons in the vicinity of the impurity atoms can be measured by a scanning tunneling microscope. For anisotropic superconductors these experiments reveal exotic patterns, such as those shown in



Figure 1(a)

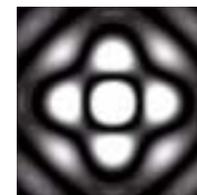


Figure 1(b)

Fig. 1, which serve as fingerprints for the underlying unconventional order parameter. For a conventional isotropic superconductor, one would expect concentric rings centered around the impurity site. In contrast, for the case of an anisotropic high-temperature superconductor with a $d_{x^2-y^2}$ -wave order parameter, one obtains the fourfold symmetric lobe patterns seen in Fig. 1.

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Physicists from all over the world were taking a coffee break during the annual winter meeting of the American Physical Society held on the SC campus in December, 1955. Dr. Ernest O. Lawrence, head of the physics department at the U of California at Berkeley, was chatting in a Founders Hall corridor with Dr. Gerhard L. Weissler, then head of the SC physics department. The two scientists were discussing a linear accelerator, one of the many pieces of nuclear equipment in the vast physics laboratories on the northern campus.

Dr. Lawrence turned to his colleague and asked: "Would you like to have this machine on your campus?"

Surprised and delighted, the younger man said of course he would and as casually as that the wheels were set in motion for the transfer of more than two million dollars worth of nuclear research equipment from Berkeley to the Trojan campus. With Dr. Lawrence's generous support, the Atomic Energy Commission was persuaded to turn the equipment over to SC, along with an annual operating grant of some \$200,000.

Last November 25, ground was broken for the building to house the new equipment, which is expected to be installed and working some time in the spring of 1959. The building itself will be completed about May 1.

RETROSPECTIVE: Linear Accelerator Puts SC Into Nuclear Research

Reprinted from the January 1958
ALUMNI REVIEW

NO STRINGS ATTACHED

No strings were attached to the gift. SC scientists have free rein to perform any experiments they choose with the equipment and the research to be carried on in the new

Nuclear Physics Laboratory is, in a sense, limitless. *Basic* research, of course, is distinguished from what is often miscalled *practical* research by its freedom from specific objectives. But findings of the basic researcher ultimately become the property and tool of the specific researcher.

Typical of the information to be sought, however, will be hitherto unknown information on the dimensions of the nuclei of various elements, data obtained from nuclear transmutations (operations by which one element may be changed into another), and information about the energy levels of nuclei.

To house the new equipment, the University is erecting a 144- by 70-foot reinforced masonry and concrete building to cost \$175,000. It will be a one-story structure 23 feet high, resting on a heavy concrete slab. It is rising on Hoover St., west of the Science Bldg., where it will be part of what will ultimately be a Science Quadrangle.

Inside this building, and shielding the scientists and their elaborate recording instruments from the accelerator and its generator, will be another 3-foot concrete shell. This will have moveable walls, so that cranes can get at the generator and accelerator when maintenance tasks require them to be lifted.

A 32-MILLION VOLT BOMBARDMENT

The new equipment to be housed in this shell will include two major pieces. The first of these is a Van de Graaff generator, which takes hydrogen protons at rest and speeds them up to an energy of four million electron volts. At this point, the protons pass into the linear accelerator and are speeded by successive electrical charges to 32 million volts (roughly equivalent to a speed of 50,000 miles per second.)

At this speed, the protons will bombard whatever target element is placed at the end of the linear accelerator. The effects of this proton bombardment on the target element will give the scientists data of various kinds about the nuclear structure of that element.

The Van de Graaff generator is a long, insulating tube of porcelain inside a 20-ton steel shell about 30 feet long by some 10 feet in diameter. The porcelain tube is surrounded by nitrogen under 200 pounds pressure per square inch by way of insulation. The porcelain tube itself contains a vacuum. When gaseous hydrogen is admitted into one end of this tube, and subjected to an electrical discharge, its protons separate and are shot through the vacuum tube into the linear accelerator attached to the other end of the generator.

In the linear accelerator, the protons pass through a series of tubes in a near vacuum. At each gap between the tubes the energy of the protons shot through the tubes is stepped up electrically until it reached its maximum of 32,000,000-volts.



