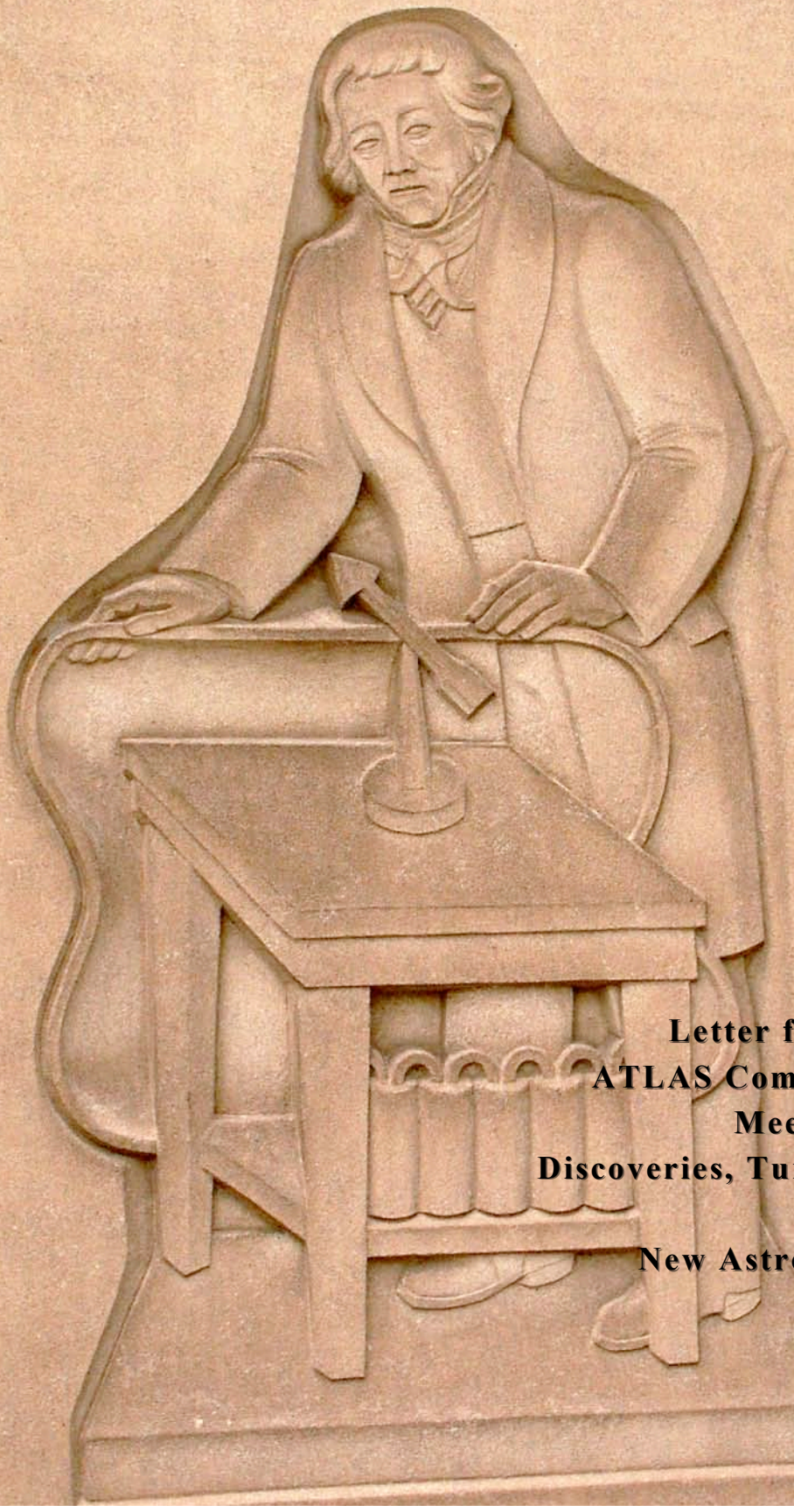
Physics and Astronomy

Michigan State University Fall 2007



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MSU Physics and Astronomy Department

Volume 9
Fall 2007

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Dr. Daniel R. Stump, Undergraduate Program Director
Dr. S.D. Mahanti, Graduate Program Director
Dr. Jack Baldwin, Associate Chair, Astronomy

A Letter from the Chair

Dear Friends of the Department of Physics and Astronomy,

During the past year we have added two new members to our faculty, both in nuclear physics, one experimentalist and one theorist, one senior and one junior appointment. Wolfgang Mittig, a German working in France at GANIL, which is one of the main international competitors for our cyclotron laboratory, accepted the Hannah Chair of Nuclear Science. And Scott Bogner, who came to us from a post-doctoral research appointment at The Ohio State University, is the newest member of the nuclear theory group. He holds a joint NSCL-PA faculty appointment.

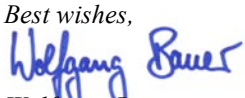
We also lost two of our most senior physicists to retirement. University Distinguished Professor Walter Benenson and former Lyman Briggs College dean Michael Harrison both will retire effective July 1, 2008, and are now in their consultancy year. Both are planning to continue working, but have graciously given up their positions so that the department can hire additional junior faculty in the future. In addition to Michael and Walter, it now seems likely that we will also lose Simon Billinge, one of our rising young stars in condensed matter physics, who has received a very lucrative offer from Columbia University. Thomas Duguet, assistant professor of nuclear theory, has decided to return to his home country France and accepted a prestigious appointment at the Saclay national nuclear physics laboratory. On the bright side, we will have Chih-Wei Lai, from Stanford University, join our faculty in January 2008 as the first holder of the Cowen Chair in experimental condensed matter physics.

