QUANTA

Newsletter of the Department of Physics and Astronomy

www.physics.iastate.edu

IOWA STATE UNIVERSITY
Vol. 2, No. 1 - Fall 2006

In This Issue

GREETINGS FROM AMES

We welcomed incoming classes of 17 new graduate students this fall and 22 last fall. They have turned out to be a lively group. On their own they have organized intramural sports teams and arranged for "movie nights" on Fridays. We have remodeled the offices occupied by our first- and second-year graduate students in the so-called "Court Area," and 32 of our graduate students are occupying this space.

Our undergraduate and graduate students are engaged in other activities outside the classroom. All our graduate students participate in a graduate-student-run seminar where they present their research to their peers. While the seminar was established with departmental support, faculty members are not invited to attend these seminars.

Our undergraduates are equally active. For example, members of our Physics and Astronomy Club attended a regional meeting of the Society of Physics Students that was held in Decorah, Iowa, last fall.

Our faculty members continue to distinguish themselves. Costas Soukoulis, who last year was named a distinguished professor, won the prestigious Descartes Prize for Excellence in Scientific Collaborative Research. This is the European Union's highest honor in the field of science. Joe Shinar, John Hill, and Jianwie Qiu were named APS fellows. Steve Kawaler was named a fellow of the AAAS. Paul Canfield was named a distinguished professor. Soeren Prell won a College of Liberal Arts and Sciences award for early excellence in research, and Paul Canfield and John Lajoie won the comparable mid-year career excellence awards. Marshall Luban won an LAS award for outstanding teaching.

In the last issue, we announced the naming of the Physics Addition after Daniel Zaffarano. In his honor, a plaque donated by members of the Physics and Astronomy Council was placed inside the west entrance of the building.

Eli Rosenberg

A concrete marker tablet was placed outside the entrance, supported by contributions to the department.

As always, we thank you for your support and welcome your input and comments. I would love to have the opportunity to visit with you in Ames and share with you the enthusiasm of our faculty, students and staff! *Q*

SEARCHING FOR THE STARS

Astronomy has always been Steve Kawaler's passion.

Steve Kawaler's Zaffarano Physics Addition office is filled with memories of his childhood, when he was inspired to become an astronomer. *The Golden Book of Astronomy* is still strategically placed where all who enter can't miss it. Toy models from "that campy TV show" *Lost in Space* are placed prominently on a table near his desk.

"Stars have been my passion," the professor of physics and astronomy said. "I like astronomy so much because although we don't have all the answers yet, it's something that we can see every day and each night. We see the stars and the sun–objects that we understand a great deal about, but in other ways are way beyond what we can understand."

That passion has led the American Association for the Advancement of Science (AAAS) to elect Kawaler a fellow of the association.

"I can't say this was totally unexpected," he said. "I was forewarned to make sure my membership dues were current, since you can't be an AAAS fellow unless you're paid up."

AAAS cited Kawaler's research, service and teaching. He has worked for 20 years to understand and model white dwarf stars. Since 1997, he has directed the Whole Earth Telescope (WET), a worldwide network of observation stations that takes uninterrupted measurements of stars.

Kawaler handles the administrative duties of the NSF-funded organization, including archiving the data obtained by WET observations and coordinating at least one WET run each of the last 10 years.

Kawaler has been active on the scientific side as well. He is an author on most of the papers gleaned from data collected by WET. He is currently working on a NASA Astrophysics Theory Program grant on the next generation of computer models of stars, in particular sub-dwarf B stars.

"This is an exciting and potentially very important project," he said. "WET data has pointed out how bad the current models are."

The AAAS also honored Kawaler for his classroom instruction. He has taught and developed curricula such as "Astronomy Bizarre," a course for non-science students that explores the more bizarre objects and events in the universe.

"I got into astronomy because it was fun," Kawaler said. "I grew up watching watching the moon launches and it was hugely exciting for me. I guess part of any field can get routine, but that hasn't happened to me yet.

Steve Kawaler

Every other day I go in front of 100 or so students and try to fire them up about astronomy, although I know that they are potentially excited about many other things. That keeps me excited and passionate about the subject." Q

GET INVOLVED!

Get the latest news on our research, education programs, faculty and alumni at www.physics.iastate.edu.

