University at Buffalo The State University of New York | REACHING OTHERS

Interactions

The Newsletter of the UB Department of Physics

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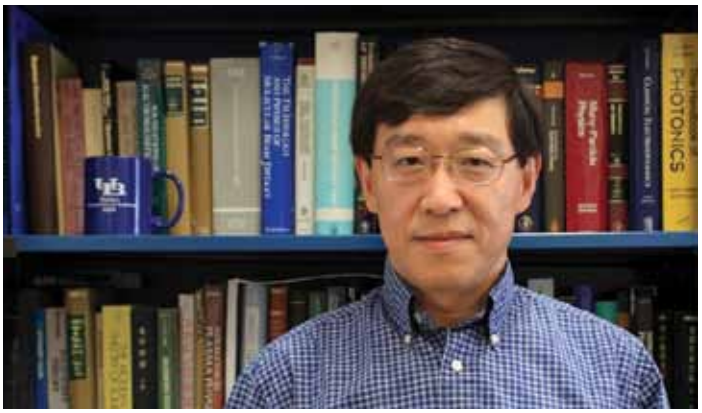


Dear alumni and friends,

As I mentioned in the previous issue, the new President and the Dean of CAS are now in office. The SUNY2020 legislation was passed and signed into law, which allows UB for the first time to plan on a five-year horizon. The new directions and initiatives that are being implemented by the new administration are therefore more tangible than symbolic. This means opportunities for the Department. It is encouraging to see that the President's plan for the University overlaps with some of the main concerns and aspirations of the Department.

As many of you know, the quality of education and research in the Department has seen marked improvement in recent years. This has a lot to do with the infusion of new and excellent faculty members. The pause of this process in the last couple years due to the economic down turn appears to be ending and we are on the right track again. Towards this end, the Department is currently searching to hire a tenure track high energy experimentalist.

I am very grateful to Professor Xuedong Hu for agreeing to serve as the Graduate Director, starting this academic year, succeeding Professor Athos Petrou, who served in this capacity for 16 years. The responsibilities entailed in this position have direct impact in several key areas in the Department, ranging from undergraduate teaching through TA appointments to the vitality of graduate research. Professor Petrou provided great leadership over the years and established well formulated procedures for all the graduate studies. He continues to be a source of information and advice for our graduate program.

Our majors, headed by Alec Cheney, were instrumental in starting a new chapter of the Sigma Pi Sigma, the Physics Honors Society, at UB. They collected signatures and petitioned the Society for a UB chapter. After successfully receiving approval, they also made arrangements for the installation. The President of the Sigma PI Sigma, Dr. Diane Jacobs, presided the chapter installation ceremony on November 4. Five students, Alec Cheney, Matthew Gorfien, Connor Gorman, Chun Kwan and Katherine Spoth, were inducted during the ceremony. It was very rewarding to see our majors take charge, accomplish their goals and receive recognition for their outstanding achievements.

This year's Homecoming was made special by the return of our distinguished alumnus, Dr. Thomas Bogdan (featured in *Alumni in Focus*), to give an exciting public lecture on space weather. He has been the Director of the National Space Weather Prediction Center, and was recently named the President of the University Corporation for Atmospheric Research, starting January 9, 2012.

Two workshops took place this semester. The first one, *Uli Baur Memorial Symposium*, organized by Professor Doreen Wackeroth and the high energy physics and cosmology group, was held at UB on Sept. 24, 2011. It had a list of distinguished scientists attending from around the world. The second one was organized by Professor Xuedong Hu, titled *Buffalo Workshop on Quantum Computing*, held on September 17 – 18. It attracted researchers from institutions in North America, Asia and Europe.

As always, keep in touch.

Best regards,

Hong Luo, Chair
Professor of Physics

Banner: The Sabres may not have won the NHL Championship in 2011, but an important member of the UB community did! UB Council Chairman, Jeremy M. Jacobs is also the owner of the Stanley Cup winning Boston Bruins and generously shared the Cup with us in June 2011. Here, we see our own Kevin Cullinan (left) and Tom Gruenauer (third from left) along with Tom's daughter Shannon and son Brian with the Stanley Cup.

McCombe and Gasparini – Achievements as Administrators

By Drs. Hong Luo and S. Ganapathy

Professor Bruce McCombe stepped down as the Dean of CAS in the summer of 2011. Just when we thought Bruce was staying in the Department for good and it was a good time to look back at what he did while being away from the Department, since Jan. 2005, he was asked again to be the interim Provost, starting Jan. 3, 2012. This in itself gives an idea about what he accomplished as the Dean of the Graduate School (Jan. 2005 – June 2006) and as interim Dean and then Dean of CAS (July 2006—June 2011). The actual list of his accomplishments is quite long, as one would expect, and we will just list a few that directly impacted us.

The one that was the closest to our heart was the increase in graduate stipend that stayed the same for years. As soon as Bruce became the Dean of Graduate School, he negotiated and implemented a $2000 increase to the base stipend starting the 05-06 academic year, followed by another $1500 increase, which brought us to a competitive level with peer institutions. As an effort to ensure quality of our education, Bruce created a process and procedures for and implemented university-wide comprehensive program reviews for both undergraduate and graduate programs. Bruce recognized the important contributions of postdoctoral scholars, and created the Office of Postdoctoral Scholars, which has provided guidance, services and career development to this group of scholars.

After becoming the Interim Dean and Dean of CAS, Bruce contributed to the growth of CAS, bringing the total CAS faculty count to 487 as of Fall 2008.