Our students and faculty earned numerous national and international awards. Kurtis Geerlings, now a senior, won a prestigious Barry M. Goldwater scholarship, one of only 23 in the entire history of MSU. (This newsletter also contains an article on Kurtis' other major achievement, his 'SpartyJet' computer program). Graduating senior Victoria Moeller is the first MSU student to receive a Gates Cambridge Scholarship award, which covers the entire cost of graduate study at Cambridge University in the UK, and which is valued at up to $200,000. Second-year graduate student Angelo Signoracci won an NNSA Stewardship Science Graduate Fellowship.

Two of our faculty members, Joey Huston and Hendrik Schatz, were elected Fellow of the American Physical Society. Jack Baldwin won an MSU Distinguished Faculty Award. And Tim Beers and I received the designation of University Distinguished Professor. With the addition of Tim and myself, there are now six of our faculty, who hold this highest faculty rank at MSU, in addition to four of our emeritus professors. In the history of MSU only 104 faculty members have received this designation, which means that our department faculty have earned approximately 10% of all of these awards, making us by far the most successful department in the university by this measure. But without a doubt the 2007 Nobel Prize in Physics, which was jointly awarded to our adjunct professor Albert Fert, tops this year's list of awards.

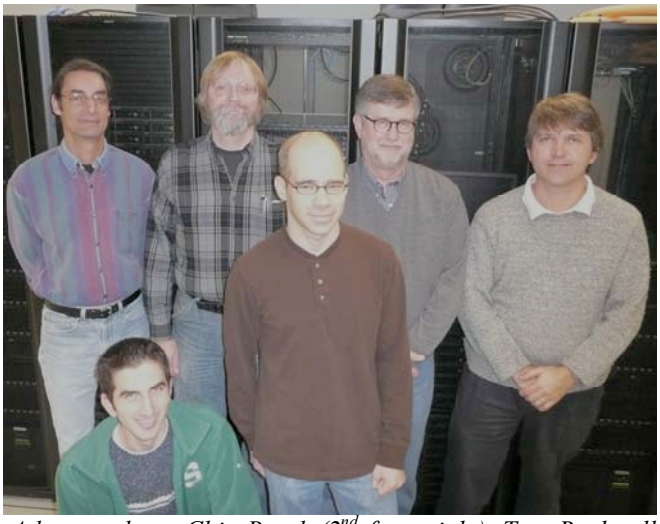
The quality of the support staff is of incredible importance to a department. We are very fortunate to have a truly outstanding group of professionals working for our department, who make the difference for much of the success that I have the regular pleasure to report on. In this issue we will start a regular feature of highlighting the work of a support group, and we are kicking this series off with a short portrait of our machine shop group.

Best wishes,



Wolfgang Bauer
bauer@pa.msu.edu
http://www.pa.msu.edu/~bauer/

MSU Commissions ATLAS Great Lakes Tier 2 Computing Center



Atlas members, Chip Brock (2nd from right), Tom Rockwell (center front) and Phillippe Laurens (right), with Computing Specialists George Perkins (second from left) and Ehren Benson (lower left), along with Instrument Specialist Mike Nila (left) stand in front of the first of 5.

MSU's high-energy physics group has begun a new era with the commissioning of a dedicated computing facility to be used for the ATLAS experiment at CERN. The ATLAS collaboration (http://atlasexperiment.org), which is composed of over 1900 members, operates one of the two large experiments for the Large Hadron Collider (LHC) which will be taking its first data in 2008.

In addition to the Tier-1 center at Brookhaven National Laboratory, ATLAS has 5 Tier-2 centers in the U.S. Chip Brock is the co-director of the Great Lakes Center (AGL-2), which includes the University of Michigan, and will serve the needs of all ATLAS institutions in the region. The centers use the Michigan Lambda Rail, a high-speed network linking the main internet backbone in Chicago to MSU, UM, Wayne State and the Van Andel Institute in Grand Rapids. Twenty gigabits (!) of bandwidth are dedicated to the AGL-2 project.

The MSU facility will initially consist of 54 nodes, each with 8 processor cores, and 200 terabytes of storage, contained in five racks, one of which is pictured above. To facilitate the project, the Department's server room was completely gutted and re-outfitted to handle the cooling needs of the computing farm. Thirty tons of air-conditioning units, capable of removing 100,000 Watts of heat, were added above the ceiling and in the adjacent room.

ATLAS will record data at a phenomenal rate, sorting through the tens of millions of collisions per second, and after triggering, writing hundreds of events per second and storing approximately 10 Gigabytes per minute, or the equivalent of 20 CDs. Data will be downloaded to the analysis centers, where it will be made available to all collaborating institutions. Data stored across multiple locations will appear transparent to the user by setting up an international GRID network. (http://en.wikipedia.org/wiki/Grid_computing)

By hosting the center, MSU is poised to play a leading role in analyzing the discoveries to come from the LHC. Perhaps the biggest discovery will be the Higgs boson, which in the standard model is believed to have condensed into a massive field very soon after the big bang. The condensate is believed to be responsible for generating all the fundamental masses in the standard model.

The nature of *pp* collisions at the LHC requires mining for rare events, coupled with the application of highly sophisticated methods for the statistical subtraction of numerous background processes. Analysis also hinges on intimate knowledge of the design and engineering of the detector and triggers, and mastery of the analysis infrastructure. Ultimately, results will be compared to evolving theoretical models. Given the Department's central role in the construction of the ATLAS calorimeter, the role played with the AGL-2 project, and the fact that MSU has arguably the strongest high-energy phenomenology university group in U.S., the next several years should be exciting times for MSU and the high-energy group.

Cooling units being lowered onto the roof above the server room at the BPS building.

