September 2012
Volume 7

Physics Matters

at Syracuse University

When the World Was New

I

When the world was new and
the stars were bright,
God promised
all the mythical secrets
of the earth and stars
would be mine if
I could but ask the
right questions.
Thus was I ordained
into the holy rites of science.
I saw how the universe is
marvelously interconnected
like the bones of the Spiritual.
But what sort of engine with what kind of gears
can drive that leviathan
in its infinite complexity?
Books told how
the intuitive physics visible to me
is the human-sized limit to
the quantum super small world
of atoms and molecules,
And
to the relativistic super large world
of stars and galaxies;
My intuitive-level kernel is thus
stitched into a much more
elaborate impressionistic
embroidery.
But reading that tapestry was impossible to me,
a mere child.
Abstruse mathematics barred the way.
There,
truth was spoken in the babbling syllables of
a mathematics far removed from
the school math my father and teachers knew.

II

Finally,
tutored by giants,
quantum and relativity theory
became mine in
A continuous traveling craps game of delight,
While
in broken accents
I began at last to speak the tongue
of the masters.
Physics became not
pages of writ to be laboriously dug from books
and slavishly memorized,
But a living thing speaking directly to my psyche,
to be translated and fine tuned into bookish
symbols at leisure.
In this way
that world of
created beauty slowly became even more fully mine,
As
more than a mere onlooker
I became
a bit composer as well;
Not
just the discoverer of new land,
But
fashioner of that land
into human sized constructs in the mind.

III

Now I am exhausted by attempts to scale
impossibly steep inclines;
A few actually scaled
but most far too steep,
All part of a jagged immensity only dimly perceived
and left for stronger
generations to attempt.
The beginning was all
tingling anticipation and challenge;
Now I laugh with God over our shared romp.

Robb Thompson '53

Cindy Urtz

The warm smile and lively eyes that greet you as you enter Room 201 identifies Cynthia Urtz, the Physics Department Receptionist/Purchasing Specialist. Cindy came to Physics in the fall of 2000. At the time she had also been admitted to the School of Social Work to study for an MSW. After her program of interest was changed, she transferred to the School of Education for a degree in counseling. While working full time, that has made slow progress and essentially is on hold for now.

Cindy was born in Newport, Rhode Island, but by the time she was 3, her parents had moved to Baldwinsville, where she still has relatives living. She was educated in the Baldwinsville schools and graduated from CW Baker HS in 1974. After earning an Associate's degree in Human Services from OCC, Cindy went to Columbia College (home in Missouri) extension at Hancock Air Base in Syracuse where she earned a BA in psychology.

In addition to the classes mentioned above, she graduated from the Entrepreneurial Bootcamp Program at the School of Management in 2007. She recently completed an SU Toastmasters Orange Orator Work Shop series at Bird Library for which she wrote and gave speeches and met many wonderful people. She also earned a 1250 hours certificate of completion in Cosmetology back in 1989. Her former passion throughout was Drug and Alcohol Rehabilitation Counseling and she's thinking of revisiting this interest by volunteering after hours at local rehabilitation facilities where she did her internships while an undergrad.

Cindy is loquacious and enjoys entertaining. She has taken professional Ballroom and Country Line Dance lessons. Gardening, interior design, and mini-philanthropy are among her many other interests. Cindy stays active and enjoys many things that life has to offer. She embraces people of difference and enjoys learning from them. Her philosophy is to live in the moment and cherish each one.

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From the Editor

This issue has been particularly interesting for me. First of all, my friend and colleague Robb Thomson sent me a couple of poems he wrote about coming to Syracuse to study and about his career overall. The poem on the title page is of the latter type. I hope you all have enjoyed it as much as I did upon receiving it. Robb did a dissertation in general relativity before doing a postdoc with Frederick Seitz and eventually becoming expert in fracture theory. Another innovation in this issue is to bring biographical information about emeritus faculty. I hope to have at least one biographical essay in all future issues. In this case, Erich Harth who retired in 1990, has written his own essay describing his very colorful life.