HOLMES & WEISSLER
they'll take a big first step

ALUMNI REVIEW

PROF. WEISSLER'S BACKGROUND

Professor Weissler, who will direct the nuclear research and have the title of chief investigator, is a naturalized American who fled from the Hitler terror in 1939 after his uncle had been beaten to death in a Nazi concentration camp for his support of Protestant Pastor Niemoeller and after Weissler himself had been expelled from a Berlin university for protesting Nazi atrocities he had witnessed. He enrolled at UC Berkeley as a graduate student in physics, obtaining his Ph.D. there in 1942. He was an instructor in radiology at the UC Medical School when SC's President von KleinSmid and Vice President Raubenheimer invited him onto the SC faculty as an assistant professor. In 1951 he was appointed head of the Physics Dept. In 1956 he asked to be relieved of his academic administrative responsibilities in order to direct the transfer and installation of the new equipment on the SC campus. He was succeeded as department head by Dr. John R. Holmes.

Dr. Weissler is married to an LA girl by whom he has a son, aged 3. They expect another child any day. They live in Baldwin Hills near the Trojan faculty tract where Coach Don Clark has built his home.

A FIRST STEP

Under the new set-up, Dr. Holmes will function as deputy chief investigator. He also expects to add two or three faculty members to the Physics Dept. to assist with the nuclear experiments.

Both Weissler and Homes regard installation of the linear accelerator as the first step in a long-range, expanded program of nuclear research. Dr. Homes told REVIEW he expects the new installation to improve the SC graduate program in physics. This, in turn, should attract more of the best science students, since undergraduate teaching is done by graduate students serving as teaching assistants.

Said Holmes: "SC is bound to become an even better teaching institution as we expand our work in basic research."

Anthony D. Lazzaro '49, SC director of physical plants, was the liaison between the Physics Dept. and the architects and builders. ♦

VITALY KRESIN

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Vitaly carries out experimental and some theoretical research on metal nanoclusters – agglomerates of a finite number of atoms (from a few to thousands) which are bigger than a molecule but smaller than a piece of bulk matter. The gradual development of various bulk characteristics can be studied as a function of size, and quantum effects unique to finite systems can be observed. Work in this field allows for considerable interaction with solid-state, atomic, chemical, and even nuclear physics, and has practical implications for surface science, nanoelectronics, catalysis and environmental studies.

Another project is carried out in collaboration with Professor **Curt Wittig**, USC Department of Chemistry, and Dr. **A. Scheidermann**, University of Washington. They study very cold helium nanodroplets, including (1) the formation and behavior of metallic clusters inside the helium droplets, and (2) photodissociation of diatomic molecules localized at the center of the droplet. These experiments touch upon such questions as atomic transport through a superfluid, wetting of alkalis by liquid helium, long-range forces in a liquid helium matrix, very low temperature spectroscopy of clusters and molecules, and other interesting issues.

Assisting him in his research are the four graduate students he is currently supervising; **Vitaly Kasperovich**, **George Tikhonov**, **Sascha Vongehr** and **Kin Wong**.

Vitaly is married to **Dr. Susan Kresin**, who is a linguist at UCLA (neither are huge football fans so the tension level doesn't rise too much during the season). They have a two-year old daughter and live in Santa Monica.

We are extremely pleased that Dr. Kresin is a member of our faculty and has been promoted to Associate Professor. His tenure enhances the prestige and presence of USC, and he is happy to be in a position to continue the work he loves. ♦

UNCONVENTIONAL SUPERCONDUCTIVITY

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The first experimental image of such a localized bound state (Fig. 1(a)) around a zinc impurity atom in the high-temperature superconductor $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_8$ was obtained by the group of J.C. Davis at UC Berkeley last year. Using a variational solution of the corresponding Bogoliubov-de Gennes equations for $d_{x^2-y^2}$ -wave superconductors (Fig. 1(b)), we were able to reproduce the generic features which were observed by scanning tunneling microscopy. Furthermore we predicted the bound state patterns around other impurity atoms such as nickel. These predictions were subsequently verified experimentally.

Unconventional superconductivity continues to be a rich field, constantly revolutionized by the discovery of new materials, the refinement of modern experimental techniques, and the development of new theoretical ideas and methods. For condensed matter theorists, the fundamental question remains as to what is the origin of the complex attractive forces between electrons giving rise to anisotropic superconductivity. The proposed answers to this question are still hotly debated, indicating that this field is very active, and promises to hold many more surprises for the future. ♦

Physics Phollies

What's the difference between Astrology and Astronomy?