Photo: Douglas Levere

One of the most important things that we noticed at the department level was his leadership during the worst financial crisis in years, in terms of both minimizing cuts to departmental operating budgets and in maintaining the strength of CAS, with retention of senior faculty members and protecting untenured junior faculty members. Bruce also visited all departments, so that the faculty could be informed of the budget situation and approaches he was implementing. This is especially heart felt in light of the difficulties experienced by colleagues in other universities, especially public universities, including other SUNY campuses.

Bruce initiated major increase in summer programs and negotiated income sharing with the provost. This resulted in $1M/year of additional state dollars for CAS by fall 2011, part of it will be returned to the departments responsible for the income.

For amusement, Bruce calculated the time, the way he often does for other things, that he spent in meetings. The result came to 3 years of working time in meeting during the 5 years in the Dean's Office! While Bruce believes that he did "what was necessary", it is clear that many greatly appreciated what he deemed as necessary.

Banner: Bruce McCombe and Renee Bush attending one of the UB events.
Photo: Nancy J. Parisi

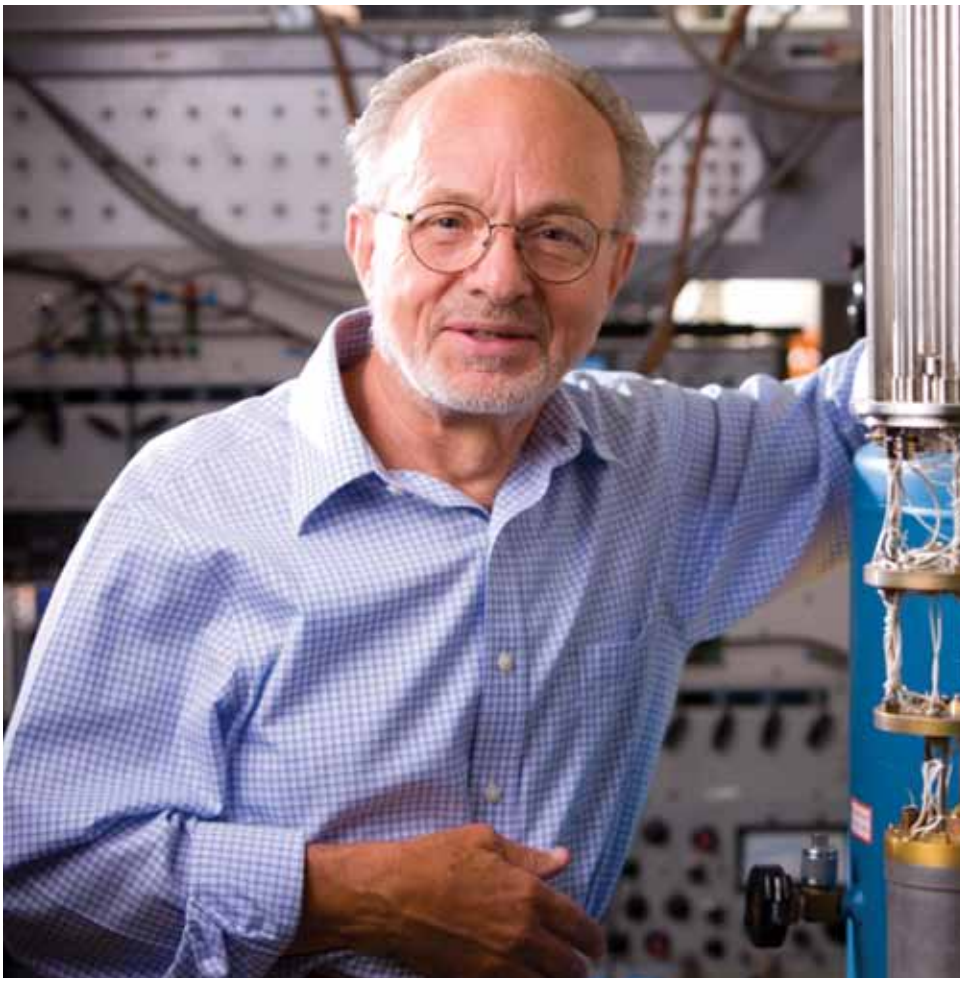
Faculty in Focus

CONTINUED

Professor Frank Gasparini has already spent a year doing his regular duties as a faculty member after stepping down as the Chair since Fall 2010 after six years. Looking back, one can't help but notice that his tenure as the Chair covers the period of arguably the biggest change in the Department. Here is a list of things that he did since he started his chairmanship in 2004. He negotiated an increase in TA support which amounted to a $500 yearly raise for each TA in the Department. This, combined with what Bruce did as the Dean, made our stipend much more attractive than before. He then negotiated a permanent addition to the operating budget of the Department. He also points out that it was taken back recently because of the budget cuts. But if we didn't have this increase, something else would have been cut in its place. Frank also set aside a support fund from the departmental budget for graduate students attending meetings to present their research ($200 per meeting per student).

The faculty count increased from 21 to 32, then coming back down to 28. This was achieved through the hiring of 14 new faculty members over a period of 6 years. Retirements and people leaving for other institutions brought this number below 30. With the financial situation at UB improving, hopefully we will be able to reach and surpass the number in the near future.

Photo: Douglas Levere



Among these new hires four assistant professors have received NSF CAREER awards. These hires allowed us to establish a new group in high energy experimental research, and expand the biophysics group. Increase of the faculty size also led to an increase in the number of graduate students from about 80 to over 90. The teaching load was also changed from 3 courses per year to 2 courses per year. This was in keeping with peer institutions and to improve our research posture relative to other institutions. What is not seen in these numbers is a corresponding change of the level of expectation, as can be seen from a list of benchmarks for research productivity. For citations in particular, the Department received 3000 citations during 2005. This was 5700 in 2010. This is a good gauge of the quality of the faculty who were hired. Also a goal of 35 for overall faculty size was set which would be in keeping with UB's size and a broader range of faculty research fields.

