

PHYSICS

**A UNIVERSITY
EXEMPLARY
DEPARTMENT**

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Dr. John Ficenech
Professor, Interim Chair

Dr. Jimmy Ritter
Professor, Assoc. Chair

Ms. Rhonda Mitcham
Dept. Business Manager

Ms. Deborah Cruise
Newsletter Editor



Quanta

A publication for the faculty, staff, students, alumni & friends of the Virginia Tech Physics Department

Two new colleges

The College of Arts and Sciences and the College of Human Sciences and Education have been restructured into two new colleges; the College of Science and the College of Liberal Arts and Human Sciences. The restructure will allow these colleges to have better focus on the disciplines of their departments.

The College of Science

consists of the following departments/programs:

- Biochemistry
- Biology
- Chemistry
- Economics
- Geological Sciences
- Mathematics
- **Physics**
- Psychology
- Statistics

Under the new structure, the College of Science consists of the departments listed in the left box; the College of Liberal Arts and Human Sciences departments listed in the right box.

After an in-house search, Lay Nam Chang was named as dean of the College of Science. Jerry Niles will head the College of Liberal Arts and Human Sciences.

Chang and Niles will help establish the two colleges, define their visions, enhance the quality and diversity of employees and students, create administrative infrastructure, lead the colleges' participation in the university's capital campaign, create a climate that encourages all members of the college community to contribute to college and university goals, serve on the leadership team, develop internal and external relationships to promote the colleges' programs, and provide entrepreneurial leadership for the growth and development of academic, research, and outreach programs.

Welcome alumni, to our new college, the College of Science. As always, we look forward to working with our students, faculty, staff, alumni, and friends.

The College of Liberal Arts and Human Sciences

consists of the following departments/programs:

- Air Force ROTC
- Apparel, Housing, and Resource Management
- Army ROTC
- Center for Interdisciplinary Studies
- Communication
- Educational Leadership & Policy Studies
- English
- Foreign Languages and Literatures
- History
- Human Development
- International Studies
- Music
- Navy ROTC
- Philosophy
- Political Science
- School of the Arts
- Science & Technology in Society
- Sociology
- Teaching and Learning
- Theater Arts

"Restructuring will bring more coherence to science and math areas of the university. Restructuring has presented many challenges, but I am looking forward to participating in the solutions."

- John Ficenech, Interim Chair, Physics Department -

Student News

Physics students garner NSF graduate-research

National Science Foundation (NSF) awards are one of the top measures of a scientific program's success, and Virginia Tech's physics-department students received five awards this year.

Three of the students who received the awards (nearly one tenth) received their degrees from Virginia Tech this spring, and two from the University of Texas at El Paso have chosen to do their fellowship work at Virginia Tech. That means about one-sixth of the recipients in physics are affiliated with Virginia Tech, said Beate Schmittmann, professor of physics.

NSF recently gave 32 fellowships to graduating physics majors. Three of the students who received the awards (nearly one-tenth) received their degrees from Virginia Tech this spring. Two from the University of Texas at El Paso have chosen to do their fellowship work at Virginia Tech. That means about one-sixth of the recipients in physics are affiliated with Virginia Tech, said Beate Schmittmann, professor of physics. The NSF awarded five other fellowships to current Virginia Tech students in fields other than physics.

According to the NSF Graduate Research Fellowship web page, "NSF fellows are expected to contribute significantly to research, teaching, and industrial applications in science, mathematics, and engineering. These contributions, in turn, will broadly impact society and the community."

The three Virginia Tech physics student award winners are Jay Mettetal, Beth Reid, and Mike Zwolak.

The two students coming to Virginia Tech on the NSF fellowships will work with Mark Pitt, associate professor of physics, on a new experiment called "Q_{weak}" at the Thomas Jefferson National Accelerator Facility in Newport News. "This experiment is a test of the validity of the Standard Model of elementary particle physics, and it is very sensitive to possible 'new physics' not described by that model," Pitt said.

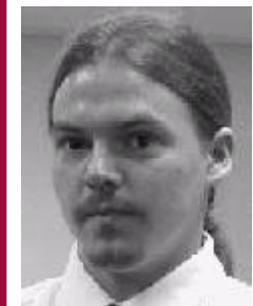
"We are very proud that Virginia Tech garnered so many NSF fellows in physics this year," said John Ficenec, professor and interim chair of physics. ⚙️



Jay Mettetal



Beth Reid



Mike Zwolak

Article Courtesy: Sally Harris, Spectrum

Two graduate students honored

Two physics graduate students were honored at the Spring banquet of the Virginia Tech Chapter of the National Honor Society Phi Kappa Phi.