Get in touch. We welcome your suggestions and comments! Let us know what you think about this newsletter, about current initiatives in the department, and about ways that we could help you. Please contact Eli Rosenberg, department chair, redmount@iastate.edu, or Mark Fleming, editor, stratondmd@aol.com, with your thoughts or questions.

Keep us posted on your career interests, family and contact information by updating your profile at www.physics.iastate.edu.

Dig deeper. Are some of our initiatives of interest to you and your organization? Please contact Eli Rosenberg to arrange a briefing with the appropriate people, either by telephone or in a personal visit to campus.

Contribute your time, talent, or resources. We could use your experience, perspectives, and hands-on help in some of our initiatives. We also welcome financial donations, either unrestricted or designated for any of a number of areas of need, including scholarships, awards and facility improvements (see page 7).

HIGH-ENERGY PHYSICS AT THE EXTREME

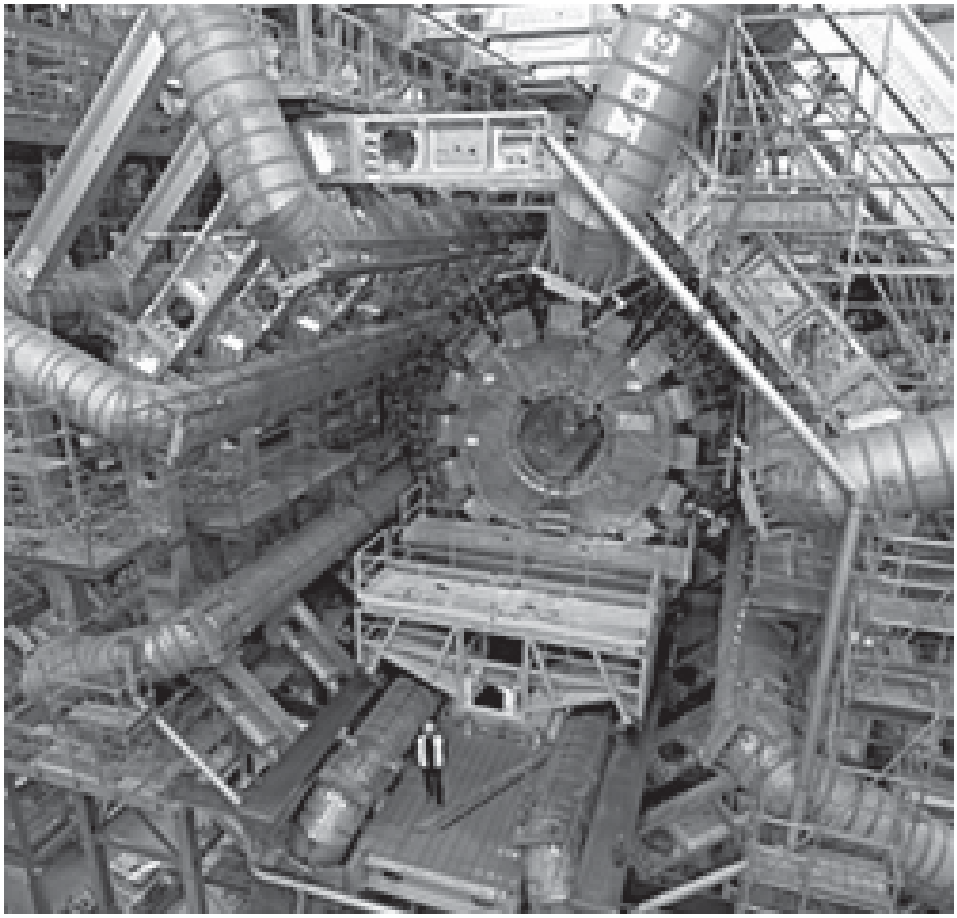
The Large Hadron Collider will be the most powerful particle accelerator on the planet, and Iowa State physicists are helping to build and use it.

The European Laboratory for Particle Physics in Geneva, Switzerland, is building the Large Hadron Collider (LHC), a new particle accelerator that will collide beams of protons or lead nuclei at record energies, with fluxes expected to produce 800 million collisions per second. Those densities will recreate the conditions that existed just after the Big Bang.

The LHC is being built in a 17-mile circular tunnel that crosses the French-Swiss border near Geneva. The machine is expected to get a pilot run next summer.