Wolfgang Mittig Accepts Hannah Chair

The National Superconducting Cyclotron Laboratory (NSCL) and the Physics & Astronomy Department are happy to welcome Wolfgang Mittig, who will join MSU in January 2008 as the fourth Hannah Chair in the history of the NSCL. (Previous holders of the Chair were David Scott, George Bertsch, and Gregers Hansen). For the last 25 years Wolfgang has been the driving force behind several major experimental initiatives at GANIL, the leading nuclear physics laboratory in France. Most notable is his involvement with SPIRAL, a facility that reaccelerates radioactive nuclear beams via the ISOL (Isotope Separation on-Line) technique. Wolfgang's experimental expertise with re-accelerating beams, active targets and magnetic spectrometers, along with his scientific interests in spectroscopy of exotic nuclei, nuclear reactions and fundamental issues in quantum mechanics make him a perfect match for the NSCL. In addition to his expertise in nuclear physics, Wolfgang has been involved in questions regarding sustainable nuclear energy and global energy problems.

Wolfgang's career has taken him to varied locations around the world, from his education in his native Germany and in Paris, to positions at Saclay (Paris), the IFN-USP in Sâo Paulo and Caen (Ganil) along with a visiting position at RIKEN in Japan, and now to East Lansing. He is fluent in German, English, French and Portugese, and can also converse a bit in Japanese and Latin. Wolfgang also has family in the U.S., including two grandchildren in Philadelphia.

Scott Bogner Joins NSCL Theory Group

Scott began his joint NSCL/PA appointment in the Summer as a nuclear theorist specializing in many-body methods and inter-nucleon interactions. Scott earned his Ph.D. in nuclear theory from SUNY Stony Brook in 2002, where his research focused on the development of many-body methods to construct effective shell model Hamiltonians and Fermi liquid parameters microscopically. He then spent two years as a post-doc at the Institute for Nuclear Theory at the University of Washington, followed by a three year post-doc at Ohio State University. Scott's current research interests include effective field theory (EFT) and renormalization group (RG) methods, three-nucleon interactions, and the interface between ab-initio and nuclear density functional theory (DFT) methods using effective action techniques. He is a co-PI in the MSU contingent of the SciDAC project "Building a Universal Nuclear Energy Density Functional (UNEDF)" , where a primary objective is to develop non-empirical nuclear energy density functionals with controlled extrapolations away from stability to better understand properties of exotic nuclei studied at current and next-generation rare isotope beam facilities such as those at the NSCL.

Scott is succeeding Thomas Duguet, who has decided to leave MSU and to return to his home country France, where a prestigious appointment at the Saclay national nuclear physics laboratory just outside Paris is waiting for him. But Thomas will remain an adjunct professor in the department and the NSCL and will return to our campus regularly for research projects.

Joey Huston and Hendrik Schatz are Elected APS Fellows

Election to Fellow of the American Physical Society (APS) is a high honor, which is only given to a maximum of 0.5% of the APS membership in any given year. This year Professors Hendrik Schatz and Joey Huston were among the newly elected fellows. Schatz is a nuclear physicist and co-director of the JINA Frontiers Centers. His citation reads: "For his seminal contributions to our theoretical and experimental understanding of the r-process, the rp-process, x-ray bursts, and the modification of neutron star crusts by the ashes of nuclear processes." Huston is a particle physicists and plays a leading role in the CDF collaboration at Fermilab and in the ATLAS collaboration at CERN. His citation reads: "For scientific leadership and fundamental contributions to the study of the strong interaction of quarks and gluons through definitive experiments at hadron colliders and important phenomenological calculations.

MSU Group Probes the Physics of Donor Molecules

Embargoed

until publication

in Nature Physics

NSCL Discovers Three New Isotopes

Staking out new territory in the nuclear landscape, MSU's National Superconducting Cyclotron Laboratory has created three never-before-observed isotopes of magnesium and aluminum. According to Dave Morrissey, University Distinguished Professor of chemistry and one of the paper's authors, "This result suggests that the limit of stability of matter may be further out than previously expected; really, it shows how much mystery remains about atomic nuclei."

In the experiment that ran earlier this year, the NSCL created and detected three new super-heavy isotopes of magnesium and aluminum: magnesium-40, with 12 protons and 28 neutrons; aluminum-42, 13 protons and 29 neutrons; and aluminum-43, 13 protons and 30 neutrons. If the everyday version of aluminum were a 160-pound adult, aluminum-43 would be a muscular, 255-pound heavyweight. The findings appeared in the October 25 issue of the journal *Nature*.

Retirement Symposium for Wu-Ki Tung

On May 12, 2007, the Department of Physics and Astronomy and the High-Energy Physics Group hosted a day-long symposium in honor of the retirement of Prof. Wu-Ki Tung. Seventy participants gathered for talks from many of the most influential particle physicists of the last 40 years. Speakers included George Sterman (SUNY Stony Brook), Steve Adler (Institute for Advanced Study), Bill Bardeen (Fermilab), Bj Bjorken (SLAC), Steve Ellis (U Washington), Henry Frisch (U Chicago), Max Klein (U Liverpool), Jorge Morfin (Fermilab), Jeff Owens (Florida State), Chris Quigg (Fermilab), Heidi Schellman (Northwestern), and Marlan Scully (Texas A&M/Princeton). The speakers related in detail the impact Wu-Ki Tung has had on the field of particle theory in the United States, both through his research and through his efforts to found CTEQ (The Coordinated Theoretical-Experimental Project on QCD). The day concluded with a banquet at the Kellogg Center. We were especially pleased that, in addition to Wu-Ki and Beatrice Tung, their sons Bruce and Lei were able to attend as well.

The Department and the High-Energy Group will miss both Wu-Ki and Beatrice. One consolation is that Wu-Ki continues his activities on CTEQ in collaboration with many here at MSU. We wish them well in their new home in Seattle, and look forward to seeing them often.