Unfortunately, not everything that happens is happy. In February, Arny Honig died suddenly and unexpectedly. His life and career at SU was written up in the 2010 issue of PHYSICS MATTERS, Vol. 5. It is that write-up that inspired the editor to solicit biographies from other emeriti faculty. You will find his obituary on page 13. There is also a belated recognition of the almost mythological figure Henry Levinstein. Henry had an extensive laboratory studying and making infrared detectors that were used by the Defense Department. Henry was also fascinated by the variety of toys that exhibit principles of physics. He gave a one hour course whose attendance overflowed Stolkin Auditorium.

Apart from the extra material described above, this issue contains a description of the activities of the current faculty and students. There are two articles coming from the group engaged in research using soft condensed matter. One article is the description of a major research and teaching program headed by Cristina Marchetti, IGERT, the Integrative Graduate Education and Research Training Program. The other is a study by Martin Forstner of the nanoscale membrane of cells and the transmission of atoms and molecules through the surface. This has obvious implications for understanding cell operations and for possible medical applications. Research activity by other faculty is also briefly sketched.

There were two celebratory events during the past year. The first in December was a one day meeting celebrating the retirement of Aiyalam Balachandran. While Bal is leaving Syracuse, he moving to Chenai University in India where he will continue to teach and carry on his research. Many of his former students came to celebrate with us. Second, the Editor was honored by two of his students who organized a festschrift issue of the journal General Relativity and Gravitation. The SU Physics Department followed up with a celebratory day preceding the East Coast Gravity Meeting in April.

During Commencement, the University granted an honorary degree to Joel Lebowitz ,'56 who has made outstanding contributions to statistical mechanics in the study of materials solid, soft, and fluid. At the same time he was involved in humanitarian activity concerning scientists in the Soviet Union and other authoritarian countries.

There is much more in this issue. As usual, we look forward to your comments. We would also like you to write up to 10-1200 words about your career since leaving SU. Some of you must have very interesting stories to tell. Share them with us and we will print them in PHYSICS MATTERS.

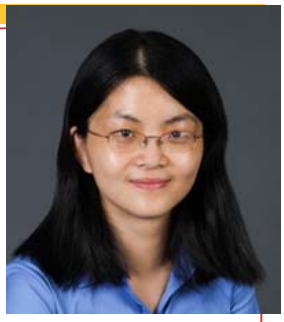
The past year has been an exciting one here at the SU Physics Department, with stellar accomplishments in our research, teaching, and outreach missions.

A signal highlight of our research program was the creation by Dean George Langford of a *Soft Matter Program*, under the Directorship of Prof. Mark Bowick, created with strong support from the office of Vice Chancellor and Provost Eric Spina. The signature activity of the Program is the establishment of two three-year Distinguished Postdoctoral Fellowships, to support the research program in Soft Matter of the Condensed Matter Theory Group. The first of these Distinguished Postdocs has been awarded to Dr. Rastko Sknepnek from Northwestern University, who will arrive this Fall.

Two new teaching programs were established in the past year. At the undergraduate level, we inaugurated a new interdisciplinary Integrated Learning Major called "Energy and Its Impacts". It combines study of technical and social aspects of energy issues, and is designed as a second major for students whose primary major is in natural or social sciences, engineering, or business. The Physics Department is the host of this exciting initiative, which last year welcomed its first majors -- they completed our first junior seminar on the way to carrying out a senior capstone project this Fall.

A new research initiative in the area of soft matter and biological physics was created this year thanks to the award of an IGERT (Integrative Graduate Education and Research Traineeship) grant from the NSF on the physics of Soft Interfaces. This is the first IGERT grant awarded to Syracuse University. The grant will support six new graduate fellowships per year for doctoral students pursuing research in various area of soft matter and biological physics. Headquartered in the Physics Department, under the leadership of Prof. Cristina Marchetti, the IGERT connects research in Physics, Chemistry, Biology, Chemical Engineering, and Bioengineering