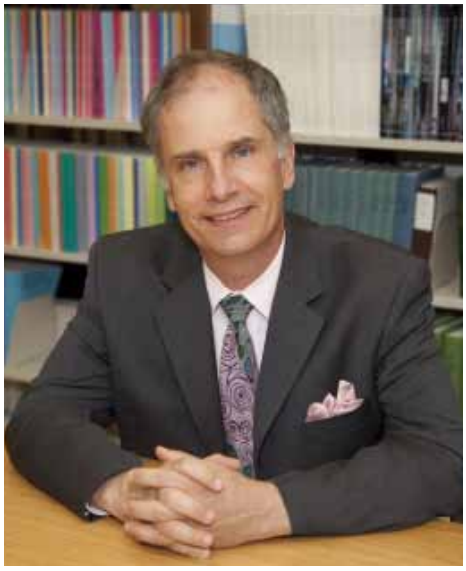
Frank was actively involved in development efforts. During his period as chair, two new endowments were started: Excellence Endowment, and with the leadership of Y. C. Lee the Ta You Wu Endowment. Each of these is now funded at more than $40,000. In addition we received an endowment to fund the Rustgi Professorship during this time. On a lighter note, Frank instituted a weekly social hour which continues to this day, and remains particularly popular with students and faculty members alike.

We are certainly at a much better place because of what Bruce and Frank did over the years. From what they have done since stepping down as Dean and the Chair, there is no doubt that they will continue to be sources of advice and serve the Department well in the future.

Banner: Frank and Lucille Gasparini enjoying a leisurely ride on a tandem tour of New Zealand's South island.
Photo: Frank M. Gasparini

Thomas J. Bogdan, BS 1979

By Dr. Hong Luo



Dr. Thomas Bogdan graduated Summa Cum Laude with a B.S. in mathematics/physics from UB in 1979. Tom earned his Ph.D. in Physics at the University of Chicago in 1984, specializing in Plasma Astrophysics. He was the recipient of the Gregor Wentzel and Valentine Telegdi Prizes.

Tom held important research and management positions at the National Center for Atmospheric Research (NCAR). He joined NCAR in 1983 as a postdoc, was promoted to Senior Scientist in 1993, served as the Head of the Solar Magnetism and Variability Section, and the Acting Director of Advanced Study Program. He is the author of over 100 papers in solar-terrestrial research.

Tom became the Director of the Space Weather Prediction Center at the National Oceanic and Atmospheric Administration (NOAA), located in Boulder, Colorado, in May of 2006. In this capacity he has been the principal representative for civil space weather operations in the US. He works closely with the World Meteorological Organization as the U.S. point of contact for space weather issues.

Tom is a fellow of the American Meteorological Society and serves on its Council of the Members. He has chaired and served on numerous National Science Foundation, NASA, and National Research Council committees and panels that provide advice to federal agencies and policymakers. He is currently a member of the Dean's Advisory Council for the College of Arts and Sciences at UB.

It was recently announced that Tom would assume the presidency of the University Corporation for Atmospheric Research UCAR) on January 9, 2012. UCAR is a consortium of over 70 universities offering Ph.D.s in the atmospheric and related sciences, which also manages NCAR. While Tom modestly called this a "pleasant surprise", UCAR's Board of Trustees cited Tom's great accomplishments in the announcement and believed that he "will translate the leadership, management, communication, and advocacy skills he has demonstrated at NOAA to UCAR…"

Tom's passion for geophysics and solar-terrestrial research is evident beyond his direct involvement in research and management. He has been a great advocate for bringing science and technology to the community at large. He has given many informative and inspiring public lectures, including one at UB during the Homecoming week in September, 2011. One of his less known, but very telling, appointments is that he served as the Associate Chair of the History of Geophysics Committee of the American Geophysical Union, while he was busy making history in this increasingly important field.

Professor Charles M. Fogel

1914 – 2011

Charles M. Fogel died on May 20, 2011 in Canterbury Woods, Amherst. He was 97. Charles is survived by his wife Bernice Fogel and his children Paul, Lorin, and Howard Fogel. A memorial service was held on June 7th 2011 in the Drama Theater Center for the Arts, UB North Campus. A reception followed in the CFA atrium.

Dr. Fogel received his bachelor degree in 1935 and his Masters in 1938 through the University at Buffalo Physics Department. He went on to graduate studies at Columbia and Ohio State University. A full text of his life and career can be found at

http://www.buffalo.edu/ubreporter/2011_05_26/colleagues.

Over the years Charles and his wife Bernice gave generously to the Physics Resource Fund. Donations were made to this fund in his honor.

Banner: After obtaining a PhD in theoretical physics (advisor Dr. Jong Han) in 2009, Dr. Ryan Heary joined the US Air Force and earned his pilot's wings in June 2011. Here, Ryan is pictured with his wife Vianka and parents Norman and Lori at his class's winging party. Ryan is currently in an advanced training program for the C-130J Super Hercules (a newer version of the aircraft based in Niagara Falls) which performs tactical airlift missions.