We encourage all alumni to send us news!!!

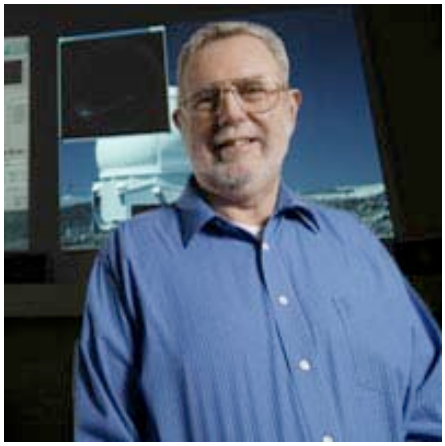
American Association of Physicists in Medicine Recognizes Steven Goetsch

Steven Goetsch, who received his BS in Physics from MSU in 1972, was awarded the Public Health Service Fellowship from the AAPM this last year at the annual meeting in Minneapolis in July. Steven worked with Peter Schroeder, with whom he published his first paper, and went on to Northwestern and Wisconsin where he received his Ph.D. with his thesis work studying neutron/gamma dose separation. He then went on to work in radiation therapy and he served as President of the North Central Chapter of the American Association of Physicists in Medicine, and later as Chapter Representative to the Board of Directors. Steven served for years on the AAPM committee which oversees the Accredited Dosimetry Calibration Laboratories and on a number of other committees and task groups. In 1990 he became a Hospital Physicist and Associate Clinical Professor of Radiation Oncology at the UCLA Medical Center, where he worked with neurosurgeon Antonio De Salles to develop a linear accelerator based stereotactic radiosurgery program. In 1994 he accepted the position of Director of Medical Physics at the new San Diego Gamma Knife Center at Scripps Memorial Hospital in La Jolla. Steven has been Director of Medical Physics at the Center since 1994 and supervised acceptance of the Model U Gamma Knife in 1994 and the Gamma Knife Model 4C in 2005. He has served as President, Newsletter Editor and Education Chairman of the Southern California Chapter of the AAPM since 2000. Steven has also taught courses at California State Long Beach and at San Diego State.

Steven lives in San Diego with his wife and son, and mentions that UCSD , with Varian Medical Equipment , is building a $150 million proton therapy center, a mile down the road from his Gamma Knife Center (http://www.sdgkc.com).

Physics-Astronomy alumni: Please stay in touch and let us know about your successes. We would love to feature them here!

Jack Baldwin Wins Distinguished Faculty Award



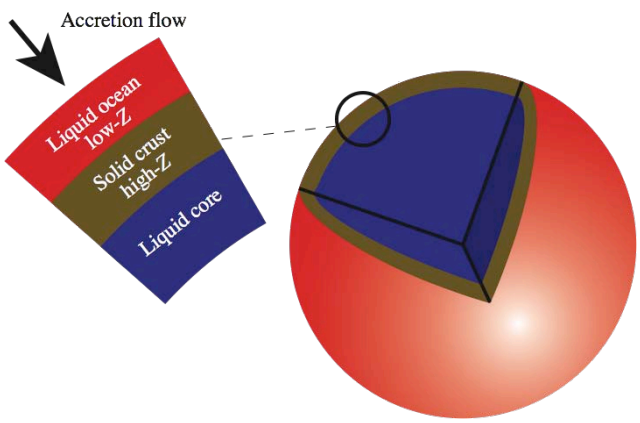
Jack Baldwin's career in astronomy research spans three decades of groundbreaking discovery. Every astronomer knows about the "Baldwin Effect," which relates the brightness of quasars to the widths of their emission lines, and the "BPT" (Baldwin-Phillips-Terlevich) diagrams, which provide information on galaxy emissions. His publications on these and other fundamental discoveries have earned him a place as a Web of Science top-cited scholar, an honor that only 22 other MSU faculty members share. Baldwin is co-director for the Center for the Study of Cosmic Evolution, which brings together astronomers, nuclear physicists, and particle physicists to study the evolution of the cosmos, to which the SOAR telescope in Chile, which MSU jointly operates and owns, is key. Baldwin was essential to the successful completion of this telescope. Under his leadership, the department's astronomy group has developed an evening lecture series for lay audiences at Abrams Planetarium.

Angelo Signoracci Wins NNSA Stewardship Science Graduate Fellowship

The Department of Energy National Nuclear Security Agency awarded a four-year fellowship to second-year graduate student Angelo Signoracci. Angelo is working towards his Ph.D. with Alex Brown in nuclear theory. The prestigious award will include extended yearly trips to either Lawrence Livermore, Sandia or Los Alamos National Laboratories.

New Astronomy and Astrophysics Research Results

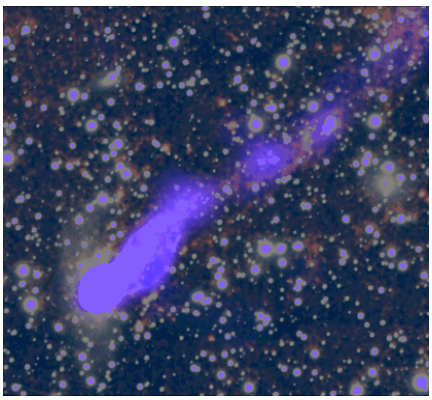
Hot Neutron Star Crusts—Neutron stars are the densest objects in nature and have long fascinated scientists. An MSU team led by Professors Edward Brown and Hendrik Schatz is starting to uncover what happens deep inside the star. As shown at right, neutron stars have a thin "crust," composed of electrons and ions. Many neutron stars accrete hydrogen and helium from a sun-like companion star. As the hydrogen and helium accumulates, it fuses to heavier elements in an explosion known as a *type I X-ray burst*. Recently, some neutron stars were discovered to produce *superbursts*—explosions that are about 1000 times more energetic than a type I X-ray burst and recur on a roughly yearly timescale. These superbursts are thought to be powered by the unstable fusion of ^{12}C and have presented a puzzle to researchers: how does the neutron star crust become hot enough for the ^{12}C fusion to begin?