You can't tell your future with a telescope.

2001 UNDERGRADUATE SYMPOSIUM

The third annual USC Undergraduate Symposium for Scholarly and Creative Work was a resounding success. The Symposium, sponsored by the Office of the Provost, is designed to provide our undergraduates with the unique opportunity to exhibit and share examples of their significant research with the university community. The Symposium is modeled on a professional conference poster session with six separate disciplines: 1) Arts, 2) Humanities, 3) Social Sciences, 4) Life Sciences, 5) Professional and Applied Disciplines, and 6) Physical Sciences, Mathematics and Engineering.

First place honors in the Physical Sciences, Mathematics and Engineering category went to Lindsey Bruesch, a Physics major currently in her senior year, who was sponsored by Professor Werner Däppen. Her poster, entitled *Laboratory Investigations of Europa's Sodium Atmosphere*, discusses the possible sources and origin of Na in the atmosphere of Jupiter's ice moon, Europa. Lindsey received the top award of \$500.

Several of our undergraduates received honorable mention for their work. Linda Carpenter, sponsored by Dr. Nick Warner, with her poster, *Calculation of Quark Antiquark Potential Using String Theory in Schwarzschild-AntideSitter Spacetime*, the collaborative work, sponsored by Dr. Hans Bozler, of Chun-Cheng Lin, Melissa Dobbins and Barry Fink for their poster *Temperature Measurement Using NMR in Platinum*, and Matt Behrend, sponsored by Professor Gerd Bergmann with his *Investigation and Design of High Voltage Coupled Resonators* poster.

The Department of Physics and Astronomy extends our congratulations to our award winning undergraduates. Keep up the good work! ♦

PHYSICS STAFF MEMBER NAMED EMPLOYEE OF THE MONTH

Ty Buxman, Director of Undergraduate Affairs, was named the March 2001 Employee of the Month by the USC Staff Assembly. Ty was nominated for this honor by Tu-nan Chang, Department Chair with Professor Gene Bickers, Associate Chair and Professor John Nodvik seconding the nomination.

Ty first came to the USC campus as a student after graduating summa cum laude from California Polytechnic State University, Pomona in 1993, with a B.S. degree in Physics. He spent two years at USC as a student, earning his M.S. Physics in 1995.

In the Fall of 1995, Ty was hired by the department for the position of Director of Undergraduate Affairs and he has been in that position since that time. With duties ranging from staff and budget management to lab curriculum development to student advisement and recruitment, Ty always finds himself busy. His greatest enjoyment comes from working with the students. "I receive great satisfaction from helping the students develop their own interests, pointing them in the right direction," he stated. "I enjoy seeing them successfully attain their goals."

Ty has become an essential part of the department and our faculty, staff and students have all come to depend on him. He takes great pride in his work and it shows in a myriad of ways throughout the department. His knowledge, commitment to quality and desire to continually improve and expand the physics program are invaluable.

Ty lives with his wife of ten years, Annika, in Pasadena and enjoys working on projects around the house. As Staff Member of the Month, Ty received \$75 and a plaque presented at a continental breakfast. The Department of Physics and Astronomy joins the University in congratulating him and we thank him for his tireless dedication over the past six years. ♦



Thank you to the following alumni for your show of support and interest. Your response is encouraging and appreciated by the Faculty and Staff of the USC Department of Physics and Astronomy. Please be sure to visit our web page at <http://physics.usc.edu/Alumni>. Let us hear from you!

1950's

JACK AVRIN

M.S. Physics '51, has been living in Rancho Palos Verdes with his wife since 1972. They have two sons, one of whom is a physicist, the other a professor of mathematics. After working as a defense/aerospace engineer for forty years, he retired and is now interested in fundamental physics. He developed what he calls a Geometrical Model of the elementary particles that correlates well with the fundamentals of the well-known Standard Model but goes well beyond the latter's ability to explain many of its basic features. Jack has spent the last few years trying to interest the particle physics community in his work but with a singular lack of success due at least in part, to the departure of the model's basic notions from mainstream thinking. He presented a paper at the annual meeting of the Division of Particles and Fields of the American Physical Society at Ohio State University last August. A summary of the paper is expected to be published by World Scientific publishers as a supplement of the International Journal of Modern Physics.

