We are just completing the Fall Semester at Valparaiso University, and we want to take this opportunity to highlight some of the accomplishments of our students in the last year, with brief mention of faculty members as well.

1. Student Postgraduate Plans

All six graduates in the class of 2005 are continuing their studies in graduate school in physics, astrophysics, or geophysics. Each one has the support of a fellowship, teaching assistantship, or research assistantship. We are proud of all of their accomplishments!

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<th>VU Class of ‘05</th>
<th>Graduate School</th>
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<tr>
<td>Brian Bucher</td>
<td>U. of California at San Diego</td>
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<tr>
<td>Ross Corliss</td>
<td>MIT</td>
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<tr>
<td>Tim Rogers</td>
<td>U. of Minnesota</td>
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<td>Tom Rosenwinkel</td>
<td>U. of Texas</td>
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<td>Brad Rush</td>
<td>U. of Toledo</td>
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<td>Marta Stoeckel</td>
<td>U. of Minnesota</td>
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2. Student Summer Research Activities

Josh Vredevoogd and Ted Hopkins spent the summer at VU working with Prof. Koetke on the STAR experiment at the Relativistic Heavy Ion Collider at the Brookhaven National Laboratory on Long Island, NY. Josh and Ted continued research begun by Ross Corliss (VU graduate 2005; graduate school at MIT) and advanced it dramatically. The goal of their work was to develop a computer algorithm that would identify electrons emerging from the collision of two very high energy protons at the center of the STAR detector using data from the Endcap Electromagnetic Calorimeter (EEMC) on STAR. At the same time, they had to reject signals from strongly-interacting particles called hadrons. Their algorithm was far more successful than anticipated and they won the praise of many physicists on the STAR collaboration. Their report to the STAR physicists can be seen at [http://physics.valpo.edu/studentResearch05/STARElectronID.html](http://physics.valpo.edu/studentResearch05/STARElectronID.html)

Jason Summerlott worked with Prof. Stanislaus on the Crystal Ball experiment to analyze data to search for the production of a particle called the sigma(1385). The sigma is in the same family as the proton and neutron, but the sigma(1385) mass-energy is 1385 MeV, over 200 MeV heavier than its cousin, the (normal) ground-state sigma.
Jeff Massura, Jason Strains, and Larry Selvy spent the summer at the VU Observatory working with Profs. Hrivnak and Hillwig observing variable stars and analyzing their properties (see pictures above). They continued his long-term project, funded by the National Science Foundation and the Indiana Space Grant Consortium, to find the period of variation of a sample of dying stars. They also continued in the third year of a new study of eclipsing binary stars in collaboration with an astronomy group from Ball State University. Jeff also made an observing trip to Arizona with Prof. Hillwig to observe with the 6.5-m MMT telescope (see picture on right).

3. Faculty Research Activities

Prof. Todd Hillwig traveled to Kitt Peak National Observatory in Arizona for one week to observe the binary system SS 433, which potentially harbors a black hole. He also obtained data from the Hobby-Eberly Telescope in Texas. This work is a continuation of research with astronomers at Georgia State University, MIT, and the National Radio Astronomy Observatory. He also continued work on binary star systems at the center of planetary nebulae by obtaining data from the Cerro Tololo Interamerican Observatory in Chile. Dr. Hillwig is collaborating with astronomers from the Space Telescope Science Institute in Baltimore and Ege University in Turkey to better how planetary nebulae are formed. His research has recently been published in the Astrophysical Journal, as well as being highlighted in articles in the popular magazines Sky and Telescope and Astronomy.

Prof. Bruce Hrivnak continued his research on the death of stars like our Sun, stars in the transition between red giants and white dwarfs. He carried out most of this work here at VU, but made one trip to Calgary, Canada to work with colleagues at the University of Calgary on collaborative research using the Gemini 8-m telescope in Hawaii. He is completing a research project in which he is using his Hubble Space Telescope images of
these dying stars, in collaboration with astronomers from the Univ. of Arizona. This research is funded by the National Science Foundation and NASA.

Prof. Donald Koetke continued work on the STAR experiment at the Relativistic Heavy Ion Collider at the Brookhaven National Laboratory. The experiment on which he is working is designed to understand, for the first time, what the fundamental origin is for the spin of the proton. By colliding very high-energy beams of polarized protons, this experiment will discover the role played by the quarks and the gluons inside the proton in forming the resulting measured spin of the proton. Prof. Koetke is also working on an experiment to search for the electric dipole moment of the neutron using the reactor at the National Institute of Standards and Technology (NIST) near Washington, DC. Prof Koetke has attended scientific meetings in Europe, Hawaii, and Santa Fe, NM in the past six months.

Prof. Robert Manweiler worked to conclude the analysis of data taken with the Crystal Ball detector at the Alternating Gradient Synchrotron at the Brookhaven National Laboratory. Specifically, this analysis is focused on the study of the all-neutral final state of a pi-zero + sigma particles. These will provide the world’s best measurements of this reaction that is very difficult to study because the particles have no electric charge.

