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Quanta

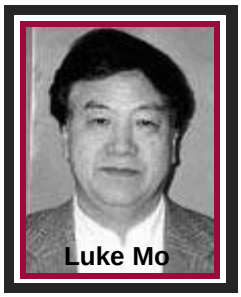
A publication for the faculty, staff, students, alumni & friends of the Virginia Tech Physics Department

PHYSICS

A UNIVERSITY EXEMPLARY DEPARTMENT

2002 - 2003 Department Retirements

Three members of the Physics Department retired during the past year after serving the department for a combined ninety-plus years.



Luke Mo

Luke W. Mo joined the department in 1976. He received his Ph.D. with C.S. Wu in 1963 followed by appointments at Columbia University, Stanford Linear Accelerator Center (SLAC), and the University of Chicago, before coming to Virginia Tech. Professor Mo is a Fellow of the American Physical Society, was a Guggenheim Fellow in 1981, and the 1980 recipient of the Virginia Tech Alumni Award in Research Excellence. His career has been a model of dedication to research excellence with a passion for experimental investigations of fundamental questions in particle physics. He has co-authored research papers that have been cited more than seven-thousand times. He was a key member of the team that studied deep inelastic electron scattering at SLAC, which experiments garnered the 1990 Nobel Prize in Physics for Friedman, Kendall, and Taylor. The Nobel citation reads in part "for their pioneering investigations concerning deep inelastic scattering of electrons on protons and bound neutrons, which have been of essential importance for the development of the quark model in particle physics." Mo's 1969 radiative corrections article with Tsai in Reviews of Modern Physics presented the techniques for extracting from experimental electron-proton scattering measurements the relevant physics quantities, which quantities could be compared with theoretical predictions. This article has been cited over 450 times, and continues to be cited more than thirty years after publication by experimental investigators studying electron scattering from nucleons. He had a key role in muon-nucleon scattering experiments and was the leader of a benchmark neutrino-electron scattering experiment at Fermilab. These experiments were followed by an experimental search under his leadership for axion-like particles at SLAC and by very high energy studies of electron-proton collisions with the collider at DESY in Hamburg, Germany. As part of the latter project he was the co-developer of a novel low-power, accelerator-type, photomultiplier-tube base for use in the experiment's calorimeter modules. In addition to pursuit of excellence in research, he served on numerous national and international particle physics laboratory advisory boards and invited numerous internationally recognized colloquium speakers to Virginia Tech, which colloquia were followed by gracious and stimulating receptions in his home.

- see Retirements pg.7 -

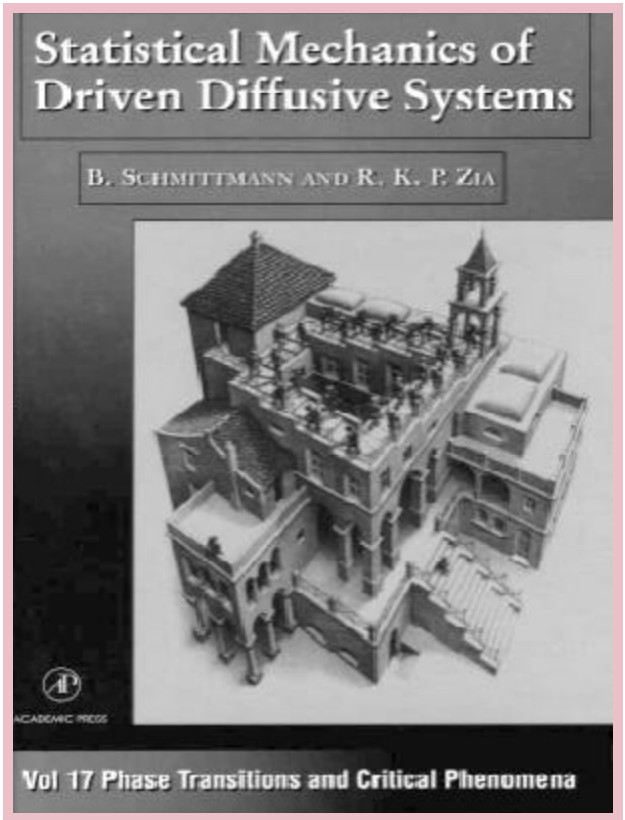
Royce Zia Receives the Alexander von Humboldt Research Award