A. WAYNE HARRISON

B.A. Astronomy '59, along with his wife have resided in Leawood, Kansas for the past forty years. Their three children have now produced ten grandchildren including a set of triplets who will celebrate their fourth birthday soon. Wayne and his wife, Anita celebrate their 55th wedding anniversary this year.

ROSHAN L. SHARMA

M.S. Physics '55, has completed sixteen years of consulting in the field of networking and eight years of teaching at SMU in Dallas after retiring early from Rockwell International in 1984. He remains active in both fields.

HERBERT J. WINTROUB

B.A. Physics '50, holds the position of Distinguished Engineer, Engineering and Technology Group at The Aerospace Corporation in El Segundo, California.

1960's

BRUCE COOK

B.S. Physics '68, M.A. Film Education '73, Ph.D. Communications '76, after he spent five years in aerospace, Bruce moved into cinema. He's directed 7 feature films, produced 11, edited 20, done the trailers for 18, created sound and mixes for 20, written 30 screenplays and has had 9 produced. Also has done international consulting to help make foreign films competitive in the global market.

Has taught part-time since 1973 at USC for five years, 26 years at L.A. City College and over a dozen other colleges in the Southern California area. This summer, he'll be teaching at UCLA.

G. ROGER GATHERS

B.S. Physics '60, went on to graduate school at UC Berkeley as the first physics graduate from USC (or so they told him). Graduate school was extended because he had to do 2 experimental thesis projects (the first proved to be technically beyond the state of the art and still is). As a result, he received the Ph.D. in Physics from Berkeley in 1967, with his thesis topic *Cyclotron Resonance in Lead*.

He spent his career at Lawrence Livermore Laboratory. Initially he worked in the weapons testing program. He went on to become a group leader and wrote a classified report on how to test nuclear weapons as well as an unclassified excerpt that could be taken into the field. That report became the standard training manual for new diagnostic physicists from LLNL.

Roger pioneered a high temperature properties of materials measurement technique called the Isobaric Expansion Experiment. In some cases it produced data in a region of conditions where no other source was available. He became somewhat of a specialist on pyrometry for awhile.

He then moved into shock wave experimental work, measuring the Hugoniot of materials. He published results for a number of materials, one of them platinum which served as a standard because of its high shock impedance. He then modified a computer code called GASGUN to model three stages and a cryogenic gas fill. He published a graduate level text on shock wave physics and equation of state modeling. He also worked on SDI projects for assessing the ability to destroy incoming warheads on ICBMs and 'black' projects for the weapons divisions.

Finally, he moved into doing nuclear criticality analysis. He retired from LLNL in 1993, however was invited to come back since a replacement could not be found. He worked five more years, then moved into the commercial sector where he worked for M.H. Chew & Associates in Livermore doing the same type of work. His title is Senior Scientist.

Roger married Christine E. Key in 1969 and they have one son, Kevin who works in computer graphics, animation, etc. Roger has an Extra Class ham radio license with the call N6GRF (Christine's is N6RBI). He is an amateur astronomer and both he and his wife enjoy camping.

MURLAND W. SEARIGHT

B.A. Astronomy '60, forty-two years ago, he received USC's very first degree in Astronomy, courtesy of the United States Navy. Although he never actually pursued astronomy professionally, he stayed in touch with two inspirational

teachers, Professor John Russell and Gibson Reaves. He owes them much.

GEORGE STROBEL

Ph.D. Physics '65, is a physics professor at the University of Georgia. He is working on removal of center of mass energy from 2 and 3 body systems of relativistic nearly massless quarks confined via a scalar linear potential. He also works at Lawrence Livermore Laboratory in the summer, so he can pay high gasoline taxes, and enjoy a rolling blackout, neither of which can he experience back in Athens, Georgia