Schematic of a neutron star. *Most of the star (the blue portion) is at supernuclear density. The outermost layers of the crust (shown in brown and red) are composed of nuclei and electrons. Accretion of hydrogen and helium from a companion star gradually replaces the crust; the compression induces reactions that heat the outer layers of the neutron star.*

The MSU astrophysicists together with JINA (Joint Institute for Nuclear Astrophysics) colleagues at Los Alamos National Laboratory and the University of Mainz, Germany, have now computed the heating in the crust using a realistic model of the relevant nuclear reactions. Over millions of years of accretion, the "ashes" of X-ray bursts and superbursts gradually replace the crust of the neutron star. As this mixture is compressed to greater and greater densities, nuclear reactions release heat. Interestingly, the amount of heat deposited in the crust by these reactions is much larger (a factor of 5–10) than previously thought. This extra heating may partially explain how some neutron stars are able to produce superbursts on a yearly timescale: a hot crust helps to ignite the superburst! A paper on this has been published in *the Astrophysical Journal* (preprint available at http://arxiv.org/abs/astro-ph/0609828). The results from this paper have led to an unexpected twist: Prof. C. Horowitz (Indiana) has used the composition computed by the MSU team to compute the "freezing" transition, in which the ions go from a liquid state to a solid (red to brown in the figure). At high densities, the electrostatic potential between ions is much larger than the thermal energy, and the ions arrange themselves in a lattice. Surprisingly, the material was found to separate, with lighter nuclei (oxygen in this case) diffusing into the liquid portion, and heavier nuclei diffusing into the crystalline portion. This separation may increase the concentration of ^{12}C in the neutron star ocean and help to explain the superburst ignition as well. A paper by Horowitz, Berry, and Brown has been published in *Physical Review E* (preprint available at http://arxiv.org/abs/astro-ph/0703062).

Star Formation in Intergalactic Space— A team of MSU astronomers led by Research Associate Ming Sun has discovered bursts of star formation occurring in a long tail of hot gas that is being stripped out of a galaxy diving through a giant galaxy cluster. Sun and MSU astronomers Megan Donahue and Mark Voit combined visible-light data taken with the SOAR Telescope together with an x-ray image made with the Chandra Space Telescope. In the figure, a SOAR image of the light of old stars is shown in white, with the galaxy ESO 137-001 standing out at the lower left. The superimposed blue image shows hot (millions of degrees) gas detected at x-ray wavelengths by Chandra. This gas has been pulled out of the galaxy as a result of friction from the intergalactic gas that permeates the huge galaxy cluster Abell 3627, of which ESO 137-001 is a member. The process is known as ram-pressure stripping.



Bursts of star formation (red dots) in the tail of million degree gas (shown in blue) that is being stripped out of the galaxy ESO 137-001 (the white blob at lower left). SOAR & Chandra Space Telescope images.

The exciting new result, from a second SOAR image at another wavelength, is the collection of small red dots scattered in and around the tail of hot gas. These mark the locations of strong Hα emission lines, which can only be coming from cool hydrogen gas that is ionized by very hot stars. Since these hot stars have very short lifetimes (mere millions of years), they would not have survived long enough to have moved to their current location if they had formed in the parent galaxy and then somehow been peeled away. Rather, they must have formed out in the intergalactic space. This is the first direct evidence of such intergalactic star formation. This is an example of the synergy between visible and infrared observations made with the SOAR telescope and observations made with the giant space observatories now in orbit. The result will appear in the December 15 issue of the Astrophysical Journal.

The Two Faces of the Milky Way's Stellar Halo— It has long been known that the disk of stars that we see as the Milky Way is imbedded in a much more tenuous, roughly spherical distribution of very old stars known as the "stellar halo". A team of MSU astronomers led by visiting graduate student Daniela Carollo and also including professor Tim Beers, graduate students Young Sun Lee and Brian Marstellar, along with astronomers at other institutions in the U.S., Italy and Australia have found that the stellar halo is a composite of two components with quite different sets of orbital motions and chemical abundances. This result starts to fill in the details of how this outer region of our Milky Way galaxy was formed through a succession of mergers with smaller subsystems. It is based on measurements of hundreds of faint stars taken as part of the SEGUE extension of the Sloan Digital Sky Survey. MSU participates in this project through our membership in the Joint Institute for Nuclear Astrophysics. The results will appear in the journal Nature

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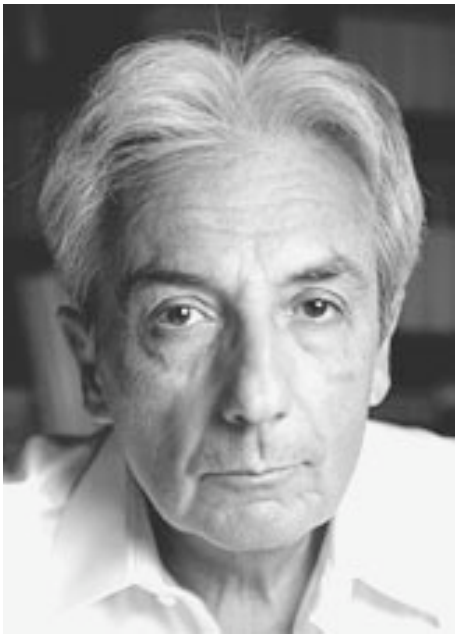
2007 Nobel Prize Awarded to MSU Physics-Astronomy Adjunct Professor