Events

Uli Baur Memorial Symposium

By Dr. Doreen Wackeroth

Prof. Roberto Peccei (UCLA, left) and Prof. Harald Fritzsch (Ludwig Maximilians University Munich, right) at the Symposium dinner.
Photo: Carl Albright

On September 24th, 2011, friends, colleagues and former students of Ulrich Baur attended the Uli Baur Memorial Symposium, to celebrate Uli's life and honor his scientific contributions in Particle Physics. The participants represented Uli's entire scientific life, starting from being a graduate student of Prof. Harald Fritzsch at the Ludwig Maximilians University at Munich, to his time as a faculty member at the UB Physics Department. Among the eight speakers were Professors Roberto Peccei and Harald Fritzsch who shared with us their memories of Uli as a graduate student and young postdoc at the MPI Munich, and Professor Lynne H. Orr, who met Uli when they both were SSC fellows in 1991. Prof. Orr emphasized Uli's important role in creating the LHC Theory Initiative, which supports graduate students and postdocs conducting research in theoretical high-energy physics. Friends and colleagues, Dr. Sally Dawson, Profs. Tilman Plehn, Henry Frisch, and Sekhar Chivukula, reminded us of Uli's significant contributions to his research field, and his unique ability to bridge the gap between theory and experiment. The 50 Symposium participants also included Drs. Carl Albright, Bill Bardeen, and Andreas Kronfeld, who are members of the Fermilab Theory group where Uli was a frequent visitor. Last but not least, Dr. Michael Stamatikos, one of Uli's graduate students, who now has a position with NASA and OSU-CCAPP, presented his work on Gamma-Ray Bursts. A complete list of participants and the slides of the talks can be found on the Symposium webpage, www.physics.buffalo.edu/UliBaurSymposium.

The Symposium was preceded by a public lecture "Escape from Leipzig," by Prof. Harald Fritzsch, the PhD advisor of Uli and a world-renowned physicist. In his lecture, he portrayed an authentic picture of the East Germany regime and the events of late 1960s when he was a student at the Leipzig University, which eventually let to his daredevil escape across the Black Sea.

As reported in the last issue of Interactions, Prof. Ulrich J. Baur died in a tragic snorkeling accident on November 25th, 2010, while on vacation on the U.S. Virgin Islands with his wife Yvonne. The Symposium dinner represented a wonderful opportunity for Uli's friends to share their memories of Uli with Yvonne, who attended all Symposium activities. Apart from the Symposium, public lecture and dinner, these activities also included the unveiling of a new exhibit at the welcome reception, which displays Uli's famous stack of research papers. It is quite fitting that we honor Uli's memory in this way, since he has been one of the creators of the permanent Physics and Art Exhibition in Fronczak Hall.

Quantum Computing

By Dr. Xuedong Hu

On Sept 16 and 17 Professor X. Hu organized a workshop on quantum computing at UB, with attendants mainly coming from University at Buffalo, Rochester, Syracuse, McGill, Waterloo, Toronto and Ottawa.

The aim of the workshop was to report the latest progresses in the field of quantum computing, and to foster exchanges and collaborations between experimental and theory groups that are close geographically (around Lake Ontario) and scientifically (all are in the general field of quantum computing).

The Science & Art Cabaret 4.0

By Dr. Doreen Wackeroth

SCIENCE FICTION/SCIENCE FACT took place on March 30th, 2011, in the Ninth Ward at Babeville. More information about the event can be found at www.hallwalls.org/visual/5022.html.

Will Kinney, Associate Professor of Physics, and Gary Nickard, Clinical Associate Professor of Visual Studies, are the organizers of the Science & Art Cabaret series at Hallwalls, who bring together artists, musicians and UB researchers to offer a unique view of current topics in science. These events are admission free and invite the public to participate in making sometimes quite unexpected connections between arts and science. At the Science & Art Cabaret 4.0 Dr. Kinney gave a presentation on why space travel is harder than one may think, and travel to the stars even requires revision of fundamental laws of nature.

Banner: From left to right: Dr. Bill Kilgore (BNL), Dr. Bill Bardeen (Fermilab) and Dr. Sally Dawson (BNL) at the welcome reception for the participants of the Uli Baur Memorial Symposium.
Above: From left to right: Yvonne Baur, Cindy Albright and Prof. Carl Albright (Fermilab) at the Symposium dinner.
Photos: Carl Albright

New Chapter of Sigma Pi Sigma at UB

By Alec Cheney

Dr. Diane Jacobs, Professor of Physics and Astronomy at Eastern Michigan University and President of Sigma Pi Sigma, visited the Physics Department on November 4th, 2011 to install a new chapter of the physics honor society at UB. Sigma Pi Sigma receives into membership undergraduate and graduate students, faculty members, and a few others in fields closely related to physics. Chapters are restricted to colleges and universities of recognized standing that offer a strong physics major.

Sigma Pi Sigma exists to honor outstanding scholarship in physics; to encourage interest in physics among students at all levels; to promote an attitude of service of its members towards their fellow students, colleagues, and the public; and to provide a fellowship of persons who have excelled in physics.

The following undergraduate students were inducted into the society on November 4, 2011:

Alec Cheney, Matthew Gorfien, Connor Gorman, Chun Pui Kwan and Katherine Spoth

Congratulations to all!

ΣΠΣ Sigma Pi Sigma
THE PHYSICS HONOR SOCIETY

Middle School Visit to UB

By Dr. John Cerne

Dr. Cerne showing middle school students how the transmitter controls the model airplane (held by student behind and to the right of Dr. Cerne). The airplane's pitch, yaw and thrust (3 channels) are controlled by the pilot.

On July 12 and 13, 2011, seven students from a Buffalo public middle school who are participating in UB's Center for Excellence in Education through Technology and Arts spent their afternoons with Drs. Andrea Markelz and John Cerne. They were led through interactive displays and demos in the Department, and participated in several demonstrations on liquid nitrogen and high temperature superconductors.

The final set of demonstrations used plans and resources from Dr. Cerne's NSF-funded work on starting a radio controlled flying club in a Buffalo public high school. The students built and tested their own gliders, constructed from 9" foam plates (www.modelaircraft.org/education/fpg-9.aspx).The students were very excited about building and flying their gliders. One student was jubilant when her glider set the flight distance record for the group as it gently banked into a 20 m long flight from the back of the sloped lecture hall to the chalkboard at the front.