"Iowa State is at the cutting edge of research in these facilities at the forefront of physics," said Eli Rosenberg, professor and chair of the Department of Physics and Astronomy and the leader of Iowa State's high-energy physics research team. "We play an important role in these experiments."

Iowa State's physics and astronomy department research team at the LHC includes Rosenberg; H. Bert Crawley, professor; James Cochran, associate professor; Soeren Prell, associate professor; and W. Thomas Meyer, adjunct research professor. Fredrik Tegenfeldt, a postdoctoral research associate, is stationed at the European Laboratory for Particle Physics, and Nathan Triplett, a physics and astronomy graduate student, has taken up residence at CERN and will work on acquiring his thesis data in the next two years. This team is working on detector design and the study of proton-proton collisions related to the LHC's ATLAS detector, an instrument 150 feet long and 72 feet high.



Crews assembling the ATLAS detector at the LHC

In addition, members of the department's experimental nuclear physics group–John Hill, professor; Marzia Rosati, associate professor; and Alexandre Lebedev, assistant scientist–are planning to use ATLAS to study the collisions of lead nuclei.

John Hauptman, professor of physics and astronomy, is also working on the Compact Muon Solenoid, the LHC's other large, multi-purpose detector.

Iowa State's work in experimental and theoretical high-energy physics is supported by a six-year grant of nearly $6.9 million from the U.S. Department of Energy (DOE). The grant continues a tradition of high-energy physics work at Iowa State and the DOE Ames Laboratory that dates back to 1963.

One of the research goals at the LHC ATLAS detector is to find evidence of the Higgs boson, a particle predicted by the Standard Model of particle physics. The model theorizes that space is filled with a Higgs field, and that particles acquire mass by interacting with the field. Although no experiment has yet detected the Higgs particle, researchers at the LHC hope that their experiments will yield this discovery.

"This is basic research that goes back to the question, 'What is the world made of?'" Rosenberg concluded. "We're trying to figure that out." **Q**

STELLAR GERONTOLOGY

Pioneering a long-term study of a very long-term phenomenon.

Lee Anne Willson has been working for 35 years to understand the stars that produce space dust. That effort dates back to graduate school for the university professor of physics and astronomy.

Calling her work "stellar gerontology," Willson studies red giants–the stars that expand and burn red, cooling as they move through the final stages of life.

In the years since she first started her research, the field has changed vastly, Willson says. At the beginning, there was nothing in the data showing that stars were losing mass at all. Willson was among the few astronomers actually studying this phenomenon.

"There were only three or four scientists interested in this area when I came along," she said. "That has changed now, because of technology changes. A lot of new data came with the advent of infrared and ultraviolet telescopes in space. People now also realize the evolutionary role of these stars."

Computer modeling developed in the late 1970s also has increased the analytical capabilities for red-giant evolution. Emeritus professor George Bowen produced models incorporating some of Willson's insights, and these models have led to better understanding of the mass loss of these stars.

Willson recently presented some of her findings at the Annual Meeting of the American Association for the Advancement of Science (AAAS). She also addressed and helped to organize a press briefing at the meeting on the subject "Stardust: Solar System Birth and Death."

Some of Willson's findings indicate that the origins of space dust are red giants characterized by (1) super size, with stellar radii about the size of earth's orbit, (2) dramatically changing brightness within a year, and (3) high luminosity, several thousand times that of the sun.

"The variability of those stars is fundamental to dust formation," she said. "The variations produce shock waves, which compress the gas. The compressed gas radiates some heat and then cools quickly as it expands again before the next shock passes. It's a refrigerator."

These conditions allow dust formation closer to the star than would otherwise be possible. These dust particles start their journeys in the stars and end up in solar systems.

Although she has worked in other areas, red giants are Willson's favorite subject.

"This project has sustained my interest the most over the years," she said. "There's nothing quite as much fun as working on a challenging problem. There comes a moment when you suddenly realize that there is another way of looking at the problem that makes sense–and all the pieces fall into place." Q

Lee Anne Willson

From the Editor...

It has been a privilege and quite an experience to launch *QUANTA* and edit this publication over the past couple of years.

At the time that we decided to start up this newsletter, editorial resources were not readily available within the university for this type of endeavor. So I took on the job to give the periodical some initial direction and momentum.

More recently, Dave Gieseke, director of communications for the College of Liberal Arts and Sciences, has started to edit newsletters for several other departments. As a matter of fact, Dave has contributed a number of articles to this and previous issues of *QUANTA*.