Beth Reid received a Phi Kappa Phi Medallion Award for having the highest QCA (a perfect 4.0) in the College of Arts and Sciences.

Jay Mettetal was presented with the Phi Kappa Phi Virginia Tech Chapter Award which recognizes outstanding academic achievement and all-round performance. ⚙️

Student News

UTEP Couple Share Friendship, NSF Fellowship

Article Credits: Donna Dennis, University Communications, Univ. of Texas at El Paso.

Russell and Juliette Mammei share many things.

As a couple, they share a marriage. As students, they share the same educational interests, and recently they shared a prestigious honor from the National Science Foundation.



In a fierce competition, the foundation awarded only two graduate research fellowships in nuclear physics in the nation — the Mammei’s snatched them both.

The couple was in their chemistry lab when a friend from Wisconsin called to tell them he spotted their names on the NSF Graduate Research Fellowship awards Web site.

“We were ecstatic. We were jumping up and down, running through the hall. We couldn’t believe it,” Russell Mammei said.

A few weeks later the Mammei’s received their official award letters in the mail.

“Using their native intelligence and taking advantage of a UTEP undergraduate education, they were able to contend successfully for the most competitive fellowships in the nation,” said Thomas Brady, dean of the College of Science.

NSF Graduate Research Fellowships offer recognition and three years of financial support for advanced study to approximately 900 students throughout the nation in the mathematical, physical, biological, engineering, and behavioral and social sciences. The fellowships also support research-based doctoral degrees in science education.

This year, nearly 7,800 students applied for a fellowship in these fields, and three were awarded to UTEP students.

The Mammei’s and Beatriz Irene Alvarado, who received her

*“Russ and Julie are testimony to the outstanding quality of an undergraduate education here at UTEP.”
— Thomas Brady, dean of the College of Science*

fellowship for psychology, each received \$27,500 for a 12-month tenure. They’ll also receive an annual allowance of \$10,500, paid to the fellow’s institution in lieu of tuition and fees.

Mario Borunda received an honorable mention in science from the foundation.

see “UTEP” p7

SPS Outstanding Chapter Advisor Award

It is with great pleasure to announce that Dr. Jerome Long has been named the SPS Advisor of the Year by the national SPS office.

The purpose of this award is to recognize an Outstanding SPS Chapter Advisor. A truly successful SPS chapter requires leadership, organization, a broad spectrum of activities, and enthusiastic student participation. An outstanding Chapter Advisor provides the stimulus for such success.



Congratulations Jerome!

The award consists of a citation of the recipient’s distinctive service. In addition, an award of \$5,000 will be given. The distribution will be as follows: 60% to the Chapter Advisor, 20% to the recipients chapter, and 20% to the recipient’s institution.

Only one advisor in the country receives this award each year, and this recognition is a great testament to Dr. Long’s dedication to our chapter. 🌀

Virginia Tech Undergraduate Student's Physics Research Earns Trip to International Conference in Denmark

Beth Reid, a recent graduate of Virginia Tech with majors in physics and mathematics, represented the United States at an international conference of student researchers in Denmark after receiving the Society of Physics Students (SPS) Outstanding Student Award for Undergraduate Research.

Only two students represented this country at the International Conference of Physics Students (ICPS) in Odense, Denmark, Aug. 7-13. Reid presented the research that resulted in her receiving the SPS honor.

Reid's research was done with a group working with Uwe C. Täuber, associate professor of physics. "Our group (condensed matter theory) tries to build theoretical understanding of systems 'out of equilibrium,'" Reid said. "One example is life, which is maintained by a constant energy flux through the system. My project's focus was to use computer simulations to study anomalous diffusion (how particles move through unordinary media) and is related to the study of percolation. The computer simulations allowed us to test a specific theory of how the particles should behave and discover that theory's limits". Reid's main contributions were writing and performing the simulations, doing detailed data analysis and interpretation, and developing an intermediary model to explain the group's results.

Täuber said Reid is "definitely among the very best students I have ever met during my career at the Technical University of Munich, Harvard University, the University of Oxford, and here at Virginia Tech". Her "remarkable academic achievements" led to her receipt of numerous scholarships and to being named the College of Arts and Sciences Outstanding Senior 2003. She also received the Barry M. Goldwater Scholarship and a rare National Science Foundation Research Fellowship.