After a radio control flight demonstration, each student flew one of the club's radio controlled airplanes in the lecture hall. The flying not only gave us the opportunity to discuss basic physics concepts such as forces and acceleration, but also highlighted the great advances in technology that have revolutionized radio controlled flight over the past few years. The students' enthusiasm resulted in the tours running well past the allotted time on both days and many of the students were very disappointed that the tours would not continue for more days.

Trip to Airshow Exposes Youth to Science and Technology

By Charlotte Hsu

About 20 students from Buffalo Public Schools attended an air show at Niagara Falls on September 11, 2011 as part of a University at Buffalo outreach program that uses aviation to illustrate the wonders of science and technology.

The aim of the trip was to get students excited about aviation science and technology. The show, which took place at the Niagara Falls Air Reserve Station on the 10th anniversary of 9/11, also helped students gain an appreciation for the country's servicemen and servicewomen, said John Cerne, an associate professor at UB who helped plan the outreach activity.

Cerne organized the visit with the UB Graduate School of Education's Liberty Partnerships program, which provides local students with academic and college preparation support.

The attending Liberty Partnerships students are from East High School and the Buffalo Academy for Visual and Performing Arts, which serves grade 5 to 12.

Funding for the trip comes from a National Science Foundation grant that Cerne and his colleagues received for research and education. As part of the outreach component of that award, Cerne has started a radio-controlled flying club for Buffalo public school students that emphasizes how basic physics and advanced technology combine to make radio-controlled flight possible.

Banner: Students from Buffalo public schools attended an air show at Niagara Falls on 9/11/11 as part of a University at Buffalo outreach program that uses aviation to ilustrate the wonders of science and technology. The program was started by Dr. John Cerne (left back row wearing UB cap) in collaboration with Dr. Ramone Alexander (center back row wearing UB cap) and Judith Colon (second row middle right wearing sun glasses) from UB's Liberty Partnerships Program.
Photo: Zheng Gong

The goal of the air show is similar. Cerne hopes that seeing planes in motion will spark curiosity in students about how they work.

"Our main goal is to get them excited about science and technology, and about what's out there in the world, about what's possible," he said. "Many of these students have never had the opportunity to attend an air show. It was great to expose them to something completely different from anything they've ever seen."

"It can be challenging to make learning fun, so I thought this was an excellent opportunity to do that," said Ramone Alexander, project director for Liberty Partnerships. "It's a way to engage students with a real-life example of what the possibilities are."

Understanding the Metal-Insulator Transition in Single Nanowires of Doped VO_2

By Adam A. Stabile
and Dr. Sambandamurthy Ganapathy

From electronic band theory perspective, we can group materials into five types: insulator, semiconductor, superconductor, semimetal, and metal. However, certain materials change their behavior and undergo phase transitions when tuning specific external parameters. One such textbook example of a system undergoing a metal-insulator transition is vanadium dioxide, VO_2. In 1959, F. J. Morin was the first to show that the temperature dependence of its resistivity switches between that of an insulator and that of a metal at one particular temperature (T ~ 340 K), signifying the first experimental evidence of a metal-insulator transition (MIT) in VO_2. VO_2 also undergoes a structural phase transition at the same T thereby increasing the interest of scientists to understand the microscopic mechanisms behind this transition.

Even decades later, the cause of MIT in VO_2 remains a hot topic of debate among solid state scientists. In our work on VO_2 systems in nanowire form, we carefully observe the transport of charge carriers through MIT while changing dopant levels (various amounts of Tungsten, W), temperature, and voltage. It has been shown from simultaneous transport and optical measurements on single-crystal VO_2 nanowires that MIT occurs in steps: metallic domains sprout across the nanowire as T is continuously increased until all domains connect together forming a complete metal. Thus, in a series of recent studies, we use individual, single-crystal, tungsten doped VO_2 nanowires in order to understand the nucleation and dynamics of these individual domains across the MIT.

Fig. 1 shows MIT for $W_xV_{1-x}O_2$ nanowires where x is the atomic concentration of W. Arrows indicate the direction of temperature (T) sweeping. The MIT is shown in the sharp drops in electrical resistance, R ($\Delta R \sim 10^2 - 10^3\ \Omega$). The hysteresis is typical of a first order phase transition and suggests that the mechanisms driving the system from insulator to metal and from metal to insulator are not the same. Increasing amounts of W can reduce the transition temperature (T_c) to below room temperature from 340 K. Thus, the ability to tune this electrical switching behavior at room temperature through simple doping control portends the likelihood of future applications in nanotechnology. A closer inspection of these traces shows discreet, smaller jumps within overall transition. These features signify formation/nucleation of metallic domains. Interestingly, these domain features appear more numerous and prominent in the lower doping levels.

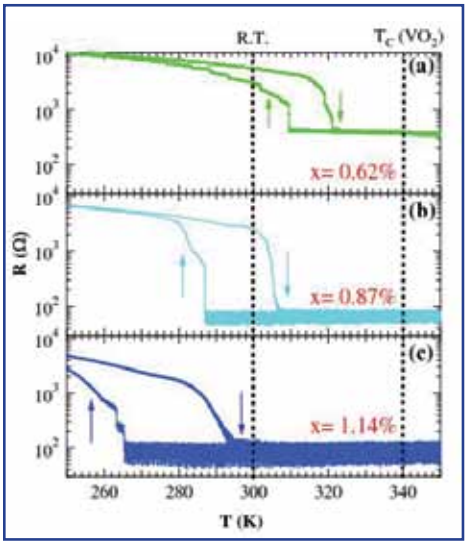


Fig 1: R vs T of $W_xV_{1-x}O_2$ nanowires at various concentrations of W as described in text.The transition temperature is tuned controllably between 260 K and 340 K by tuning the amount of W.

