NEWSLETTER 2004

DEPARTMENT OF PHYSICS
CALIFORNIA STATE UNIVERSITY, CHICO

Dedicated to providing the highest quality undergraduate education in physics.

Galileo (Jake Baker) and Aristotle (Robert Foster) survey the aftermath of the SPS sponsored Pumpkin Drop; an educational event attended each Halloween by hundreds of K-12 and University students.

Department of Physics
California State University, Chico
Chico, CA 95929-0202
530-898-6259

Department of Physics
California State University, Chico
Chico, CA 95929-0202

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Cultural Timeline Project: A Context for Concepts in Physics

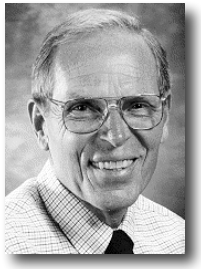
"My heart is in physics," Louis Buchholtz readily admitted, "but I also believe very strongly in the liberal arts idea that we're of one fabric -- that science is a cultural, not just a technical study." Having discovered that most of his students possess neither a personal nor a societal cultural context in which to understand the concepts he teaches, Buchholtz, along with physics major Justin Stimatze, set about helping them create one. The result is the Cultural Timeline Project, a multi-disciplined and multimedia adjunct to his standard curricula in the lower division core.

"I've been trying out things for many years," Louis said, "but I finally decided to do it in a comprehensive and serious way. We're embedding physics in a cultural background. We decided to work from the time periods principally associated with the origins of what students are studying technically." Each student receives a disc that includes several timelines with highlights of all cultural issues to be presented during the course. The timelines will be linked to databases, which are continually updated. Five minutes out of every class, students will look at a different cultural concept -- art history, music history, economic history, or political history. They can then go home and dig deeper into the database. Louis' commitment to the project stems from his passion for his students' overall cultural education: "It's my contention that if you gave students culture for five minutes out of each class, they would come away with a thousand percent more than what they now have."

Faculty Publications & Presentations

Department faculty published several articles and had a number of presentations this past year. **Dave Kagan** reported on his investigation of magnetic acceleration in "The Gauss Accelerator" in the January 2004 issue of *The Physics Teacher*. **Xueli Zou** shed more light on student thinking in "How students justify their knowledge in the Investigative Science Learning Environment," published in the *Proceedings of National Conference of Physics Education Research 2003: Data Analysis as a Window of Theory*.

Michael McGie Service Award Presented



Michael R. McGie received his BA in Chemistry in 1957 from Chico State College. He earned a Ph.D. in physics from UC Davis. Then he chose to return to Chico State to give back to the community of his origins. While on the faculty for 32 years, Mike always demonstrated a strong commitment to the needs of students. Mike's service to others represents the best of the teaching profession and this award is intended to encourage this commitment in our students.

This year's recipient of the Michael R. McGie Service Award is **Brendan Diamond**. Brendan arrived in Chico just as the Chico Community Observatory was being built in Bidwell Park. Having a lifelong love for astronomy, he quickly volunteered to help get the observatory "off the ground". He currently volunteers considerable time at the observatory and is recognized as one its best docents. His grasp of physical and mathematical principles, combined with his friendly and engaging manner, has made him a favorite star guide to hundreds of observatory visitors.

We thank this year's donors: Society of Physics Students, Cheuk-Kin and Theresa Chau, Louis Buchholtz and Barbara Janzen, and Izella Evans.

The Arloe Anania-Murray Physics Scholarship

The Arloe Anania-Murray Physics Scholarship Fund honors the memory of Arloe Anania-Murray who was the Department of Physics secretary before her death in September of 1989. She brightened the Department of Physics with her outgoing personality, and her work and dedication were appreciated by faculty, staff and students. At the time of her passing, it was her wish that contributions be made for a scholarship fund for students in the Physics Department. This wish was characteristic of Arloe's compassionate love and genuine interest in our students. The primary criteria considered in awarding this scholarship is scholastic achievement.

This year's recipient of the Anania-Murray scholarship is **Kevin Meagher**. As Louis Buchholtz once quipped, "Kevin is a man of few words and large homework sets". Kevin was originally an electrical engineer, but switched to physics because he found the models more fundamental and logically consistent. He has maintained a 3.5 GPA while taking between 17 and 20 units a semester. As he has entered more deeply into the upper division courses his quality of work as only improved. A number of faculty have commented on the fact that when a difficult question is posed in class, Kevin is most likely the first to arrive at an insightful answer.