Article Courtesy: Royce Zia

This award will enable Prof. Zia to take a study-research leave next academic year. His main research work will be based in Essen, Germany, but he expects to travel extensively, both within Germany and throughout Europe. Invited recently to join the editorial board of Journal of Physics, a major European journal, these travels will bring him to board meetings, as well as collaborative research efforts.

Statistical mechanics is a discipline devoted to the understanding of the co-operative behavior of large numbers of microscopic particles (e.g., atoms, molecules). In a daily context, we see ice, water, and steam — all of which are all composed of "just H_2O molecules." Similarly, when many carbon atoms are gathered together, they can make very different substances, like ash, graphite, diamond, and more recently, Buckyballs and nanotubes. All these familiar systems are realized under equilibrium conditions. By contrast, when subjected to conditions far from equilibrium, a collection of atoms or molecules can produce an even greater variety of states. Examples range from physical patterns like snowflakes, biological ones like ferns, to fantastic fractal images in pure mathematics. Prof. Zia's research focuses on the question common in all these examples: How do complex macroscopic patterns emerge from a few simple constituents evolving according to a few simple dynamical rules?

Professor Royce Zia (left) receiving the Alexander von Humboldt Research Award from Prof. W. Frühwald, President of Alexander von Humboldt Foundation



One way to set up a system "far- from-equilibrium" is to subject it to external drives, e.g., electric fields or temperature gradients – thus, the phrase cited in the award: "driven diffusive systems." Over the last 15 years, he has written many journal articles, mostly with Professor Beate Schmittmann. In 1995, they published a book, reviewing the then decade-long progress in this subject.

Parts of this research are very well suited for undergraduate research. This year, Jay Mettetal and Rafael Hipolito are involved extensively, while Justin Krometis, Brian Skinner and Heike Lohse-Busch just started. Recent graduates include Leah Shaw (who will write her PhD thesis at Cornell on this area of research) and Anubav Vasudevan (who is pursuing an MA in Philosophy at VT).

"This prize is awarded for Professor Zia's seminal contributions to the theory of critical and numerous interfacial phenomena and the pioneering role he has played in recent years in advancing our understanding of the statistical mechanics of non-equilibrium systems, in particular, of driven diffusive systems."

Achievement earns Di Ventra fellowship in IOP

His "very high level of achievement in physics and outstanding contribution to the profession," have earned Massimiliano Di Ventra of the Department of Physics the title of Fellow of the Institute of Physics (IoP).

Fellowship is the senior class of membership in IoP, a leading international professional body and learned society that promotes the advancement and dissemination of knowledge of and education in pure and applied physics.

In 2001, Di Ventra received a National Science Foundation (NSF) Nanoscale Exploratory Research grant of $85,000, which served as seed money to explore the nanoscale world through computer simulations. He then received a NSF Faculty Early Career Development Program (CAREER) Award for $300,000 over five years. That grant allows him to use newly developed atomic-scale first-principles approaches to study some of the most fundamental issues in transport in molecular wires that can have major impact in the development of molecular electronics. These include current-induced forces, local heating and heating dissipation, electric-current fluctuations, and interference effects at the molecule-leads contact.

Di Ventra also works with experimentalists to advance the new technology and provide new input for future developments in molecular electronics. By providing theoretical models, Di Ventra will help shorten the experimental time needed for selecting materials and structures with specific transport properties.

Di Ventra came to Virginia Tech in the summer of 2000. In addition to holding the position of research assistant professor at Vanderbilt, he has been a visiting scientist at the IBM T.J. Watson Research Center since 1998. Di Ventra also received the Ralph E. Powe Junior Faculty Enhancement Award and the New Century Technology Council Innovation Award, among others.