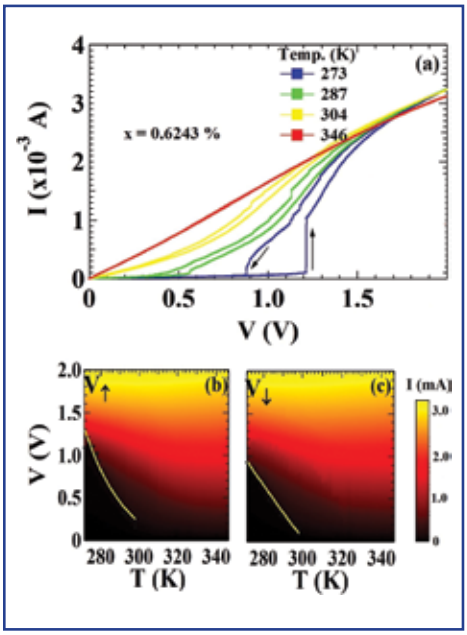


Fig. 2a

Fig 2a shows voltage-driven MIT in one of our nanowires at different temperatures (T_c = 291 K). Arrows indicate direction of sweeping. For temperatures below T_c we see a sharp, hysteretic MIT at two threshold voltages and smaller,

Banner: In July 2011, students from a Buffalo public middle school who are participating in UB's Center for Excellence in Education through Technology and Arts spent two afternoons with Drs. Andrea Markelz and John Cerne. They were led through interactive displays and demos in the Department, and participated in several demonstrations on liquid nitrogen and high temperature superconductors.They also built gliders and flew them and radio-controlled airplanes inside one of the NSC lecture halls. Here Dr. Markelz is demonstrating what happens to balloons when they are cooled by liquid nitrogen.

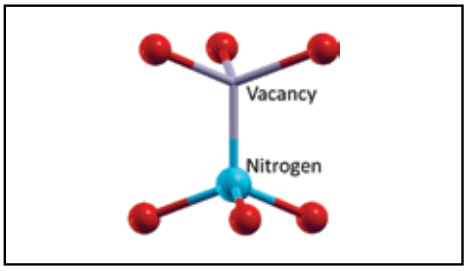
discreet jumps especially on the down sweep. The color map of current (I) vs. T and voltage (V) gives us an overview of the voltage-driven transition where Fig 2b is plotted for up sweep of voltage, and Fig 2c is plotted for the down sweep. In Fig 2b the threshold voltage, $V_{TH\uparrow}$, (color contrast between dark red and black) is fitted to the yellow curve which takes the activation form $V_{TH\uparrow} \sim \exp(-T/T_o)$ typical of a charge ordered system in which charge carriers move through a system of hopping sites in the material. In Fig 2c, for threshold voltage, $V_{TH\downarrow}$, the yellow fit follows $V_{TH\downarrow} \sim$ which describes heat dissipation through Joule heating as the dominate mode of transport. This is the first time the different mechanisms responsible for the electric field-induced switching have been identified in VO_2 systems. These results and other related results have appeared in a series of recent publications: T. L. Wu et al., Phys. Rev. B 83, 073101 (2011); L. Whittaker et al., ACS Nano 5, 8861 (2011) and Patridge et al., Nano Letters 10, 2448 (2010).

We are currently investigating the effects of charge carrier injection across MIT in these materials through the use of gating with ionic liquids to distinguish the effects of charge injection from structural transformation. More recent results and publications can be found at: http://www.acsu.buffalo.edu/~sg82/home.html

Hidden Aspect of the NV Color center in Diamond Uncovered

By Dr. Peihong Zhang

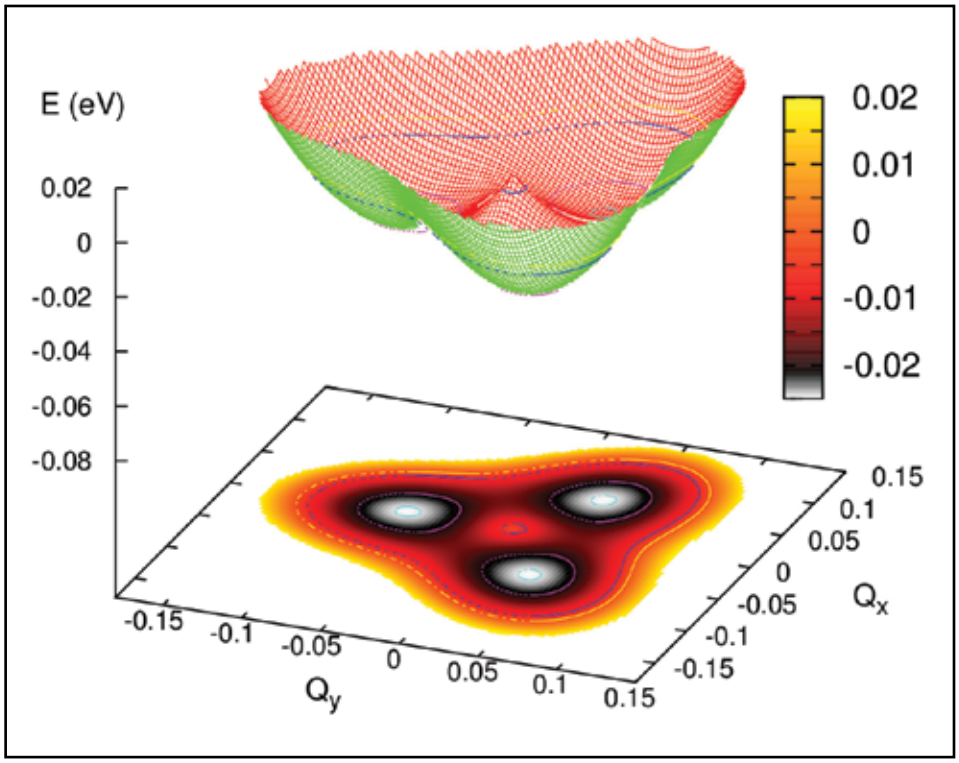
All materials are inevitably created with imperfections, the so-called defects. Defects are not necessarily detrimental to a material's properties. In fact, defects are often deliberately introduced into materials for controlling their electronic, optical, and transport properties. One such defect, the so-called nitrogen-vacancy (NV-) center in diamond, is considered to be one of the most promising solid state systems for quantum information applications.