We thank this year's donors: Louis Buchholtz, Barbara Janzen and the Society of Physics Students.

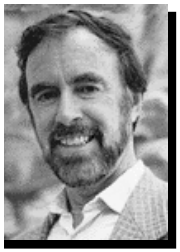
Contributions to the Arloe Anania-Murray Physics Scholarship or the Michael McGie Service Award can be sent to the Department of Physics, CSU Chico, Chico, CA 95929-0202.

Department Scholarships

The generosity of alumni and friends of the Department of Physics once again made it possible to award scholarships to deserving majors. (Obviously not all deserving majors received scholarships, but all scholarships were received by deserving majors.)

Paul Hewitt Scholarship for Future High School Physics Teachers

Hewitt's teaching career began in 1964 at City College of San Francisco. In 1971, the first edition of his famous textbook, "Conceptual Physics," was published. This book, now in its ninth edition is used all over the world and has been translated into many languages. Hewitt's conceptual approach translated the concepts of physics from mathematical language into standard English, which allowed physicists to share their world view with a wider audience. His textbook changed the way physics is taught to both nonscience and science majors. The intent of this scholarship is to encourage those with a love for and knowledge of physics to share their enthusiasm for the science by becoming high school physics teachers.



This year's recipient of the Hewitt scholarship, **Dan Bowen**, arrived from Feather River College in the Fall of 2003 with a 4.0 GPA and an impressive work ethic. He is committed to becoming a high school physics instructor and hopes to work in a rural area, where the need for qualified physics teachers is great. He has shouldered a significant amount of his educational costs by working 15 to 20 hours per week at a variety of jobs. This last spring Dan was putting in a couple of hours of roofing each day before he arrived for his 9:00 am differential equations class. We hope this scholarship enables Dan to spend a little less time on the roof and a little more time on the proof.

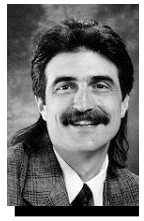
We thank this year's donors: Paul Hewitt, David Kagan and the Society of Physics Students.

Contributions to the Paul Hewitt Scholarship for Future High School Physics Teachers can be sent to the Department of Physics, CSU Chico, Chico, CA 95929-0202.

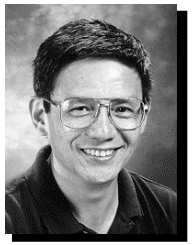
Floyd English Scholarship

While this scholarship is college-wide rather than departmental, we include it here for two reasons. First, it is made possible by the generosity of one of our alumni: Dr. Floyd English. Second, two of our current students were chosen as recipients this year: **Brendan Diamond** and **Justin Stimatze**. We congratulate them on their selection from a highly competitive pool of candidates.

Eric Ayars' expertise lead to his article: "Near-Field Raman Spectroscopy" that appears in *Dekker Encyclopedia of Nanoscience and Nanotechnology* . **Dave Kagan** and **Chris Gaffney** went virtual with their article, "Building A Physics Degree for High School Teachers" ,that electronically appeared in the September issue of *The Journal of Physics Teacher Education Online.*

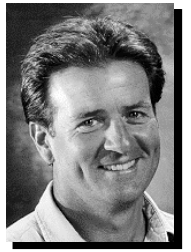


Faculty were active participants at a number of conferences this last year. **Cheuk Chau** presented "Wavelength of Remote Control LED" at the AAPT Meeting at Sonoma State in April 2003. At the August 2003 National Conference on Physics Education Research in Madison Wisconsin **Xueli Zou** made three presentations: "Identifying "naïve" indicators of students' abilities in conducting scientific inquiry experiments"; "Probing students' epistemological beliefs: A mixed data, design, and analysis approach" (with student Orion Davies); and "The development of evidence-based instruments to probe students' scientific investigation ability".