1970's

JACKIE ALAN GIULIANO

B.S. Astronomy '77, attended USC during the time when the Astronomy Department was run by Gibson Reaves and John Russell. Those were golden times with only 10 - 12 majors who were able to be TA's, give planetarium shows, and use the 30-inch reflector at Stony Ridge Observatory near Mount Wilson. Upon graduation, he was employed by NASA at the Jet Propulsion Laboratory in Pasadena. For the next 20 years, he worked as a mission planner on missions such as Voyager, Galileo, the Space Station and Project Topex. During his time at JPL, his interest in the Earth was rekindled and he went back to school and received his M.S. in Environmental Studies from Cal State, Dominguez Hills. In 1998, he received his Ph.D. in Environmental Studies from the Union Institute School of Graduate Studies. After leaving JPL in 1992, he began his teaching career. He now lives in Seattle, Washington where he teaches classes in Environmental Science and Astronomy at local colleges. For the last four years, he has written a weekly commentary for the Environment News Service, hosted on the Lycos Search Engine and Internet Guide (www.ens.lycos.com) on environmental issues of the day. He maintains a website devoted to his environmental and educational work at www.deepteaching.com. A complete archive of his weekly writings

can be found at www.healingour-world.com.

MARTIN GUNDERSEN

M.A. Physics '68, Ph.D. Physics '73, received the 2000 Germeshausen Award of the International Power Modulator Symposium *For contributions to power modulator and radar transmitter technologies* at the June meeting in Norfolk, Virginia. The award is named after Kenneth Germeshausen of EG & G (he is the first G, and also the first recipient of the award) and is the major award for the meeting. The award is sponsored by the DoD Advisory Group on Electron Devices, Departments of the Army, Navy and Air Force, Sandia National Laboratories, and the IEEE Electron Device Society. The Power Modulator Symposium is a forum for research and development for repetitive pulsed power for laser, radar, accelerator and other applications, and is held every second year. Additionally, Martin, professor and chair of electrical engineering/electrophysics and professor of physics at USC, received a substantial research grant through the Department of Defense Multidisciplinary University Research Initiative program.

DONALD HAVENS

B.S. Physics '69, M.A. Physics '72, has worked for Rockwell Collins as an acoustic engineer since graduating from USC. Don and his wife Kay, live in Irvine, California with their two children.

W. STEVE QUON

B.S. Physics, '68, M.A. Physics, '70, Ph.D. Physics '74, after completing graduate work in physics under S.P.S. Porto, Steve spent the next 7 years in Research and Development in the then nascent industry of flat panel displays, particularly in the development of liquid crystal displays and electro-activated particle displays, for North American Phillips Laboratories and Beckman Instruments. For the next ten years he was a senior scientist and optical system engineer for TRW, Inc. specializing in

high-energy lasers for Strategic Defense Initiative programs during the Reagan administration. This culminated in 1988 with the first lasing of a megawatt-class cw hydrogen fluoride laser. He also worked on phase conjugation system engineering to clean up beam distortions. As an independent consultant, Steve worked for Mission Research Corporation where he performed experiments to develop optical sensing using an enhanced Zeeman-effect using cesium. For the last 10 years, he has been Professor of Physics at Ventura College. Steve is currently authoring a Web-based electronic companion book to R. Serway's College Physics published by Saunders.

PHILLIP G. WISE

B.S. Physics '76, M.D. School of Medicine '82, is the Vice Chairman of the Commission on Legislation for the California Medical Association. He is also the President-elect of the California Urological Association as well as Councilman for District 1 of the San Diego County Medical Society. He has a private practice of urology in La Jolla and San Diego, specializing in male infertility, prostate and bladder cancer.

1980's

TERRY BURTON

B.S Physical Sciences '85, is currently in the graduate school program of engineering at the University of California Berkeley. His emphasis is environmental engineering, from the chemical and nuclear engineering perspective. After finishing at USC, Terry began working on the Boeing 747 aircraft as a technical writer. After two years, he moved over to the B-2 bomber project at Northrop, where he remained until 1990. He left Northrop for a management position at Chrysler Technologies (now part of Raytheon) until deciding to return to graduate school full-time. He earned his M.S. from the University of Massachusetts Lowell in 1999, and began the Ph.D. program at Berkeley that same year. As lead or co-writer, he has more than 25 technical publications in the fields of aerospace and environmental engineering. Terry is married to the former

Welcome to our recent Graduates

Alev Taskapilioglu, and has a daughter, Jasmin. He continues to try to warrant the confidence Dr. Forster showed in him as an undergraduate.

ROBERT DE LEONARDIS
M.A. Physics '76, Ph.D. Physics '80, is an engineering specialist in the Guidance Analysis Department at The Aerospace Corporation in El Segundo, California. He works in the booster area; primary topics include vehicle dynamics and the guidance algorithms in the onboard software.