According to the NSF Graduate Research Fellowship web page, "NSF Fellows are expected to contribute significantly to research, teaching, and industrial applications in science, mathematics, and engineering. These contributions, in turn, will broadly impact society and the community". Reid said her proposal for the NSF fellowship involved "the application of techniques of statistical physics to study the distribution of biological populations in space in order to understand issues about habitat loss and fragmentation".

In fact, some of Reid's concerns are environmental and ecological issues, and she plans interdisciplinary research on the interface on non-equilibrium statistical physics, mathematical biology, and ecology, according to Täuber. Reid says she probably will stay in academia and do

see "Denmark" p6

The Q_{weak} Experiment at Jefferson Lab



Q_{weak} is a new experiment being constructed for running at the Thomas Jefferson National Accelerator Facility (TJNAF) in Newport News, Virginia. The goal of the experiment is to provide a precise test of the Standard Model of particle physics using the high energy electron accelerator at TJNAF. Physicists from Virginia Tech have been involved in the experiment from the beginning, and they will play a substantial role in its construction and running. The National Science Foundation has provided funding in the form of a Major Research Instrumentation (MRI) grant for equipment, an operating grant to Professor Mark Pitt, and a joint operating grant to Professor Caren Hagner and Dr. Norman Morgan. The local participants also include new graduate students Juliette and Russell Mammei, each of whom won a National Science Foundation Graduate Fellowship to support their graduate work. The overall Q_{weak} collaboration consists of about 45 scientists from 15 institutions.

The theory that describes the interactions of our most fundamental particles is called the Standard Model, and it has worked well for the past three decades.

see "Q_weak" p6

Marvin Blecher - NSF
 "Reactions of Polarized Gamma Rays on Polarized Hydrogen-Deuterium Molecular Targets"

Marvin Blecher - NSF
 "KOPIO - Measurement of the Decay $K_L^0 \rightarrow \pi^+ + \nu + \bar{\nu}$ "

Caren Hagner, Norman Morgan - NSF
 "Calibration and Tracking Subsystem for the Qweak Experiment"

Mark Pitt, Caren Hagner, Norman Morgan - NSF
 "Collaborative Research: Development of a Particle Tracking System for the Qweak Experiment"

Uwe Tauber - NSF
 "Scale Invariance and Dynamic Phase Transitions in Non-Equilibrium Systems"

Leo Piilonen - KEK
 "Detector R&D for KEK B-Factory"

J. Randy Heflin - Office of Naval Research
 "Symposium on Organic Thin Films for Photonic Applications"

Robert Vogelaar - NSF
 "M-Cavern: Ultra-Low Background Microchemistry and Counting at Gran Sasso"

Guy Indebetouw - NIH:
 "Multifunctional Microscopy for Structural Biology"

Department News

Promotion and Tenure

The Board of Visitors approved the much deserved promotion and tenure to the rank of Associate Professor to Max Di Ventra, Tatsu Takeuchi, and Uwe Tauber. This recognition of their professional accomplishments is certainly appropriate. The physics department extends enthusiastic **CONGRATULATIONS!**



DIVENTRA



TAKEUCHI



TAUBER

Business Manager says farewell

Faculty and staff of the Department of Physics bid farewell to Janet Sanders at a luncheon on June 30, 2003. During Janet's thirty years of extraordinary service in the Department she advanced from entry-level secretary to Departmental Business Manager with responsibility for many of the Department's essential functions. Although we will miss Janet's presence in the Department, we can take comfort in the fact that she now serves as Business Manager for the newly formed College of Science. During the period of transition to a new Departmental Business Manager, the friendly and willing assistance of Janet, an experienced and confident collaborator, was essential. On behalf of the faculty and staff in the Department, we extend to Janet our thanks and best wishes for a rewarding career in the College of Science. ⚙️



Department welcomes Rhonda Mitcham

The Department of Physics welcomed a new Business Manager, Rhonda Mitcham, on September 15, 2003. Rhonda received her B.B.A. in Accounting from Radford University in 1993 and is a CPA. Rhonda joins the Department after nine years at the Virginia Tech Foundation, serving as Accountant, Senior Accountant, and Accounting Manager while there. Rhonda is rapidly mastering the unique challenges and special nuances associated with her new positions as Departmental Business Manager and as the mother of a three-month old baby girl. We look forward to Rhonda's presence as a key member on the collaborative team of physics staff and faculty, as we strive to improve the Department and implement the University's missions. ⚙️