DiVentra is a co-editor of the book *Nanoscale Science and Technology*, scheduled for publication in 2003, and has written a number of book chapters and articles for professional publications.

Article compliments: Sally Harris, Spectrum

Dr. Chang chosen as Dean for the College of Science

Lay Nam Chang, a physics professor and former department chair, assumed the dean's position for the newly formed College of Science on March 10, 2003.

His initial appointment will be for up to three years. In November 2001, Dr. Chang accepted the role as interim dean for the College of Arts and Sciences. Since then, as part of Tech's restructuring, a separate college for the hard sciences was formed - aimed at expanding its research agenda, improving efficiency and encouraging inter-departmental collaboration. The departments of Biology, Chemistry, Economics, Geological Sciences, Mathematics, Physics, Psychology, and Statistics are currently expected to be the academic units forming the new college; however further changes to this configuration are possible.

Chang emerged from the search as an energetic and effective scholar with established leadership experience. He is committed to the goals of diversity and excellence. Considering Chang's passion for achievement, he is sure to play a key role in Tech's ambition to become a Top 30 research university by 2010.

2003 - 2004 Award Winners

Alice Estes Martin Scholarship
Jeremy Saria

Col. Nelson Carey Brown Memorial Scholarship
Richard Foster

Daniel C. & Delia F. Grant Endowed Scholarship
Brian Donovan, David Erickson, Christopher Luck, Eric Ritch, Sean Settle, Carol Thornton

Frank Leigh Robeson Scholarship
Christopher Graziul, Heike Lohse-Busch

H.Y. Loh Award
Beth Reid, Jerome Mettetal II

Hugh D. Ussery Scholarship
Larry Jon Cook, Brian Skinner, Mark Washenberger, Sara Yancey

Ray F. Tipsword Scholarship
Tom Bullard

Robert C. Richardson Scholarship
Justin Krometis, Rafael Hipolito, Aaron Wallo

Robert P. Hamilton Prize
Christopher Purcell

Webster & Sara Schoene Richardson Memorial Scholarship
Travis Merritt, Annalisa Pawlosky

Jamie Dunn Memorial Scholarship
Ed Lyman

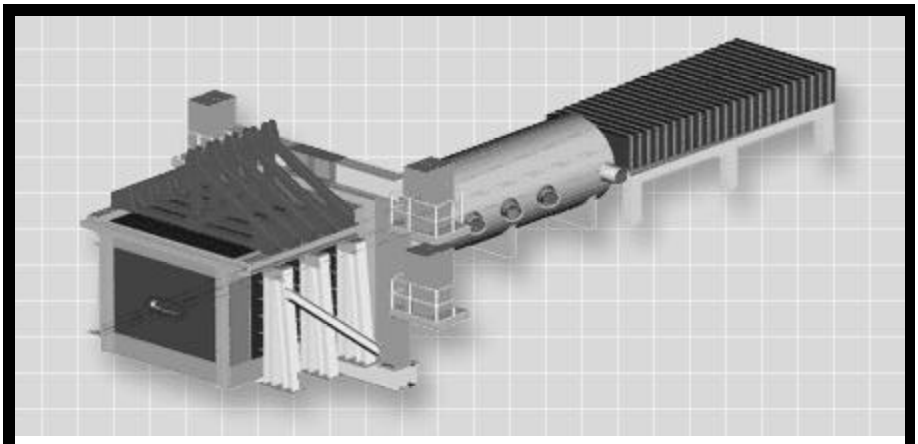
NSF gives Project KOPIO an MRE start in FY 2006

The NSF decided to give a project called KOPIO an MRE start in FY 2006. Together with sister project MECO $30M will be alloted. KOPIO will study direct CP violation. This topic has bearing on why matter is left over from the energetic conditions of the early universe. Physics faculty that have expressed interest in KOPIO are M. Blecher, M. Pitt, and B. Vogelaar.