New Faculty: Jiji Fan



I received my undergraduate degree in Physics from the University of Science and Technology of China in 2004. In 2009, I earned my Ph. D degree in Theoretical Particle Physics under the supervision of Prof. Witold Skiba at Yale University. My Ph. D thesis, "Symmetries in particle physics beyond the Standard Model: supersymmetry, conformal symmetry and accidental Lorentz symmetry" explores several novel proposals of new physics beyond Standard Model and their experimental signatures. I continued to study beyond Standard Model physics, including various electroweak symmetry breaking mechanisms and their collider signatures, dark matter models and model-independent analysis, and conformal field theory during my first postdoc term in physics department at Princeton University. I constructed novel supersymmetric models with collider signatures that have not been studied and also developed a systematic effective theory framework to interpret the dark matter direct detection data. Most recently, with collaborators at the IAS, I show that a large deviation in the Higgs decaying to the diphoton channel would shed light on one of the deepest questions at the weak scale: is electroweak symmetry breaking natural? At Syracuse, I will develop a collaboration with local theorists and experimentalists. Besides Higgs physics, weak scale model building and collider physics, other directions include interpreting the cosmic ray data for dark matter models and studying implications of flavor physics for beyond Standard Model physics, in particular bottom quark physics, as Syracuse boasts the top experimental flavor physics group in the U.S.

A successful faculty search this year resulted in the hiring of Dr. JiJi Fan, a very talented particle phenomenologist, who will join the High Energy Theory group in August 2013. When she arrives, JiJi will be the fifth woman on our faculty. She is spending the upcoming academic year as a postdoc working with Prof. Lisa Randall at Harvard. JiJi Fan was hired as a "replacement" (if such is possible) for Prof. A.P. Balachandran, who has just retired. Bal, Joel Dorman Steele Professor, is an outstanding theoretical physicist who led our high energy theory group for many years. He has moved "back home" to Chennai, India, and remains very active at the university there.

We marked several other important occasions this year, several very happy and one immensely sad. In April, we honored the career of Josh Goldberg (editor of this Newsletter) with a half-day "Josh Fest". Marking the publication of a special issue of *General Relativity and Gravitation* devoted to his work, the meeting consisted of four talks by John Stachel, Mark Trodden, Rafael Sorkin, and Peter Saulson, followed by a celebratory dinner at which Ted Newman spoke.

Another happy occasion was the granting of an honorary degree at SU's May Commencement to Prof. Joel Lebowitz of Rutgers University. A student of Peter Bergmann's who earned his Ph.D. at Syracuse in 1956, Joel has had a remarkable career in statistical physics and as a defender of human rights.

All of us in the Department were saddened by the sudden passing of Prof. Emeritus Arny Honig in January. He was a vivid and inspiring presence in the Department for over 50 years, who was hard at work in the Physics Building until a few days before his death. We will all miss him deeply.

The entrance plaza for Syracuse Stage is now an infectiously cheerful place, thanks to the "singing sidewalk" installed there by SenSyr LLC, Prof. Ed Lipson's company. Forty specially-colored pavers are instrumented with pressure sensors, prompting a mix of intriguing sounds when any of them are trod upon. Stage patrons and random passersby have been moved to leap and dance from one paver to another in order to produce cascades of sound. We are very proud of this contribution from a member of the Physics Department to the wider community

Peter Saulson
Martin A. Pomerantz '37 Professor of Physics and Department Chair

Bal and Balfest 2011

Balachandran was born and grew up in the south of India, with family roots in the "idyllic" tropical state of Kerala. He was an undergraduate at Madras Christian College and completed his PhD in theoretical physics at the University of Madras in 1962 (before the name was changed to Chennai) under the supervision of Prof. Alladi Ramakrishnan. Then he spent two post-doctoral years at the University of Vienna and at the Enrico Fermi Institute of the University of Chicago before coming to Syracuse in the Fall of 1964.

Bal has had a truly exceptional career at Syracuse during which he guided about thirty students to PhD's in mathematical physics. These include the well known theorists, Pierre Ramond, V.P. Nair and S. Rajeev. He was also host to many post-docs and visiting faculty. With them, Bal produced a great deal of influential and original research and played an important role in establishing Syracuse as a leading center of Elementary Particle Theory.