Indication of New Physics from the Belle Experiment

Article courtesy: Professor Leo Piilonen



The High Energy Accelerator Research Organization (KEK) announced that the Belle collaboration, an international research team working at the KEKB accelerator and including Virginia Tech scientists, found evidence for a new phenomenon that cannot be explained by the Standard Model of elementary particles. The discovery has to do with the size of the CP asymmetry, or the tiny difference known to exist between matter and anti-matter. The discrepancy in the findings at Belle and those predicted by the Standard Model “may hint at supersymmetric particles or something more exotic”. Virginia Tech researchers helped in writing the paper and in building one of the detectors used in making the measurement that uncovered the evidence. The VT detector also was used in analyzing a portion of the data from the experiment. The Virginia Tech professor is Leo Piilonen of physics. Two post-doctoral researchers, Bruce Yabsley and Jian Gui Wang, and two doctoral students, Manmohan Dash and Debabrata Mohapatra, work with him on the project. Yabsley gave a presentation at a recent symposium on charm physics from the Belle experiment. 

Q_{weak}

continued from page 4

There has been some evidence for “physics beyond the Standard Model” in recent years with the observation of solar neutrino oscillations. Another way to look for cracks in the Standard Model is to make measurements of reactions that have a definite prediction in the Standard Model. The collaboration is measuring the scattering rates of polarized electrons in elastic scattering from protons. The Standard Model predicts a small parity-violating difference between the scattering rate for right handed (spin polarized parallel to direction of motion) and left handed electrons. Q_{weak} will make a very accurate measurement of this parity-violating asymmetry that can be used as a stringent test of the Standard Model. If a deviation is observed from the Standard Model prediction, then it can be interpreted as evidence for new physics that is not contained in the model.

One possibility for new physics beyond the Standard Model is the existence of exchange particles heavier than the currently known exchange particles like the $90 \text{ GeV}/c^2$ Z boson (a proton has a mass of $0.94 \text{ GeV}/c^2$). One way to search for such particles is to try to make them directly at high energy collider accelerators. But such heavy particles will also appear virtually in processes at low energies. Such “virtual” processes modify the expected results, so the new physics can be detected even though the new exchange

see “Q_{weak}” p7

Denmark

continued from page 4

research.

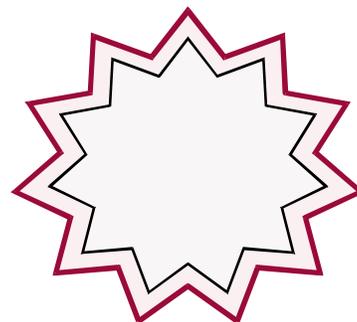
Reid has worked at the NASA Langley Research Center, has done internships with Boehringer Ingelheim and Luna Innovations, and has attended high-quality un-

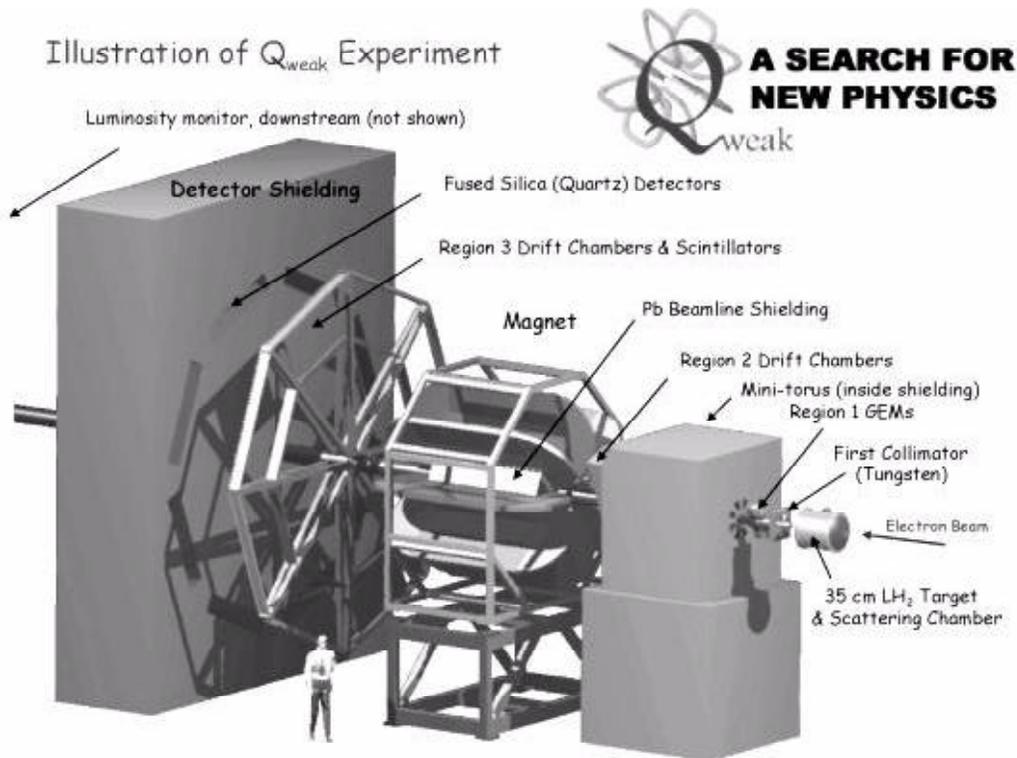
Täuber said Reid is “definitely among the very best students I have ever met during my career at the Technical University of Munich, Harvard University, the University of Oxford, and here at Virginia Tech”.