THE KOPIO EXPERIMENT

The physicists who designed KOPIO are looking for a very rare reaction with the potential to explain the observed lack of symmetry between matter and anti-matter in the universe.

We know that the universe "prefers" matter over antimatter, even though these mirror-image particles once appeared to follow perfectly symmetrical laws of physics. If the laws governing matter and antimatter were symmetrical, we would not have a universe. Why did the Big Bang produce matter instead of an even 50/50 mixture of matter and antimatter?



The KOPIO Experimental apparatus (particle beam enters from left)

The answer may lie in the discovery of a new asymmetry of nature, evidence that an antimatter universe, a mirror image of our own, would not behave in precisely the same way. Using the AGS proton accelerator at Brookhaven National Laboratory, the KOPIO experimenters wish to create an intense beam of kaons to study special very rare decays (viz. a kaon decaying into a neutral pion, a neutrino, and an antineutrino). The discovery and observation of these rare reactions will incisively probe charge parity (CP) symmetry violation, fundamental evidence that a mirror-image anti-universe would look slightly different from our own. This is important because the laws of physics are incomplete without the ability to explain the observed large-scale matter/antimatter asymmetry of the universe which is intimately related to subtleties that distinguish the behavior of matter from that of antimatter.

Article courtesy: Marvin Blecher

Physics Outreach gives Belle Heth School a Lesson In Physics

The Virginia Tech Physics Outreach went to Belle Heth School to teach students there about physics. Several stations were set up, each with a different demonstration. Below are comments from the Belle Heth students describing some of the demonstrations.

Alma Robinson, Outreach Coordinator, demonstrated what would happen to a rackquetball that was soaked in liquid nitrogen when it bounced. The students found that it didn't bounce, but exploded when it hit the ground.

Burke Green showed why electrons don't like to be together and how they go through metal creating a spark. He also showed how lightning was made by electrons going from the earth to a cloud.

Mike Sperry demonstrated liquid nitrogen and pressure. In his demonstration he explained that liquid nitrogen was below 200 degrees celsius and a balloon would expand if you removed the air from the area around it.

Curie Choi demonstrated light. She showed how all the colors of the rainbow make white light. Using a laser and several different objects, she showed how light can bend.

Sean Wilson showed that density was how much mass is in something of a particular volume. In his experiments he showed how a regular can of soda was heavier than a can of diet soda, because it has more sugar in it. He proved that saltwater was denser than freshwater.

Beth Reid taught the students about momentum. She dropped a tennis ball on top of a basketball. The basketball's momentum forced the tennis ball to go back up and hit the ceiling after the basketball bounced on the ground. She also taught the students that they spin faster when curled up rather than being all spread out. She did this by spinning the students with their arms out holding weights. When they pulled in their arms they spun faster - conservation of angular momemtum..

Ben Wilson demonstrated how all things are pulled down by gravity the same amount. He did this by pointing a cannon at a fake monkey in a tree. The cannball was shot at the same time as the monkey fell down and the cannonball hit the monkey.

It was a great afternoon with the Virginia Tech physics students.

Chirinos accepts Phi Beta Delta International Students Vice Presidency position

Congratulations to physics graduate student, Cesar "Hann" Chirinos who was offered and accepted the International Students Vice Presidency of the Phi Beta Delta chapter at Virginia Tech. Phi Beta Delta is an International Scholars Honor Society honoring outstanding performance by international students as well as among faculty, students and staff.

Presently, Phi Beta Delta has over 100 local chapters. The Gamma Omega Chapter at Virginia Tech was founded in the spring of 1997. The intrinsic values of the society are reflected in its name: Phi (philomatheia) - love of knowledge, Beta (biothremmonia) - regard for human life, and Delta (diapheren) - achieving excellence. The colors chosen for the society are red and gold. Red symbolizes the strength and diversity of humankind and gold is a symbol for the sun from which all people and cultures draw strength and life.