DIMITRIOS A. DERVOS
M.A. Physics '82, M.S. Computer Engineering '82, received his Ph.D. degree in Computer Science from Aristotle University in Thessaloniki, Greece. Dimitrios works as an Assistant Professor at the Department of Information Technology at the Technology Educational Institute in Greece.

MARK W. SINCELL
B.S. Physics '86, is currently a contributing editor at *Science Magazine*, and a freelance science writer with recent articles in *Discover*, *Popular Science*, *Astronomy*, *Sky and Telescope*, *Physics World* and the *Chronicle of Higher Education*.

SHIN-TSON WU
PH.D. Physics '81, was elected to receive the extremely prestigious 2001 Society for Information Display (SID) Fellow award. Each year, SID honors four Fellows worldwide. Based on the global display activities, Asia usually receives two seats, Europe and North American one seat each. This year the North American representative is Dr. Wu.

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1999

MUHARREM ASAR
M.A. Physics

DOUG C. GARRETT
B.S. Physics

ANDREW J. GRUBB
B.S. Astronomy

VICTOR GRUBSKY
Ph.D. Physics

JUSSI S. HENTTU
B.S. Physics

YUEQIANG HUANG
Ph.D. Physics

FUYUKO JULIE MURAKAMI
M.S. Physics

ASHISH BIPIN PATEL
B.S. Biophysics

ERTAN SALIK
M.A. Physics

ANTON SKORUCAK
M.S. Physics

MICHAEL VREDEVOOGD
B.S. Physical Sciences

TODD A. WAGNER
B.S. Physics

GUOYAO WANG
Ph.D. Physics

DAWN R. WILLIAMS
B.S. Astronomy, B.S. Math

DAVID S. WRIGHT
B.S. Astronomy, B.S. Aerospace Engineering

JUNWEI ZHAO
M.A. Physics

2000

ALEXANDRA CARRER
B.S. Biophysics

CEMISINAN DELIDUMAN
Ph.D. Physics

BANG DU
M.A. Physics

YUAN GU
Ph.D. Physics

LAURA D. HIRSCH
B.S. Physical Sciences

AARON L. PELUSO
B.A. Physics, B.A. Philosophy

EVGENII PUCHKARYOV
M.A. Physics

LUIS A. SEGURA
B.S. Physics/Computer Science

DENIS TISHININ
Ph.D. Physics

XIANGE WEN
M.A. Physics

JUNWEI ZHAO
M.A. Physics

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SHIN-TSON WU (con't.)

His second book entitled *Reflective Liquid Crystal Displays* coauthored by Professor D.K. Yang of Kent State University, will be published by John Wiley (London) in April, 2001.

This summer, Dr. Wu will become a provost research enhancement professor at the School of Optics at the University of Central Florida. Presently, the School of Optics has about 30 faculty members and is expanding rapidly. He plans to hire several post doctors in optical communications, new liquid crystal materials, and flat panel displays.

*1990's***MOON-GU BAIK**

Ph.D. Physics '96, is the Department Chair in the Department of Physics at

Kyungwon University in the Republic of Korea.

DAVID COHEN

M.S. Physics '94, Ph.D. Electrical Engineering '01, received his

Ph.D. in Electrical Engineering at USC this year. David is now working at Rifocs Corporation in Camarillo, California, as a Fiber Optic Scientist.

AMY FREDERICKS

B.S. Astronomy '96, is a data analyst at MIT for the HETG instrument on the Chandra X-ray Telescope.

JEREMY SCHEIDT

B.S. Physics '96, is working in software development in the Cincinnati, Ohio area.

ALEXANDER SMALL

B.S. Physics '98, is now at University of California Santa Barbara and prays that his next data will be good enough to advance to candidacy. He is engaged to Adrienne Kelly, an elementary school teacher in Los Angeles. He also won \$850 on *Win Ben Stein's Money* and had a fun day doing it.

ALEX WEI WEI

M.A. Physics '86, Ph.D. Physics '90, lives in the suburbs of Indianapolis with his wife and two sons (5 and 9 years old). He works for Conseco Capital Management, a wholly owned subsidiary of Conseco Inc., a financial services company in insurance, investment and consumer finance. He is Vice President and Head of Mortgage Investment. Alex has been there for five years. ♦