dergraduate research programs at the University of Washington and Behrend College, Penn State Erie. “These activities provided her with a remarkably broad spectrum of first-hand research experience,” according to Täuber, who said he was delighted to have her join his research efforts.

Reid is the daughter of Barry and Brenda Reid of Chester, VA.

Article Courtesy: Sally Harris, Spectrum



Q_{weak}*continued from page 6*

Conceptual layout of the Q_{weak} apparatus. The electron beam enters from the right and scatters off of the protons inside a liquid hydrogen target. The scattered electrons pass through collimation, and then they are focused by a large toroidal magnet into detectors inside the large shielding block. Physicists from Virginia Tech will construct the region 2 drift chambers, mini-torus magnet, and the luminosity monitor.

particle is not directly produced. Q_{weak} will search for new physics in this indirect way. Despite the fact that it only runs at a beam energy of 1 GeV, the Q_{weak} experiment is sensitive to new physics at energies up to about 4.7 TeV (4,700 GeV).

The Q_{weak} group at Virginia Tech has received funding for several hardware projects for the experiment. The overall conceptual view of the experiment is shown in the figure. Electrons scatter off of a liquid hydrogen target, and the scattered electrons are focused by a large toroidal magnet into detectors in a focal plane. The Virginia Tech group is responsible for building the Region 2 drift chambers, a mini-torus magnet for sweeping away low energy electrons from the drift chambers, and a luminosity monitor that will be located downstream of the experiment. Construction on the Q_{weak} experiment is expected to take 3 years with the first data-taking runs anticipated in 2007.

Article and photo courtesy: Professor Mark Pitt

UTEP*continued from page 6*

Alvarado, who is among 53 students nationwide awarded in psychology, will pursue graduate studies at the University of Arizona.

The Mammei's will study at Virginia Polytechnic Institute — one of the top research institutions in the United States. They'll pursue doctoral degrees in experimental nuclear physics and hope to eventually teach physics or mathematics at the university level.

Russell Mammei credits his success to his mentors at UTEP.

"There are opportunities at UTEP for students to enhance their undergraduate experience and I have taken full advantage of them," he said. "UTEP has some exceptional faculty and staff, and I have been able to be mentored by these individuals."

"Through them, I have gained a unique insight into the world of research and academics," he continued.

Those eligible to apply are college seniors, first-year graduate students, and others who have completed a limited amount of graduate study in science, mathematics, or engineering.

"Russ and Julie are testimony to the outstanding quality of an undergraduate education here at UTEP, especially in the College of Science and the Physics Department," Brady said. "These are two very intelligent people who took advantage of what UTEP had to offer by studying here and by doing research at the Jefferson National Laboratory." 

Make a tax deductible contribution

By contributing to the education of physics, you contribute to the future for all!

The future of Physics is literally determined by loyal supporters who, year after year, provide financial basis for quality education.

Listed below are a few ways in which interested donors can contribute.

- ◆ Through gift planning - charitable gifts that provide an income.
- ◆ Through gifts of securities - stocks, bonds, or mutual funds.
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To learn more on the different ways you can give, visit the Virginia Tech, Office of University Development - "Ways to Give" website at <http://www.givingto.vt.edu/waysgive.html>.

However you choose to give, private giving contributes immeasurably to making Virginia Tech a world-class institution. Contributions are tax deductible as provided by law. 

Thank you in advance,
John Ficenec, Interim Chair

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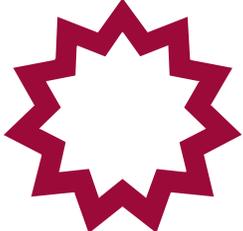
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