Dr. Gary Morris has active research program in three places: NASA Goddard Space Flight Center (GSFC) in Washington, DC, Rice University in Houston, Texas, and at on campus at Valparaiso University. While at GSFC, Dr. Morris works with NASA scientists validating satellite observations of ozone and water vapor measurements from the Aura satellite. While at Rice, Dr. Morris works with undergraduate students launching ozonesondes (weather balloons with ozone monitors attached) from the main quadrangle on campus. The work has been funded by NASA and the Texas Commission on Environmental Quality. You can see results from this work on the project website at http://www.ruf.rice.edu/~ozone. During the Spring of 2006, Dr. Morris will begin launching ozonesondes at Valparaiso University thanks to a grant from NASA. He expects a team of 4 undergraduate students to work with him on this project.

Prof. Stanislaus continued his work to provide the very high precision alignment of the detectors in the TWIST (TRIUMF Weak Interaction Symmetry Test) experiment at the TRIUMF accelerator facility in Vancouver, British Columbia. The experiment will make the world’s most precise measurements of the decay of the muon (the heavy cousin of the electron) to test the fundamental theories of elementary particle physics.

Prof. Stan Zygmunt traveled frequently to Argonne National Laboratory in Argonne, Illinois to work with his research colleagues on a project seeking to understand the special properties of vanadium oxide catalysts. He received the Valparaiso University Research Professorship for the 2005-2006 academic year and is currently on leave to pursue this research full-time. He and his colleagues recently had a manuscript describing their preliminary results accepted for publication in the Journal of Physical Chemistry. He will return to the classroom in fall 2006.
You can find much more information on VU student and faculty research at http://www.physics.valpo.edu/facultyResearch.

4. New Faculty Join the Department

Dr. Andrew Richter (VU 1990) joined the department in a tenure-track position. He received his PhD from Northwestern University. Following postdoctoral research at Argonne National Laboratory and the National Institute for Advanced Industrial Science and Technology (Japan), Dr. Richter joined the faculty at the University of Memphis. His area of research deals with the surface properties of thin films, and he will be setting up a lab in the department in which he will prepare these samples for study at the national labs.

Adam Gibson (VU 2000) joined the department as a one-year Visiting Assistant Professor. He is completing his PhD from the Univ. of California, Berkeley. His research is at the Fermi National Accelerator Laboratory, an hour west of Chicago. At Fermilab's Tevatron, the world's most powerful particle accelerator, he studies the properties of massive elementary particles, including precision measurements of the mass of the top quark.

Dr. Donald Koetke, chairman of the department for the past 27 years, has retired from teaching and has been appointed Senior Research Professor. As such, he continues his DOE-funded research in nuclear and particle physics and supervision of research students.

5. Conferences and Presentations with Students

Students Jeff Massura and Larry Selvy joined Prof. Hrivnak (see right) in participating in the Great Midwestern Space Grant Meeting in Chicago in September. The students presented posters on their summer research: Jeff - "New Light Curves of Four Eclipsing Binary Star Systems" and Larry - "A Long-Term Study of Light Variations in Dying Stars."

Prof. Morris attended the Fall 2005 meeting of the American Geophysical Union in San Francisco, CA where his undergraduate research student from Rice University and he presented a poster entitled, “Preliminary Analysis of Ozonesonde Data from Houston, TX as Par to fINTEX-A, July – August 2004.” The poster illustrated the impact of remote forest fires (burning in Alaska) on ozone levels above Houston.
Several students also made presentations at the VU Celebration of Undergraduate Scholarship and at the statewide Butler Conference on Undergraduate Research in the spring.

6. Kress Lectures

During 2005, we were fortunate to have two special visitors in the Department of Physics & Astronomy at VU as part of the Kress Lecture Series. Support for this special lecture series comes from funds made available by Dr. Kenneth Kress (VU ‘64).

Randall Hulet, a world-renowned physicist from Rice University provided the Kress Lectures on March 31 and April 1, 2005. Dr. Hulet's research has focused on super-cooled atoms, brought to temperatures on the order of nanokelvin (a few billionths of a degree from absolute zero) with the help of exotic techniques such as laser cooling and atom trapping techniques. His Kress Public Lecture was entitled “The Science of the Ultracold” while his Physics & Astronomy Department colloquium was entitled, “Lithium-6 and Lithium-7: A Tale of Non-Identical Twins.”

Thomas Dombeck from the University of Hawaii heads a program systematically surveying the sky for asteroids with Earth-crossing orbits. He came to VU on October 6 – 7, 2005 to provide the Kress Lectures. His Kress Public Lecture was entitled, “Searching the Night Sky: Killer Asteroids, Quasars, and Super Novae,” while his Physics & Astronomy Department colloquium was entitled, “Giga-Sized Projects: A Challenge for Higher Education.”

More information on these and all our department colloquia can be found on our department webpage at http://physics.valpo.edu.