Now that *QUANTA* is off and running, I have asked Dave to take over the editorial reins of this publication. We can look forward to a continuing flow of interesting news about the department and the university in future issues.

Please keep in touch, and thanks for reading this issue.

Mark W. Fleming

COSTAS SOUKOULIS WINS EUROPEAN UNION'S HIGHEST SCIENCE PRIZE

Physics and astronomy faculty member leads team that shared 200,000-euro Descartes Prize.

Costas Soukoulis, a senior physicist at the U.S. Department of Energy's Ames Laboratory and a distinguished professor of physics and astronomy, coordinates the research team that has won the Descartes Prize for Excellence in Scientific Collaborative Research, the European Union's highest honor in the field of science. He and his collaborators received the prestigious award for creating a novel class of artificial metamaterials called left-handed materials, or LHMs, which exhibit fascinating properties that cannot be found in naturally occurring substances.

LHMs exhibit negative refraction, bending light in the opposite direction to that seen in natural materials. They can be fabricated to have zero reflectance for all angles hit by incoming electromagnetic waves. In addition, they can focus light without the need for curved surfaces. These and other amazing properties promise a wide range of potential applications for LHMs.

Soukoulis, who has also been an associate with the research center FORTH in Crete, Greece, since 1984, said he was lucky to work with a top-notch team of international researchers in creating the new subclass of materials. The team includes Professor Sir John Pendry, Imperial College, United Kingdom; Professor Ekmel Ozbay, Bilkent University, Turkey; Professor Martin Wegener, University of Karlsruhe, Germany; Professor David Smith, Duke University, United States; and Professor E. N. Economou and Dr. Maria Kafesaki, both from FORTH and the University of Crete.

Costas Soukoulis (at podium) with winning team (left to right) Stephan Linden, Mike Wiltshire, Maria Kafesaki, David Smith, Martin Weneger, Ekmel Ozbay, and Sir John Pendry

The research team was awarded the Descartes Prize for Research in Physics at a ceremony held at the Royal Society in London. Of the 1,000,000-euro Descartes Prize money, the team members will share 200,000 euro for their winning project, "Extending Electromagnetism through Novel Artificial Materials, or EXEL."

"Our EXEL team was able to demonstrate the experimental reality of LHMs and their consistency with the laws of physics," said Soukoulis. "This realization opened up the possibility of unprecedented applications and devices."

The team has already shown how the ability to focus radio waves could lead to smaller, better-performing magnetic resonance imaging machines for medical and biomedical diagnostics. Numerous applications in the cellular communications industry are also envisioned, including antennas and waveguides that are 100 times smaller and much lighter than those of today. Even slight improvements to these types of devices can have a significant economic impact.

Ames Laboratory Director Tom Barton praised the work of Soukoulis and the EXEL team, saying, "It probably would be difficult to overstate the potential importance of this historic scientific achievement to the future of optical technology. The Ames Lab and Iowa State University are indeed proud of the pivotal role played by Professor Soukoulis."

The Descartes Prize for Excellence in Scientific Research, now in its sixth year, recognizes outstanding scientific and technological results achieved through international collaborative research in diverse disciplines. Winners are selected by a grand jury of experts in science, industry and the general public. Q

FACULTY ADDITIONS

New faculty members bring grants and expanded affiliations in condensed matter and nuclear physics.

Two new faculty members joined the department in recent months, bringing additional grants, affiliations, and new capabilities to department's major initiatives in condensed matter and nuclear physics.

Ruslan Prozorov obtained his doctorate from the Bar-Ilan University for his work on irreversible magnetic properties of high-T_c superconductors. Before joining the Iowa State faculty, he was an assistant professor at the University of South Carolina and previously a postdoctoral research associate at the University of Illinois in Urbana-Champaign. At those positions Dr. Prozorov conducted experiments on microscopic mechanisms of high-T_c superconductivity, the coexistence of superconductivity and magnetism, and pattern formation in superconductors. He was the first to establish the *d*-wave nature of the pairing symmetry of electron-doped superconductors.

Ruslan Prozorov

Dr. Prozorov joined the department as an assistant professor with an active research program using novel methods to study the properties of strongly correlated electronic systems. His techniques include high sensitivity tunnel-diode-oscillator and low-temperature magneto-optical measurements. He is working in close collaboration with groups led by Professor Paul Canfield and others in the university and Ames Laboratory on topics ranging from magnetic molecules to biomineralization.