In his extremely productive career, Bal has made very fundamental contributions to mathematical physics in the areas of: Partial wave dispersion relations, Consequences of "current algebras", Magnetic monopoles, General approaches to quantization, Quantized (fuzzy) space-time, Topological solitons, as well as other applications of topology to physics and contributions to other areas in theoretical physics. This work was published in more than two hundred papers and several books, including books devoted to related mathematical material.

Bal also performed a major service to the scientific community for many years as managing editor for both the International Journal of Modern Physics A and the International Journal of Modern Physics Letters A.

For this body of work, Bal was elected a Fellow of the American Physical Society.

He received the Chancellor's prize for Exceptional Achievement in 1990 and the Wasserman prize for outstanding graduate teaching in 1991. In 2000, he was appointed Joel Dorman Steele Professor of Physics.

In the summers, Bal visited research groups in Brazil, India, Italy, Spain, Sweden… and as a result a very large number of excellent students and post- docs and visitors came to Syracuse. At one time this represented a very important source of grad students.

Kameshwar Wali Lecture 2011

The lecture, "Bionic Hearing: The Science and the Experience," was delivered by particle physicist Ian Shipsey on Thursday, Oct. 6 as this year's Kameshwar C. Wali Lecture in the Sciences and Humanities. The event was co-sponsored by the Department of Physics and The SU Humanities Center.

Shipsey, the Julian Schwinger Distinguished Professor of Physics at Purdue University, became profoundly deaf at age 30. Twelve years later, he received a cochlear implant that gave him bionic hearing. Since then, Shipsey has spoken extensively about his experiences and about the broader implications of bionic technologies and disability. In his talk, Shipsey described the structure of the ear and the mechanics of hearing. He discussed what can go wrong and in particular how a viral disease can damage the hair cells in the cochlea thereby affecting the hearing process. A cochlear implant (CI), often referred to as a **bionic** ear, s a surgically implanted electronic device that provides a sense of sound to a person who is severely hard of hearing. . The quality of sound is different from natural hearing however, in patients that are deaf due to damage to sensory hair cells in their cochlea, it enables better understanding of speech and environmental sounds. Newer devices allow recipients to hear better in noise, enjoy music, and even use their implant processors while swimming.

Unlike hearing aids that amplify sounds, cochlear implants bypass damaged portions of the ear and directly stimulate the auditory nerve. Signals generated by the implant are sent by way of the auditory nerve to the brain, which recognizes the signals as sound. Hearing through a cochlear implant is different from normal hearing and takes time to learn. However, it allows many people to recognize warning signals, understand other sounds in the environment, and enjoy a conversation in person or by telephone.

A leading particle physicists, Shipley performed experiments at the Fermilab collider in Illinois and at CERN in Switzerland. He has had many distinctions including election to fellowship in the American Physical Society. In 2005, he shared in the Particle Physics Prize of the European Physical Society for the discovery of direct CP violation. Shipsey has also been inducted into "The Book of Great Teachers," a permanent wall display at Purdue University, celebrating excellence in teaching and scholarship.

Cochlear implant: A microphone and transmitter sit outside behind the ear while a receiver and electrodes are implanted

New $3.0 million NSF-IGERT grant for research and education in soft and biological materials—by M. Cristina Marchetti

A group of faculty members from physics, bioengineering, chemistry and biology, led by Physics **Professor Cristina Marchetti**, has been awarded a five-year grant from the National Science Foundation (NSF) to develop interdisciplinary graduate education and research on "**Soft Interfaces**". The new project is part of the **Integrative Graduate Education and Research Training (IGERT) Program**, which is NSF's flagship program for doctoral students working between the traditional fields of science and engineering. Since 1998 the NSF has made IGERT awards to about 100 leading universities in 41 states, the District of Columbia, and Puerto Rico. "Soft Interfaces"is Syracuse's first IGERT project.