At the March 2004 AAPT meeting at LLNL two presentations were given by faculty. **Cheuk Chau** and student **Brendan Diamond** presented "Have You Seen Dark Bands on a Rainbow Spectrum with Diffraction Gratings". **Phillip Gash** presented "A Simple Way to Measure Student Reaction Times". At the November 2004 AAPT meeting in Berkeley faculty Dave Kagan brought baseball under scientific scrutiny with "Humidity and the COR of Baseballs". At the same meeting **Xueli Zou**, with students Stephen Cheng and Eva Kozachencko, presented "Physics experiments using a battery-operated toy car".

Closer to home, department faculty participated in a year-long investigation of the theme: "Science and the Aesthetic Imagination", sponsored by the Humanities Center on campus. **Chris Gaffney** teamed up with philosopher Greg Tropea to present "'A Strangeness in the Proportions': The Role of Symmetry in the Natural Sciences". The theme concluded with **Louis Buchholtz** talk: "Perfect Form: The Ideal Synthesis of Aesthetics and Science".



Physics Seminars: A Canonical Example of Diversity

The Department of Physics Seminar Series in Spring 2004 offered an exhilarating variety of topics. Once again **David Kagan** organized a series whose speakers were a well-balanced mixture of faculty, alumni and students. The series started with **Philip Gash** discussing a radiation model that allows estimation of the length of a photon. Three additional faculty members contributed to the series. Eric Ayars demonstrated the uses, and apparent abuses, of Legendre polynomials in modeling behaviors from water balloons to nuclear structure. **Xueli Zou** reviewed the status of physics education, and presented video evidence that conclusively showed that just because you graduate from MIT did not necessarily imply that you know how to light a light bulb. **Chris Gaffney** discussed how the e/m experiments done by Kaufmann at the beginning of the 20th century were originally interpreted as being inconsistent with special relativity.

Three of our four invited speakers were alumni who gave students, and perhaps faculty (!), a good sense of the many career directions one can pursue with a degree in physics. **Tom Gosnell** from the Lawrence Livermore National Laboratory gave us an overview of the progress in developing methods for detecting radiation threats in shipping containers**. Samantha Baumgartner** from the Tuolumne County Environmental Health Department described the benefits and challenges of being an environmental health officer in a rural county. **Ernie Baragar** from International Gaming Technologies presented an insider's view of the history, theory of operation, and manufacturing process of gaming machines. **Tim Erickson** from EEPS Media demonstrated new software designed for high school and university introductory labs, but at times he did have some trouble keeping the attention of his audience since they were too busy playing with some of the cool features.

Our majors were the last to mount the stage, and true to precedent, the physics topics were wide ranging. **Robert Foster** discussed how general relativity is a practical tool that is routinely used to keep the GPS operating properly. (Neglecting general relativity will result in an error of 15 km per day!) **Titus Roff** developed a simple model for the theory of kite flight. (Even the simple model was complex enough that we wondered whether could ever recover the simple joys of kite flying without pondering the physics involved.) **Kevin Meagher** presented the experimental results and theoretical models concerning the energy in the vacuum state. (The theory still needs work: it's off by a factor of 10120.) **Lindsay Rowland** discussed the acoustics of human song and answered the question that's often raised: "Why are sopranos so hard to understand?" (And we always thought it was because they sung in Italian.)

We always welcome alumni and friends at our seminars. The schedule can be found 24/7 at our website www.csuchico.edu/phys. Also, please consider giving a talk yourself! Faculty and students often find alumni talks some of our most interesting.

Advisory Board Members

We wish to thank the members of the Advisory Board for their efforts to improve the quality of our program. If you are interested in becoming a member of the Advisory Board, please let us know. We would be delighted to have your input.

Mark Anderson, Business Unit Manager, SpectraPhysics, Oroville, CA.

Paul Bennett (BA Physics 1986) Database Administrator, Strategic Marketing Resources, Inc. He earned a teaching credential from California State Polytechnic University, Pomona.

Benjamin Catching (*BS Physics 1989*) Senior Program Manager at Optical Coating Laboratory. He has a MS in physics from the University of Delaware.

Joshua Fishkin (*BA Physics 1985*) is a Senior Engineering Specialist at Boeing North American. He was awarded a MS in physics and a Ph.D. in physics from the University of Illinois.

Thomas Gosnell (*BA Physics 1967*) is a Radiation Physicist at Lawrence Livermore National Laboratory. He earned a MS in nuclear engineering from the University of California, Berkeley.