Professor Prozorov brings a National Science Foundation CAREER Award to Iowa State, in addition to another NSF grant.

Kirill Tuchin, a theoretical nuclear physicist, was appointed an assistant professor. He also has an appointment as a RIKEN Fellow, representing a partnership between the department and Brookhaven National Laboratory to help to develop and promote the careers of promising young scientists. For a period of up to five years, Dr. Tuchin will spend six months per year at Brookhaven, and a grant to the department will provide Dr. Tuchin's support during this time.

Kirill Tuchin

Professor Tuchin's main scientific interest is the theoretical study of strong interactions [quantum chromodynamics (QCD)] at high energies. QCD possesses a very rich and complicated structure due to nonlinear interactions which–in contrast to Quantum Electrodynamics (QED)–violate the Huygens principle. Although over the past 30 years QCD has been solved for lower-energy reactions where it resembles QED, in recent years a number of theoretical tools have been developed to facilitate the study of QCD in the regime of high parton (quark and gluon) density that is achieved at high energies and in reactions with heavy nuclei.

Dr. Tuchin is involved both in the theoretical study of high-energy QCD and in the development of phenomenological applications for various experimental tests.

HELP THE DEPARTMENT TO GROW

Your contributions will make a real difference.

Maintaining a position as one of the top-ranked departments in the university and the nation is no easy challenge these days. State financing for public universities has declined in many states, including Iowa. Tuition increases have covered part of the shortfall, but private contributions are taking on a more critical role in helping the department to fulfill its mission and maintain its standards of excellence.

One area of need is the department endowment. The current endowment underwrites only eight student awards and provides limited discretionary funds for other activities. Additional capital is needed to sustain a department with more than 150 students and 45 faculty members. Endowed scholarships and fellowships are essential if the department is to continue to attract the best students in the face of escalating tuitions and operating costs.

Aside from endowments, gifts may also be directed for one-time awards or other uses that you may wish to discuss with the department.

All contributions, regardless of size, will help. Each gift will make a lasting impression on the quality of the department, its students and faculty.

If you are ready to help, please complete the adjacent form and return it with your gift. Q

HOW TO CONTRIBUTE

1. Decide where you'd like to help.

We hope that you'll consider designating your gift directly to the Department of Physics and Astronomy! If you'd like to discuss some possibilities, please feel free to call Eli Rosenberg, department chair, at 515 294-5442.

You may want to ***contribute to the Physics and Astronomy Achievement Award Fund,*** the general fund for undergraduate and graduate scholarships, ***or the Physics and Astronomy Unrestricted Fund,*** which provides the department with flexibility to finance other important projects.

If you're thinking about making a significant gift, you may wish to ***establish a new endowed fund or make a one-time award*** for a purpose that you designate. For details and guidance, please refer to the Iowa State University Foundation Web site (www.foundation.iastate.edu) or contact Alsatia Mellecker, Senior Director of Development, at 515 294-6431.

2. Decide how you'd like to contribute.

Contributions may be structured in a variety of ways, including ***outright gifts*** of cash, securities, real or personal property, ***pledges*** to give specific amounts over a stated time period, ***or deferred gifts*** such as charitable bequests, gift annuities, or life insurance policies.

3. If you're ready to give now,

Fill out the form below and send it to the **Department of Physics and Astronomy, 12 Physics Hall, Ames, Iowa 50011-3160.**

Cut Here

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THANKS for your support!

THROWING BASEBALL A CURVE

Physics plays an important role in America's pastime.

Baseball is such a simple game. You throw the ball. You hit the ball. You catch the ball. Simple–right?

Not so fast, warns Eli Rosenberg, professor and chair of the Department of Physics and Astronomy.

"In a classic episode of 'Seinfeld,' George Costanza teaches hitting to New York Yankees Bernie Williams and Derek Jeter," Rosenberg says, "and he tells them how easy it is to hit a baseball. Once again George is wrong, but there is some basic physics that is important in understanding why baseballs behave the way they do when thrown and hit."

Rosenberg opened with the "Seinfeld" clip during a presentation on the physics of baseball last year. He spoke as part of the yearlong series of activities surrounding the 2005 World Year of Physics sponsored by the U.S. Department of Energy's Ames Laboratory and presented by faculty from the Department of Physics and Astronomy to a capacity crowd in the Spedding Hall auditorium.