An NV center in diamond.

An NV center in diamond is formed by an N substitution and a nearest neighbor vacancy, which can capture an extra electron to form an NV-. The local spin states of the NV- center can be accessed and manipulated optically at a single-site level, making it suitable for quantum information applications. The ground state of the NV- center in diamond is a spin triplet, which can be optically excited to a spin triplet excited state 3E. The excited state is orbitally degenerate and should experience either static or dynamic Jahn-Teller (JT) effects.

Using a combination of first-principles calculations and vibronic interaction model analysis, we establish the presence of a dynamic Jahn-Teller effect in the 3E excited state. The calculated temperature-dependent dephasing rate for the zero phonon line as well as the splitting of the first two vibronic states are in good agreement with experiment.This work has been published in Physical Review Letters [PRL 107, 146403 (2011)] and is supported by the Department of Energy.



Calculated adiabatic potential energy surface of an NV- center showing three equivalent energy minima associated with JT distortions

Banner: Nada Tesarova, a physics PhD student from Charles University in Prague, Czech Republic, at Niagara Falls. Nada will be spending six months studying diluted magnetic semiconductors in Dr. Cerne's lab.

Research Awards

Research Awards

By Dr. S. Ganapathy

Prof. Hao Zeng, in collaboration with co-PI Prof. Shengbai Zhang at Rensselaer Polytechnic Institute, has received a grant to work on a project, "Heterojunction Solar Cells Using Chemically co-doped Titania Nanotube Arrays for Simultaneous Light Absorption and Carrier Transport", from the National Science Foundation for the period 7/2011-6/2014. This proposal aims to develop a heterojunction solar cell based on chemically co-doped titania nanotube coated with a solution processed p-type semiconductor. This scheme optimizes simultaneously light absorption, carrier separation and charge transport. The chemical co-doping reduces band gap of TiO2 without significantly affecting conduction band edge, combined with proper choice of p-type layer, it optimizes band alignment for efficient charge injection and open circuit voltage. The chemical co-doping, interface engineering and choice of p-type material will be guided by first principles computation. This collaboration between theory and experiment aims to develop highly efficient solar cells with low fabrication cost. This can help to enable large scale utilization of solar energy, as well as incorporating solar cells into building materials and textiles.

Prof. Arnd Pralle had recently received a grant from the National Institute of Mental Health (NIMH) to develop a method to remotely control neurons in the brains of mice using superparamagnetic nanoparticles. This funding for the period 9/2011 - 8/2015 comes from the program for Exceptional, Unconventional Research Enabling Knowledge Acceleration (EUREKA) which supports highly innovative research projects that promise big scientific payoffs. If the work is successful, Dr. Pralle's research will provide neuroscientists with a powerful, new activity deep inside the brain. This kind of remote neuro-stimulation would help researchers learn more about how the brain's complicated neuronal circuitry controls behavior, leading eventually to better understanding and possibly treatment of ailments that involve the injury or malfunction of specific sets of neurons. The principle combines ideas from nanoscience, physics, molecular biology and neuroscience and had been developed and tested by the Pralle team on cultured cells: superparamagnetic nanoparticles are targeted and clustered on the membrane of a nerve cell which also is genetically engineered to express a temperature sensitive ion-channel; when a radio-frequency magnetic field is applied to the nanoparticles, these heat up, causing the ion-channel to open and to depolarize the membrane of the cell, which in turns causes the nerve cell to fire an electrical pulse. With the new funding, the research team plans to test this method on neurons in the olfactory bulb of mice, which lies in the forward region of the brain and controls how animals perceive odors.

Events Calendar

Oct 15, 2011	Fall Open House
Dec 11, 2011	Holiday Party Pistacios 5-9
Feb 8, 2012	6th Arts and Sciences Cabaret
March 2012	First Ta Yu Wu Public Lecture
March 2012	Spring Open House
Apr 20, 2012	18th Annual Rustgi Lecture John C. Mather
May 2012	Commencement
June 2012	Ride for Roswell

Congratulations to our recent student award recipients

Dean Scholarship

Matthew Westley

Frank B. Silvestro Scholarship 2011

Jae Kyu Choi
Chase Ellis
Minsoo Kim
Jeongsu Lee
George Lindber
Gen Long
Szechun Mak
Katherine Niessen
Robert Poltis
Adam Stabile
H. Subramanian
P. Taherirostami
Yoichi Takato
Stephen Thomson
Yutsung Tsai
Jia Zhou

Sekula Scholarship

Junhong Choi
Daniel Filipski
William Pineros
Kristina Krylova
Chun Pui Kwan
Connor Gorman

Outstanding Senior

Jenna Curry
Grady Gambrel
Matthew Westley

Outstanding TA's

Heng Huang
Christopher Redino

Banner: Dr. John Cerne received SUNY Chancellor's Award for Excellence in Teaching in September 2011.
Photo: Nancy J. Parisi

We Congratulate Our Graduates

BACHELORS

Physics Spring 2011

Averman, Avner
Elsaesser, David R.
Ferris, Daniel Craig
Gambrel, Grady
Parks, Jared M.
Piaseczny, Alexander Zenon
Skvarch, Michael David
Stoloff, Daniel Harry
Stukowski, Robert Louis

Mathematical Physics Spring 2011

Kirby, Dean Barry
Westley, Matthew

Engineering Physics Spring 2011

Seo, Jungryeol

MASTERS

Physics Summer 2011

Mak, Sze Chun
Pakmehr, Mehdi
Peng, Weiming
Srichandan, Sasmita

Ph.D.