Professor Beate Schmittmann gets double invitation to University of Essen in Germany

Beate Schmittmann spent the month of November at the University of Essen in Germany, as a senior fellow at the newly founded International Science Center and a guest of the Physics Department. The International Science Center (ISC) is a venture of the Essen College for Gender Studies. Senior women scientists from a range of countries are invited to Essen in November, as part of a wide-ranging mentoring program for women postdoctoral researchers from several regional universities. Guests and local members meet twice weekly, over an extended period, to hear scientific presentations by the guests, discuss university systems and women's roles in different countries, and eat and socialize together. At the formal opening of the ISC, Dr. Schmittmann presented a very well attended public lecture, entitled "Totally out of equilibrium: Gene transcription, traffic jams and stock indices – New questions in statistical physics." During her stay, she collaborated with Hans-Werner Diehl from the Physics Department, studying the effect of surfaces on uniaxial ferromagnets, and presented a colloquium at the Max-Plack Institute for Complex Systems in Dresden, Germany. Her visit was so well received that she has been invited back to Essen for November 2003.

Other trips last year took her to Heidelberg, Germany, where she gave an invited talk at the European Dynamics Days, and to Colmar, France, as an invited speaker at the workshop "Disorder and Large Fluctuations".

Start für das „International Science Center" (v.l.) mit: Gudrun Schäfer, den Referentinnen Prof. Beate Schmittmann, Prof. Irina Tchikalova, dahinter: Prof. Rüdiger Brandt, Christian Kauer. (NRZ-Foto: Tietz)

The photograph, taken from the Neue Ruhr Zeitung of November 11, 2002, shows Beate Schmittmann (center, seated) with several other members of the College of Gender Studies at the opening press conference of the ISC.

Article and photo courtesy: Beate Schmittmann

Dr. Maureen Mellody- featured speaker for the 2003 Physics Awards Ceremony

Dr. Maureen Mellody graduated from Virginia Tech in 1995 with a B.S. degree in Physics. She received her M.S. degree in Applied Physics in 1997 and Ph.D. in Applied Physics in 2000, both from the University of Michigan in Ann Arbor. Upon graduation, Dr. Mellody was a Post-Doctoral Scientist at the University of Michigan through the summer of 2001. Her research specialties include acoustics, audio signal processing, and the human perception of sound. From September 2001 to September 2002, she worked as a Congressional Science Fellow sponsored by the American Institute of Physics. She spent her Fellowship year working on science and technology policy for the House Judiciary Committee's Subcommittee on Courts, the Internet, and Intellectual Property under Congressman Howard L. Berman (D-CA). Currently, Dr. Mellody is a Study Director for the National Academy of Sciences, working on policy studies related to aeronautics and space.

Retirements

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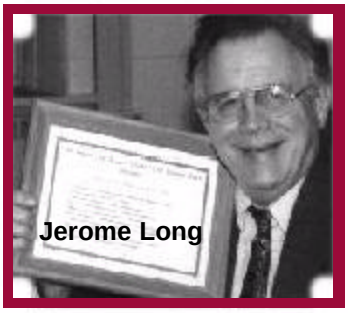
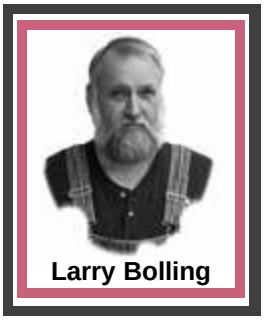