"Some of the seemingly simple aspects to the game are not really that simple–at least when you apply physics to the sport," Rosenberg says.

Rosenberg addressed several questions for the audience: Why does a curve ball curve? Why does corking a bat provide greater bat speed and more time to react, but it doesn't make the ball go further? Why are aluminum bats more popular than wood bats outside the major leagues?

"Physics is also involved in judging a fly ball and ultimately catching it," Rosenberg said. "It's a very complicated game."

Eli Rosenberg

OK, but it is still just a game, right?

"Don't be so sure about that" Rosenberg says. There's a lot of literature about the physics of baseball and other sports including football, basketball, golf, tennis, drag racing and even fly-fishing.

"The manufacturers of golf equipment are very concerned about how to improve club and ball design. Understanding the physics is an important factor," he said. "They are extremely interested in what makes a golf ball go farther.

"There are some very serious people studying this. In fact there was an article in a recent *American Scientist* that gave evidence, contrary to many [ball players'] opinions, that an overhand four-seam fastball doesn't have more lift than an overhand two-seam fastball."

But don't count on this diehard baseball fan to give up on trying to understand the matter-antimatter asymmetry in the universe in order to concentrate on the physics of baseball. Nevertheless, spending some time on the physics of sports has its benefits.

"This was a fun talk to put together. I hope that it presents a different image of physicists and makes more students think about physics in terms of course selection and a career," Rosenberg concluded. Q

OF NOTE...

ZAFFARANO PHYSICS ADDITION DEDICATED

The Iowa Board of Regents approved the renaming of the Physics Addition in memory of Daniel Zaffarano, professor emeritus in physics and astronomy and former vice president for research and dean of the Graduate College. Zaffarano died December 3, 2004, at the age of 86.

Completed in 1968, the five-story Zaffarano Physics Addition houses a number of faculty offices and laboratories in the department.

Speaking at the dedication ceremony attended by 80 colleagues, family, and friends including former Iowa governor Robert Ray, department chair Eli Rosenberg noted that Zaffarano's legacy has endured long after he left the department. "While Dan was chair, he helped to secure more funding for the department and hired many more faculty than previous chairpersons. In one year, the department grew from 30 faculty members to 50. Dan was also instrumental in securing the funding for the Physics Addition," he said. "Moreover, as vice president for research, Dan had a hand in the development of the molecular biology research initiative at Iowa State."

Members of the Physics and Astronomy Council contributed funds for a bronze memorial plaque including a bas-relief sculpture of Zaffarano, which has been installed at the west entrance to the building. Q

Erica, Elisa, Dario, Suzanne, Gina, Bianca, and Monica Zaffarano outside the Zaffarano Physics Addition

PHYSICS AND ASTRONOMY COUNCIL MEETS

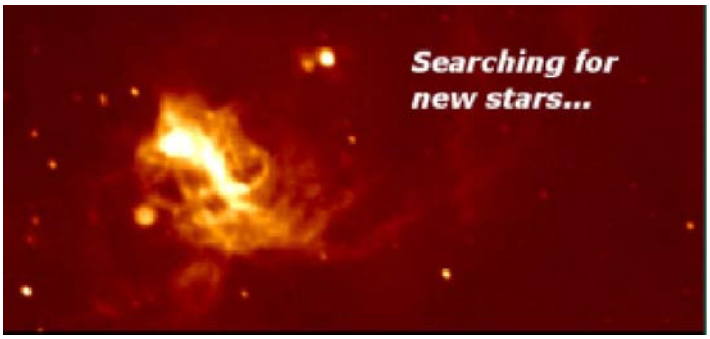
The Physics and Astronomy Council, consisting of 19 alumni and faculty from the department, provides advice and counsel to the department chair. The group meets annually in May and communicates on key issues throughout the year. Current members include