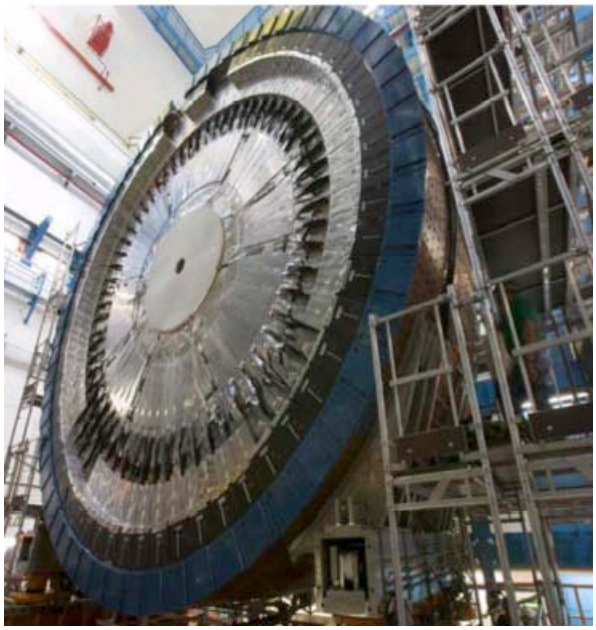


Albert Fert, Professor at the Université Paris-Sud and also Adjunct Professor at the Department of Physics and Astronomy at Michigan State University (MSU), and Peter Grünberg, Scientist at the Forschungszentrum Jülich, are sharing the 2007 Nobel Prize in Physics "for the discovery of Giant Magnetoresistance". MSU-PA has very strong collaborative ties with the group of Prof. Fert, which began when Prof. Peter Schroeder spent a sabbatical leave in Paris in 1990, a couple of years after the discovery of Giant Magnetoresistance in 1988. Prior to this visit, the MSU group of Professors Jack Bass, Bill Pratt, and Peter Schroeder had set up a state-of-the-art system for producing excellent multilayer samples. Starting with Peter's visit, part of the time on this system was used to make new samples for collaborative research with Prof. Fert. Included in this collaboration were studies of a new measuring geometry, current-perpendicular to the plane of the multilayers, where measurements were pioneered by the MSU group. Prof. Fert and a collaborator T. Valet provided the model to analyze the data. This collaboration involved visits by both MSU faculty and Prof. Fert to each other's laboratories, and visits by several French students and post docs to MSU to make samples and carry out measurements. The result has been a very dynamic collaboration. Our heartfelt congratulations go to the newly minted Nobel laureates Prof. Albert Fert and to Dr. Grünberg, but also to our faculty colleagues Jack Bass, Bill Pratt, and Peter Schroeder for making their own important contributions to this important field of fundamental physics research, which constitutes the scientific basis for all modern Gigabyte PC hard drives. More information can be found at (http://nobelprize.org).

MBTS installed on ATLAS

Our high energy and particle physics group is shifting more and more of its effort from Fermilab to the European CERN laboratory near Geneva, Switzerland, where they are participating in the construction of the ATLAS detector, one of the three large detectors for the Large Hadron Collider (LHC), which is scheduled to become operational in 2008, and which carries the promise to revolutionize our understanding of particle physics.

Shown is one of the endcaps of the ATLAS detector at the LHC at CERN. MSU instrumented 32 ten-ton modules comprising the hadron calorimeter for this endcap as well as constructing the cryostat and Minimum Bias Trigger Scintillators (MBTS) indicated on the picture. The cryostat scintillation counters help to recover the energy resolution for electrons, photons and jets in a region where these particles have to pass through multiple cryostat walls. The MBTS scintillation counters sit at a very forward angle with respect to the colliding beams and will be used in the early running of ATLAS to determine if an interaction has occured in a particular crossing. Because of their location the counters will quickly die once the LHC starts running at design luminosity, but by then they will have performed their function.



MBTS installed on ATLAS endcap.

Beers and Bauer named University Distinguished Professor

In the history of Michigan State University a total of 104 faculty members have received the honorary designation of University Distinguished Professor. This year our department was fortunate to have two of our faculty members, Prof. Timothy C. Beers and Professor Wolfgang Bauer, being named to this rank. They are joining our faculty members Walter Benenson, C. Konrad Gelbke, Bradley Sherrill, and Gary D. Westfall as holders of this title, in addition to emeritus professors Sam Austin, Henry Blosser, Edwin Kashy, and Michael Thorpe.

Timothy C. Beers' scientific vision and pursuit of excellence in research, education and outreach has made him the worldwide leader in the search for the oldest and most chemically primitive stars in the galaxy and the universe. His efforts have led to the identification of more than 10,000 stars with metal abundances less than one percent of the solar value. These stars are providing astronomers and physicists with their best records of the chemical composition of the universe from the time of their formation some 13.5 billion years ago and of the origin and evolution of the chemical elements. Most recently, Beers's group at MSU have developed (with the support of JINA, a $10 million Physics Frontier Center in which Beers is a co-PI) the software pipeline used by the Sloan Digital Sky Survey in order to assign estimates of temperatures, surface gravities, and metal abundances for over 200,000 stars (and counting) in the Milky Way. These observations led to the recent discovery of the dichotomy of the halo of the Milky Way, published in Nature (Dec. 13, 2007), which paves the way for future investigations of the first generations of stars found preferentially in the outer halo.