Theresa Hartsell (*BA Physics 1984*) is a Professor Of Physics at Clark College. She earned a MS and a Ph.D. in astrophysics from the University of Colorado, Boulder.

Gary Grim (*BA Physics 1985*) Researcher, QWIP Technologies, Davis, CA. He earned a MS and Ph.D. in physics from University of California, Davis.

Thomas Hall (*BA Physics and Math 1976*) Software Consultant, Chico, CA. He earned a M.S. in Computer Science from California State University, Chico.

Donald Knifong (*BA Physics 1963*) is a Data Processing Manager at the California State Department of Health Services. He earned a MA in public administration from Golden Gate University.

James Millerd (*BS Physics 1987*) is a Senior Scientist at 4D Vision Technology. He received his MS and Ph.D. in electrical engineering at the University of Southern California.

Scott Perry (*BA Physics 1970*) Professor of Physics, American River College. He was awarded a MA in physics from the University of California, Davis.

Boyd Reasor (*BA Physics 1969*) Senior Software Engineer at Lockheed-Martin Santa Clara, CA. He holds a teaching credential from CSU, Chico.

Danny Sorenson (*BA Physics 1983*) Physicist, Los Alamos National Lab. He received his Ph.D. in physics from the University of California, Davis.

Advisory Board Meeting

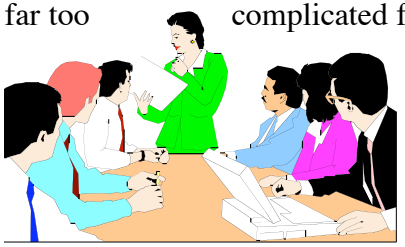
The Advisory Board met in February 2004. Advisory Board members in attendance were Paul Bennett, Tom Gosnell, Thomas Hall, Donald Knifong, Scott Perry and Danny Sorenson. The focus of the meeting was the Advanced Laboratory (Phys 227), thus providing a natural follow-up of the virtual meeting held last spring concerning this course.

The morning portion of the meeting began with John Young describing how he has guided the course over the years. This was followed by Eric Ayars, our newest faculty member, describing his ideas for new directions in the advanced lab. From their presentations it did appear that several of the concerns expressed in the 2003 meeting were being addressed.

The writing component of the Advanced Lab was the subject of significant discussion. Most board members judged the writing requirement in the course to be quite important, and one that should not be sacrificed in any appreciable way. John made a strong case that it was quite difficult in a single semester to give students an in-depth hands-on lab experience and simultaneously provide them with an intensive introduction to technical writing.

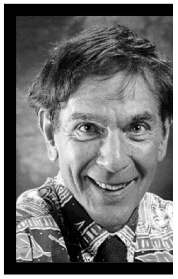
The difficulty of meeting both writing proficiency and technical proficiency in a single semester is just one of the reasons for increasing the upper-division laboratory experience of our majors. Board members were informed of the departmental faculty's intention to increase the mandatory upper-division laboratory course work to a minimum of one year.

Board members provided valuable input and insight on these and other issues surrounding the enhancement of upper-division laboratory work. While the creation of the optimal lab structure was far too complicated for a day's work, the faculty did have the overall sense that the Advisory Board stood behind the department's efforts to craft a program that would enhance our majors' laboratory experience.



John Young Retires

Professor John Young retired from his teaching duties December 2003. John taught for over 25 years at CSU Chico, providing many physics majors with a rich experience in our capstone experimental course: Advanced Lab (PHYS 227). When John first took responsibility for this course in 1979 it was literally taught out of a suitcase, with no devoted lab space. Over the years John found a home for the course and developed it into a key component in the education of all our majors. Many of our alumni have commented on its importance in their careers, and John continued to teach the course until his retirement.