Dr. Robert Amme
(Vice Chair-Elect, 2006-2008)
University of Denver
Denver, Colorado
Dr. John E. E. Baglin
IBM Almaden Research Center
San Jose, California
Dr. Leon D. Crossman
(Chair-Elect, 2006-2008)
Midland, Michigan
Dr. Craig Davis
Plymouth, Michigan
Dr. Charles L. Duke
Grinnell College
Grinnell, Iowa
Dr. Bernice B. Durand
University of Wisconsin–Madison
Madison, Wisconsin
Dr. Douglas K. Finnemore
Iowa State University
Ames, Iowa
Dr. Mark W. Fleming
(Immediate Past Chair)
Strategies on Demand, L.L.C.
Naperville, Illinois
Dr. Alan I. Goldman
Iowa State University
Ames, Iowa
Dr. John Hopkins (Emeritus)
Katy, Texas
Dr. Robert L. Mather (Emeritus)
Oakland, California
Mr. Greg Pickrell
Pillsbury Winthrop Shaw Pittman, L.L.P.
Palo Alto, California
Dr. Derek Pursey
Dubuque, Iowa
Dr. Eli Rosenberg
Iowa State University
Ames, Iowa
Dr. Thomas D. Rossing
Northern Illinois University
DeKalb, Illinois

Some of the attendees at the May 2006 Physics and Astronomy Council meeting (left to right): Robert Amme, Craig Davis, Charles Duke. Derek Pursey, Will Talbert, Mark Fleming, Leon Crossman, and John Baglin

Dr. James E. Schirber
Hermosa, South Dakota
Dr. Joseph Shinar
Iowa State University
Ames, Iowa
Dr. Clayton A. Swenson
Iowa State University
Ames, Iowa
Dr. Willard L. Talbert, Jr.
Ames, Iowa

CHARLES KERTON WORKS WITH GREEN BANK TELESCOPE



Assistant Professor Charles Kerton and graduate student Kim Arvidsson travelled to Green Bank, West Virginia in August 2006 to use the 100-meter diameter Green Bank Telescope at the National Radio Astronomy Observatory. The telescope was used to detect faint radio recombination line emission from hot ionized hydrogen gas within the star forming region KR 1.

The new radio observations will help to determine the true extent of this region which may span up to 200 parsecs (pc) in diameter making it one of the largest known star forming regions in our Galaxy. Although bright at radio wavelengths this region, located about 5 kpc from the Sun, is not visible from the Earth at visual wavelengths, because of obscuration due to interstellar dust. Q

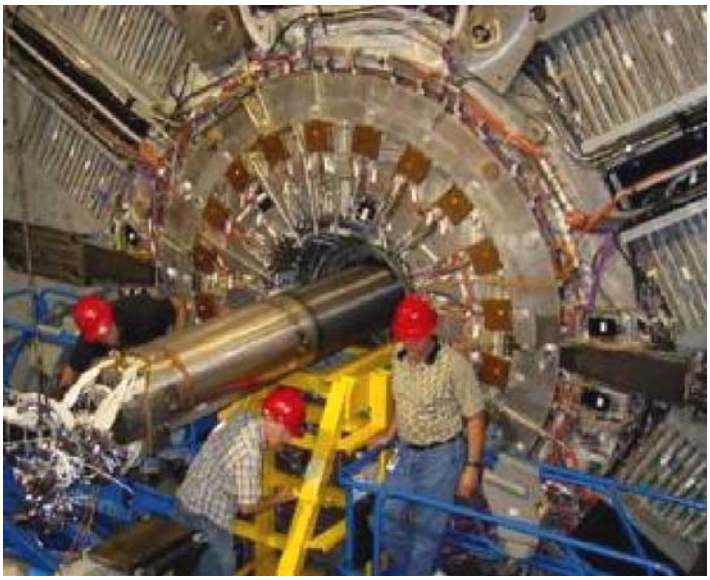
INTERNATIONAL CONFERENCE ON HIGH ENERGY PHYSICS

The major summer conference for particle physics, the 33rd International Conference on High Energy Physics (ICHEP06), took place in Moscow last July. This was an opportunity for the BaBar collaboration to present a vast array of results. Faculty members Bert Crawley, Jim Cochran, Tom Meyer, Soeren Prell and Eli Rosenberg, along with postdoctoral associates Vitaly Eyges, Liaoyuan Dong and graduate students Ada Rubin and Kyoko Yamanaka are members of the BaBar collaboration and contributed to this work.

The results are providing a more precise understanding of the Standard Model for weak-interaction properties of quarks. This framework facilitates the search for evidence of new physical interactions at high mass scales that are beyond the capabilities of current accelerators.