Wolfgang Bauer is best-known for his work in theoretical nuclear physics, in particular his contribution to the transport theory for heavy ion collisions, and the exploration of models for the phase transition of nuclear matter between the liquid-like ground state and a gas of nuclear fragments and hadrons. This work was also recognized in his receiving the Fellow designation from the American Physical Society, and the Research Prize from the German Alexander v. Humboldt Foundation. In the last few years he has used his methodology to develop new theoretical models for the physics of supernova explosions, as well as the exploration of the fragmentation of molecules, such as buckyballs. Bauer's work also has practical spin-offs. One of them, his work on pattern recognition in biopsies for cancer detection, was a byproduct of his work on chaos, non-linear dynamics, and self-organized criticality. This cancer detection research recently resulted in a patent for Bauer, his collaborator pathology professor Charles Mackenzie, and Michigan State University. In addition, Bauer is also very involved in research on teaching in physics. He is one of the fathers of the course management and automated homework grading system LON-CAPA, which is now in use in over 60 universities and 100 high schools around the country and in several other countries in Europe, Asia, and the Americas.

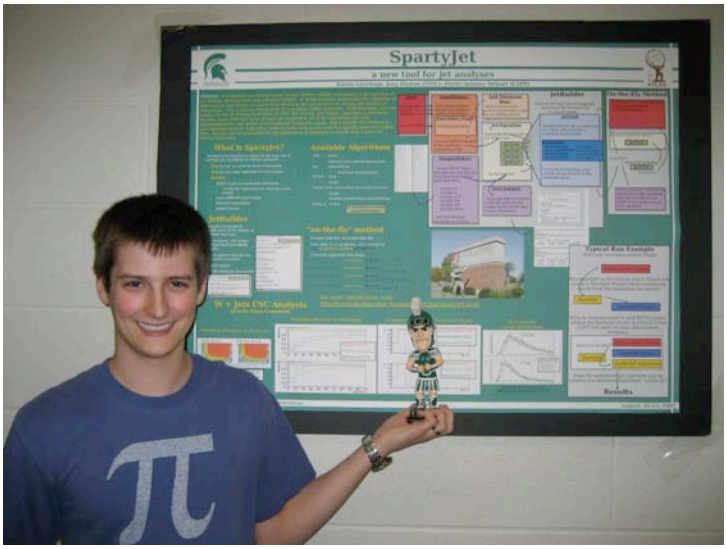
For more information and media clips on University Distinguished Professors see http://www.wmsu.org/udp/

Team REU Wins Annual Battle

The annual game featured stifling defense as two evenly matched teams battled for the right to be called "Physics and Astronomy Champions". Despite the absence of some usual stalwarts such as Wolfgang Bauer and Gary Westfall, the faculty put together a solid team, which included Mark Olson and some graduate student ringers. The REU team consisted of seven youthful student-athletes, with several of their colleagues in attendance to cheer them on.

The teams split the first two grueling games, featuring a lot of rebounds and half-court play. In the third and deciding game, the Faculty scrapped their way to an early lead of five points. However, the REU stormed back with several long-range field goals by Brandon Richard. Key drives to the hoop by John Claybrook clinched the victory. (Game 1: 15-14 REU, Game 2: 13-15 Fac, Game 3: 15-12 REU)

Sparty at Fermilab



Even University of Michigan alumni have to use SpartyJet! SpartyJet is a flexible software framework used for the reconstruction of jets of high transverse momentum particles produced in high energy collisions at hadron-hadron colliders, such as the Tevatron at Fermilab and the LHC at CERN. Virtually all physics results at the Tevatron and LHC depend upon the fast, accurate reconstruction of these jets. SpartyJet was written by Kurtis Geerlings, a senior physics major at MSU, along with Professor Joey Huston and Pierre-Antoine Delsart, a researcher at LAPP in Annecy, France. Kurtis and Joey knew that the program would be used worldwide and so wanted to name it in such a way as to publicize MSU. And who is more associated with MSU than Sparty?

Kurtis has presented SpartyJet at physics meetings both at Fermilab and at CERN. He, and SpartyJet, have been written up in Fermilab Today and in Symmetry magazine, a high energy/nuclear physics publication with a worldwide circulation. He, Joey (and Sparty) have been featured in a commercial on undergraduate research to be shown at halftimes of MSU basketball games.

One of the prime users of SpartyJet is Tom Schwarz, now a postdoc at University of California-Davis, but formerly a graduate student at a university to the southeast of MSU. Tom enjoys the ease of jet reconstruction that SpartyJet allows, but feels that he "dies a little inside" every time he is forced to run it. Tom would be mortified if he knew he was being mentioned in an article in the MSU PA newsletter.

There is more excellent news to report: In May of this year Kurtis won a prestigious Barry M. Goldwater Scholarship, only the 23rd in the entire history of MSU.

Machine Shop Takes PA Parties to New Level

The Department is very fortunate to have one of the finest machine shops in Mid-Michigan. Under the leadership of Tom Palazzolo the members of the shop have justly earned the reputation that they can build just about anything. While the machine shop has as its primary mission to support the research and teaching activities in the Department of Physics and Astronomy, it also accepts a variety of projects from other departments, time permitting. They are known to always deliver work of the highest quality and precision, on time and on budget. Over the years Tom and his colleagues have wisely managed their budgets and invested in state-of-the-art machinery, which will ensure that they can deliver products of the highest quality now and into the future.

Creating masterpieces of engineering and manufacturing in support of the departments research and teaching missions is part of their daily work, but recently the shop crew has managed to outdo themselves: In their spare time they have created the new department grill, a stunning handcrafted miracle of stainless steel with five burners. In the fall they showed off the grill's capability during the inaugural staff BBQ luncheon, the first of many to follow. By the way, this new grill will also enable the department to host our alumni during football Saturdays. (Please contact the chair, if you are interested in participating …)

The Machine Shop crew, from left: James Muns, Rob Bennett, Tom Hudson, and Tom Palazzolo.