Jerome Long

Jerome R. Long joined the department in 1967 following a two-year postdoctoral fellowship at the University of Pennsylvania. This fellowship followed the completion of his Ph.D. degree from Louisiana State University in 1965. Dr. Long's primary research interests were the experimental study of electrical, thermal, and magnetic properties of solids. These interests led him to summer appointments at the U.S. Naval Research Laboratory and Montana State University, and a sabbatical year at Simon Fraser University. Jerome has had a major role in shaping the upper-level undergraduate courses for physics majors, especially the junior-level electronics laboratory and the senior laboratory, which laboratory is currently designated as a writing-intensive course in the University Core Curriculum. Numerous former graduates have written back to express their appreciation for having experienced the senior laboratory in their training here. Jerome will most often be remembered as the advisor for 22 years to the Virginia Tech Chapter of the Society of Physics Students (SPS). During that period the local chapter has received national recognition as an outstanding chapter numerous times. In his capacity as SPS advisor and senior-laboratory instructor, Jerome has taught and/or interacted with almost all of our graduating seniors; and he has maintained contact with many of them. We hope that contacts will continue to be maintained in the years to come between our graduates and faculty and staff. We will all remember Jerome's tireless efforts to assist and guide students as they completed their studies as physics majors at Virginia Tech.


Larry Bolling

Larry C. Bolling joined the department in 1974 and has served a pivotal role in the setup of demonstrations both for on-campus lectures and for outreach presentations to the surrounding school systems and in the setup of introductory and modern physics laboratory experiments. In addition to assisting faculty develop new demonstrations and new laboratory experiments for our current building, Larry has assisted faculty in the further development of demonstrations and experiments for use in the new Chem/Phys II facility. In these roles, Larry has impacted the physics-studies lives of tens of thousands of undergraduate freshman and sophomores and the faculty and graduate students who taught them. The reliability and timeliness of his efforts allowed all faculty to have the assurance that demonstrations and teaching-laboratory experiments would run smoothly. His good humor and patience while teaching faculty and graduate students the keys to operating various items of equipment were very much appreciated. True to form, Larry has prepared his replacement for the challenges ahead. We will all remember the impact his presence has had on the smooth functioning of the teaching mission of the department.

Each of these individuals has contributed in unique and varied ways to the essential missions of the Department of Physics. The impact of their contributions will continue long after their departure. On behalf of the department I wish to express our gratitude for their tireless efforts to improve the Department and the University. We wish them the very best for the future.

Life as a physicist...

What's it like?

The life is exciting, frustrating, but never humdrum. In terms of the hours of work and intellectual energy expended, it can at times be very demanding. A physicist is a seeker of the truth, but the truth does not always come easily. A famous physicist, Niels Bohr, has described an expert in science as one who has made all the mistakes that can be made in a very narrow field. You can be frustrated by seeing an experiment fail and by realizing that one of your pet ideas is faulty. But the pleasure in making a discovery that represents a real advancement in understanding, and the satisfaction in doing a very tricky experiment successfully, make it all worthwhile.

Do you have to be an Einstein to become a physicist? The answer is NO. Physicists do have to be proficient in mathematics. The main thing to have is curiosity and drive. Below are humorous indicators to help determine if you might be a physicist.

Physics Humor

"You might be a physicist ..."

1. if you've used every single function on your graphing calculator.
2. if you think in "math" mode.
3. if you have a pet named after a scientist.
4. if you laugh at jokes about mathematicians.
5. if you always do homework on Friday nights.
6. if you consider any non-science course "easy."
7. if it's sunny and 70 degrees outside, and you are working on a computer.
8. if you are completely addicted to caffeine.
9. if you assume that a "horse" is a "sphere" in order to make the math easier.
10. if you can't remember what's behind the door in the science building that says "Exit."
11. if you have to bring a jacket with you, in the middle of summer, because there's a wind-chill factor in the lab.
12. if you understand more than five of these indicators.
13. if you make a hard copy of this list, and post it on your door.

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

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

?? Through gift planning - charitable gifts that provide an income.
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?? Through matching gifts - if your employer has a matching gift program, you could double or even triple your contributions.

To learn more on the different ways you can give, visit the Virginia Tech, Office of University Development - "Ways to Give" website at http://www.givingto.vt.edu/waysgive.html.

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

Thank you in advance,

John Ficenec, Interim Chair

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

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