Physics Spring 2011

Ali, Tariq
Advisor
Athos Petrou
Thesis Title
Magneto-Optical Studies of InGaAs Quantum Wells and Devices Used for Spintronics Applications

Physics Summer 2011

Bailey, Daniel Wayne
Advisor
Matthew Podgorsak
Thesis Title
The use of an amorphous silicone electronic portal imaging device for dosimetric measurement of intensity-modulated photon fields

Bernaciak, Catherine A.
Advisor
Doreen Wackeroth
Thesis Title
Studies of Combined Electroweak and QCD Effects to Charged and Neutral Current Drell-Yan Processes at Hadron Colliders

Cheung, Yiu H.
Advisor
Doreen Wackeroth
Thesis Title
Searching for New Physics at the LHC in t tbar production in the all-hadronic decay mode using top quark tagging

Delikanli, Savas
Advisor
Hao Zeng
Thesis Title
Spin Polarization and dynamics of DMS colloidal quantum dots

Halstead, Evan M.
Advisor
Dejan Stojkovic
Thesis Title
Potential Reconstruction, Gravitational Collapse, and Time Evolution of Thermodynamic Quantities

Stier, Andreas V.
Advisor
Bruce McCombe
Thesis Title
Far infrared magneto-optical studies of spin effects and off diagonal conductivity in the integer quantum Hall regime

Whiteside, Vincent Ryan
Advisor
Bruce McCombe
Thesis Title
The optical aharonov-bohm effect and magneto-optical properties in Type II Quantum Dots

Wu, Tailung
Advisor
Sambandamurthy Ganapathy;
Thesis Title
Transport Properties of Correlated Electron Systems in the Nanoscale

Xue, Yu
Advisor
Peihong Zhang
Thesis Title
Electronic and Optical properties of WO3 related materials and first principle Theory of Electrochromism

Development

Support the Department of Physics Programs

The Physics Department is grateful to all our alumni and friends for their contributions. These contributions provide the margin which makes UB Physics an excellent Department. In today's environment of decreasing government support the contributions to any of these funds are instrumental in the quality of our academic endeavors every year. To contribute electronically, please visit www.physics.buffalo.edu and click the Support Physics button on the top right or contact Chris Gleason in the Physics Department at 716-645-3629 or via e-mail cg57@buffalo.edu. You may also contact Deborah McKinzie in the Development Office at 716-645-0839, or via email at mckinzie@buffalo.edu with any questions.

Physics Department Funds:

Physics Excellence Endowment:
Supports recruitment and recognition of outstanding students, outreach to the community, upper level experimental laboratories, undergraduate research projects, and activities of The Society of Physics Students.

Frank B. Silvestro Endowment Fund:
Established in 2000 by Mr. Frank Silvestro, BA 1962, MA 1968, the fund supports outstanding students with financial need. Currently used to support graduate students.

Dr. Stanley T. Sekula Memorial Scholarship Fund:
Established in 1990 by Mrs. Anne H. Sekula, honoring the memory of Dr. Stanley T. Sekula, BA 1951, and used to recognize outstanding undergraduates with financial need.

Moti Lal Rustgi Professorship in Physics:
Endowed by the Rustgi family in 2006 to honor the late Professor Moti Lal Rustgi. Provides support for the Rustgi Professor, currently held by Professor Athos Petrou.

Moti Lal Rustgi Memorial Lectureship Fund:
Established in 1993 by the Rustgi family, the fund supports an annual lecture by distinguished researchers.

Ta-You Wu Lectureship Fund:
Established in 2008 by Professor Yung-Chang Lee in remembrance of the late Professor Ta-You Wu, who was a key member of the Department from 1966 to 1978.

Physics & Arts Exhibition Fund:
This interactive permanent exhibition in Fronczak Hall opened in 2006, and was funded by alumni. It is one of the Department's most effective outreach initiatives. Support will allow continued evolution and development.

Physics International Graduate Student Assistance Fund:
Established in 2010 by Professor Bruce D. McCombe to provide support for critical financial assistance to international graduate students in the Department of Physics, with a preference given to Asian students and 1st year Ph.D. candidates, at the University at Buffalo

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Buffalo, NY 14260

Banner: From left to right, Andrea Markelz, Justin Perron, Chase Ellis, John Cerne, Hong Luo, and Bernard Weinstein pose with the Cup.

The University at Buffalo Department of Physics Newsletter

Dr. John Cerne received SUNY Chancellor's Award for Excellence in Teaching in September 2011. Photo: UB President Tripathi, Dr. Cerne, UB Provost Stenger, UB College of Arts and Sciences Dean Pitman. Also in attendance at the ceremony were our own Drs. Luo, McCombe, Weinstein, and Gasparini, who among them share 4 SUNY Chancellor's Awards for Excellence in Teaching, 3 American Physical Society Fellow appointments, 1 UB Distinguished Professorship and 1 SUNY Distinguished Professorship! *Photo: Nancy J. Parisi*

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