These themes are reflected in the centerpiece suite of new BaBar measurements of charge-conjugation-parity transformation (CP) violation or matter-antimatter asymmetries in B-meson decays.

A new measurement of CP violation in the most prolific channels–the same channels used in the original discovery of matter-antimatter differences in 2001–has set a benchmark of precision for testing the Standard Model. Against this benchmark, new results for CP violation in B-meson decay modes involving quantum loop diagrams, so-called “penguin decays,” were produced last summer, along with other data. Q



Installation of the central part of the BaBar Detector

DEPARTMENT OF PHYSICS AND ASTRONOMY

E. Walter Anderson, Professor, High-Energy Physics
David Atwood. Senior Lecturer, High-Energy Physics
Rana Biswas, Adjunct Associate Research Professor
Sergei Bud'ko, Adjunct Associate Research Professor
Paul Canfield, Distinguished Professor, Condensed Matter Physics
David A. Carter-Lewis, Professor, Particle Astrophysics
James Cochran, Associate Professor, High-Energy Physics
H. Bert Crawley, Professor, High-Energy Physics
Helen Fretwell, Lecturer
Alan I. Goldman, Professor, Condensed Matter Physics
Guillermo Gonzalez, Assistant Professor, Astronomy/Astrophysics
Xiaofeng Guo, Affiliate Assistant Professor, Nuclear Physics
Bruce N. Harmon, Distinguished Professor, Condensed Matter Physics
John Hauptman, Professor, High-Energy Physics
Paula Herrera, Lecturer, Physics Education Research
John C. Hill, Professor, Nuclear Physics
Kai-Ming Ho, Distinguished Professor, Condensed Matter Physics
Laurent Hodges, Professor, Physics Education Research
David C. Johnston, Distinguished Professor, Condensed Matter Physics
Adam Kaminski, Assistant Professor, Condensed Matter Physics
Steven Kawaler, Professor, Astronomy/Astrophysics
Charles Kerton, Assistant Professor, Astronomy/Astrophysics
Vladimir Kogan, Adjunct Associate Research Professor
Frank Krennrich, Professor, Particle Astrophysics
John Lajoie, Associate Professor, Nuclear Physics
Marshall Luban, Professor, Condensed Matter Physics
Robert McQueeney, Assistant Professor, Condensed Matter Physics
W. Thomas Meyer, Adjunct Research Professor High-Energy Physics
Craig Ogilvie, Associate Professor, Nuclear Physics, Physics Education Research
Martin Pohl, Assistant Professor, Astronomy/Astrophysics, Particle Astrophysics
Soeren Prell, Associate Professor, High-Energy Physics
Ruslan Prozorov, Assistant Professor, Condensed Matter Physics
Jianwei Qiu, Professor, High-Energy Physics, Nuclear Physics
Marzia Rosati, Associate Professor, Nuclear Physics
Jim Rose, Affiliate Professor,
Eli Rosenberg, Professor, High-Energy Physics
Joerg Schmalian, Associate Professor, Condensed Matter Physics
Joseph Shinar, Professor, Condensed Matter Physics
Costas M. Soukoulis, Distinguished Professor, Condensed Matter Physics
Curtis Struck, Professor, Astronomy/Astrophysics
Alex Travesset, Assistant Professor, Condensed Matter Physics Physics of Biological Systems
Michael Tringides, Professor, Condensed Matter Physics
Kirill Tuchin, Assistant Professor, Nuclear Physics
David Vaknin, Adjunct Research Professor Condensed Matter Physics
German Valencia, Professor, High-Energy Physics
James P. Vary, Professor, Nuclear Physics
Kerry Whisnant, Professor, High-Energy Physics
Lee Anne Willson, University Professor, Astronomy/Astrophysics
Don Wolford, Professor, Condensed Matter Physics
Edward Yu, Assistant Professor, Condensed Matter Physics Physics of Biological Systems

DEPARTMENT OF PHYSICS AND ASTRONOMY
12 Physics Hall
Iowa State University
Ames, Iowa 50011-3160

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Editor
Mark W. Fleming
Phone 630 983-7746
FAX 630 983-0719
stratondmd@aol.com

Contributors
Mark W. Fleming
David Gieseke
Eli Rosenberg
Saren Johnston

Department Chair
Eli I. Rosenberg
Phone 515 294-5441
FAX 515 294-6027
redmount@iastate.edu

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