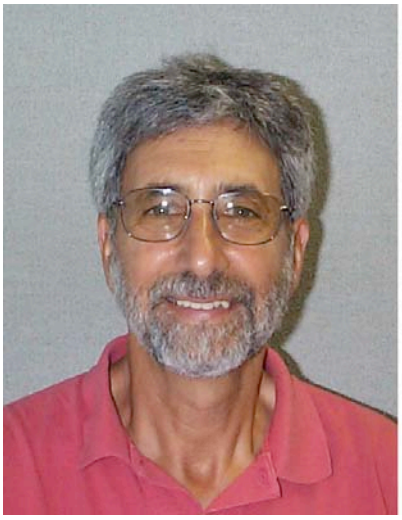
Barry Tigner and Tom Palazzolo show off the new grill during the inaugural staff BBQ luncheon. (Note the aprons with the department logo!)

Victoria Moeller Named 2007 Gates Cambridge Scholar

As a freshman MSU undergrad Victoria Moeller began her research as a professorial assistant at the NSCL, before working with the high-energy group both at Fermilab and at CERN. She graduated in May with both a physics degree from the College of Natural Science and a degree in political science from the College of Social Science.

Victoria is now pursuing a Ph.D. in high-energy physics from Cambridge, while simultaneously working towards a degree in public policy, as she plans to ultimately serve society by working in science policy. "This scholarship is a wonderful recognition for Victoria, her faculty mentors and the university in general," said Ronald Fisher, dean of the Honors College. "As a result of her exceptional talents as both a physicist and policy analyst, Victoria is unusually well situated not only to conduct research, but also to advise governments about increasingly complex issues involving public support for and regulation of scientific research."

Two Favorite Sons Retire



Walter Benenson (left) and Michael Harrison (right) will retire at the end of the current academic year. Together, they have given over 90 year of service to MSU and helped to elevate our department to the world-class status that it enjoys today.

Walter received his Bachelor's degree from Yale in 1957 and Ph.D. from the University of Wisconsin in 1961. He joined the MSU faculty in 1963 as one of the first hires in experimental nuclear physics. He was one of the key scientists who were responsible for the MSU cyclotron lab's rise to international prominence. In the years 1980 to 1982 and again in 1990 to 1995 he also assumed leadership in the cyclotron lab as its Associate Director for Nuclear Science. During the last decade of his career he has dedicated his scholarly efforts to research on teaching and learning, writing of textbooks, and helping to shape the curriculum of Lyman Briggs College. Professor Benenson's many honors include the Research Prize from the German A.v.Humboldt Foundation in 1989, the MSU Distinguished Faculty Award in 1993, the 1993 MSU Golden Key Research Award, the Eminent Scientist of Japan in 1996, the 1999 Mortar Board award, and the 2000 Osgood Teaching Award. In 1997 he was named University Distinguished Professor.

Michael received his Bachelor's degree from Harvard in 1954 and his Ph.D. from the University of Chicago in 1960. After a post-doctoral research appointment at the University of Birmingham in England he joined our faculty in 1961 as an assistant professor in solid-state theory. When the Lyman Briggs College was formed in 1967, Michael played in integral role in forming the new college's curriculum. Perhaps his biggest influence on the future of physics at MSU and the institution as a whole came in 1967, when he was the principal author (together with the president, provost, and treasurer of MSU) of "A University Science Development Proposal" for physics, mathematics, and chemistry. This proposal was funded by the National Science Foundation at $6 million and provided the initial foundation for the strong growth that the sciences enjoyed at MSU during the 1970s. Michael then moved on to become the Dean of Lyman Briggs College, a position he held until 1981, when he returned to the regular faculty in our department. Professor Harrison's honors include a Fulbright Fellowship at the University of Leiden, Netherlands, in 1954/5, and an NSF pre-doctoral fellowship from 1957 to 1959.

Stephanie Holland

In November we were saddened to learn of the death of Stephanie Holland, secretary from 1986 and graduate secretary in the department soon after that until 1997. Graduate students who were in the program during those years interacted with Stephanie almost on a weekly basis whether it was for formalities such as obtaining Permits to Register, Appointment Forms, etc., or for all kinds of assistance that was not in Stephanie's official job description. She took her responsibilities very seriously while at the same time she looked after the welfare of "her" graduate students in a most motherly way. Her friendly encouragement and enthusiasm was remembered and much appreciated as attested to by the comments of many former students.

MICHIGAN STATE UNIVERSITY

Department of Physics and Astronomy
East Lansing, MI 48824-2320

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DEPARTMENTAL AWARD WINNERS: From left to right: Baradhwaj Panayancheri-Coleppa (Thomas Kaplan Award, best graduate seminar), Kurtis Geerlings (Verwest Undergraduate Award), Lisa Lapidus (Thomas H. Osgood Teaching Award), Michael Schecter (Bruce VerWest Award for outstanding junior), Erin Nolan (Thomas H. Osgood Award for outstanding senior), Jason Smolinski (Best Teaching Assistant Award), Remco Zegers (Outreach Award), Wayne Repko (Thomas H. Osgood Faculty Excellence in Teaching), Justin Pilot (Thomas H. Osgood Award for outstanding senior), Jim Shanks (Carl Foiles Award for outstanding research and academics by undergraduate) and Aous Abdo (Sherwood K. Haynes Outstanding Graduate Student Award). Not Pictured: Vladimir Zelevinsky (Gaduate Teaching Award) and Dan Edmunds (Distinguished Staff Award) . Additionally, Lawrence W. Hantel Fellowships for undergraduate research were awarded to Michele Berry, Kurtis Geerlings, Michael Saelim, Michael Schecter and Richard Worhatch.