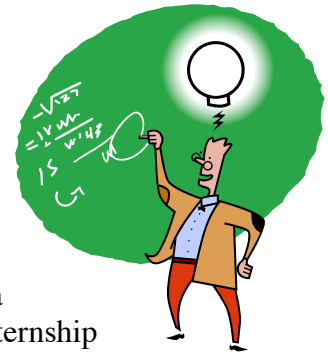
John is an expert in experimental nuclear physics, and applied this skill in a wide variety of problems. Early in his career used energy dispersive X-ray fluorescence to measure trace amounts of pollutants in environmental studies. In the 1990s he collaborated with groups from NASA, Los Alamos National Laboratory and Harvard, using neutron-activation to provide calibration for the gamma spectrometer on board the Mars Explorer. In addition to involving students in these research endeavors at CSU Chico, John would invite students to accompany him to Davis and Berkeley to perform aspects of the research that were impossible in Chico. This provided many majors wonderful opportunities to experience the larger world of scientific research.

Over the past few years John's research has taken a quite different direction. He has embarked on the difficult task of accurately measuring G, the fundamental constant describing the strength of universal gravitation. While being of cosmic significance, this constant is one whose value is least well known. He is also considering pursuing the connection between cosmic rays and cosmological history. A rather full agenda for someone who has officially retired, but as John succinctly states: “I still have some physics left to do.”

New Graduates Take Many Paths

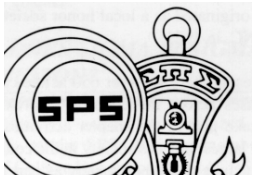
This year the Department of Physics had six students complete requirements for graduation. Four were full time students in the 03-04 academic year while two were finishing up the one or two courses they had remaining. **Tony Visco** and **Erin Jordan** are entering graduate schools in physics: Tony is off to the University of Michigan to study high-energy physics, while Erin is beginning at Brandeis University and is focusing on biophysics. **Lindsay Rowland** entered the credential program at CSU Chico this fall. Two of our graduates' immediate plans involve travel: Robert Foster headed for the hinterlands of Alaska to help a friend build a house, while **Brad Franzella** has left for Paris, where he started his European tour by viewing the transit of Venus from the Paris Observatory. **Titus Roff** has landed a job with Tinsley Optical in Richmond, California as a Metrology Technician.

Summer Internships



For many of our majors summer internships provide a valuable introduction to the world of large-scale research. Majors who are awarded internships often report that the experience was stimulating and deeply satisfying. As a department we are committed to finding internship positions for as many qualified physics majors as possible.

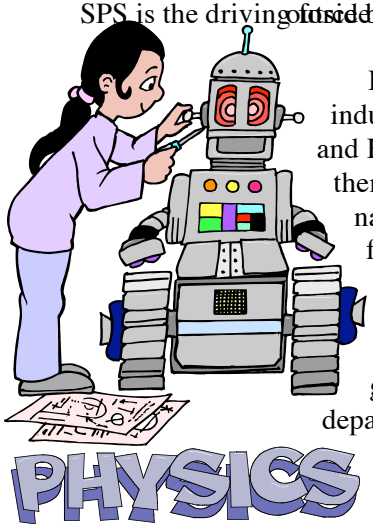
This past summer four majors were awarded internships. Two of these were NSF funded Research Experience for Undergraduates (REUs). **Kevin Meagher** worked at North Carolina State and **Justin Stimatze** worked at the Princeton Plasma Physics Laboratory. **Joe Piacentine** and **Andrew Fisher** were awarded DOE Summer Undergraduate Laboratory Internships (SULI) and worked at the Stanford Linear Accelerator Center (SLAC).



Society of Physics Students

In addition to sponsoring the annual Pumpkin Drop (a wonderful example of non-hard-sphere scattering), the members of SPS were engaged in a number of activities this last academic year. Several SPS members participated in Spring 2004 in the Minds in Motion project, in which hundreds of K-12 students, who are interested in science and engineering careers, visited CSUC to gain a better understanding of these careers. SPS members were available ~ 20 hours per week for drop-in tutoring. This service is provided to students enrolled in any lower division physics course. SPS members served as judges at the city-wide Chico Science Fair, during which they also presented and provided the Outstanding Physics Project Awards in several age groups. SPS gives generously each year to all three of our departmental scholarships.

SPS is the driving force behind several events that help give our Depar



In spring 2004 two new members were inducted into Sigma Pi Sigma: Justin Stimatze and Kevin Meagher. We congratulate them and welcome them to this national honor society. Since its founding in 1983 the Chico State chapter has inducted over 40 honorees. Their dedication to service and their promotion of excellence in physics has greatly strengthened and improved our department.