Interfaces play a fundamental role in the science of both soft (often biological) and hard matter and in the countless devices designed by engineers and materials scientists. An important example from biology is the cell membrane separating the constituents of the cell from the outside world while also serving as a reactive surface for communication of the cell with its environment, including interaction with nanoparticles (see figure). The physical and chemical properties of cell membranes have crucial implications for drug delivery and for the understanding of many diseases associated with malfunctions. *In vitro* lipid bilayers shown schematically in the figure are studied extensively both as model systems for cell membranes and for their intrinsic interest.

Another area where interface science is of utmost importance is the interaction of soft living matter with various surfaces. This is a problem of long-standing interest in the bioengineering community. A related challenge in this field is gaining understanding and control of bacterial adhesion and subsequent biofilm formation, which are crucial for controlling chronic and multidrug-resistant infections. These examples demonstrate the remarkable breadth and importance of interfaces. Their study spans hard and soft condensed matter physics, as well as chemistry and biology, and is at the heart of bioengineering.

SU's IGERT Program in Soft Interfaces is a collaborative effort of The College of Arts and Sciences and the L.C. Smith College of Engineering and Computer Science. It involves four departments: physics, biomedical and chemical engineering, chemistry and biology and will take advantage of expertise from the Newhouse School of Public Communications and the Maxwell School of Citizenship and Public Affairs. The recently established Syracuse Biomaterials Institute (SBI) to which many of the IGERT faculty participants belong, will make available its shared laboratories facilities and provide unity to the effort. Information on the program can be found at the website http://soft-igert.syr.edu

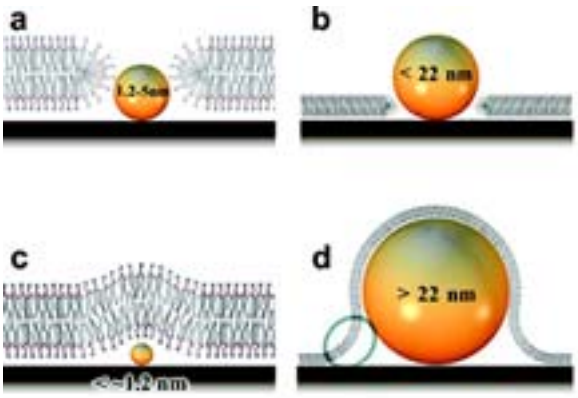
IGERT fellows will pursue a doctoral degree in one of the four participating departments while working on interdisciplinary research projects led by a faculty team composed of researchers in different departments. This will promote the growth of collaborative research across traditional disciplines at Syracuse University. A goal of the program is to train a new brand of researchers keen on establishing ties between academia and industry. Science and engineering students working alongside each other will learn to communicate and to appreciate each others' skills and goals. The students will also be exposed to current issues in science ethics and policy. This will be achieved by taking advantage of local expertise available across campus, especially at the Syracuse University's Maxwell School of Citizenship and Public Affairs. Finally, Prof. Don Torrance of the S.I. Newhouse School of Public Communication will develop a summer course in science communication where the IGERT fellows will receive hands-on training in using a variety of media to communicate science to both their peers and the general public.

The program will also develop and offer new interdisciplinary courses that will bring together graduate students and faculty from different departments. The first of such courses, *Physical Cell Biology*, will be offered in Fall 2012 and co-taught by Martin Forstner, assistant professor of physics, and Melissa Pepling, associate professor of biology. These courses will be open to all interested Syracuse doctoral students and will become part of the permanent graduate curriculum.

Doctoral students involved in research on soft and biological materials will be able to participate in various elements of the program as IGERT Associates. This will augment the cohort of IGERT participants greatly amplifying the impact of the program. Ultimately, it is hope that this NSF IGERT award will seed a change in graduate education at Syracuse towards a new model that reflects both the interdisciplinary nature of modern science and the need for the active engagement of scientists in the national discourse on science policy issues.

Cristina Marchetti, William R. Kenan professor of physics, is Principal Investigator on the award. Co-principal investigators are Patrick Mather, the Milton and Ann Stevenson professor of biomedical and chemical engineering and director of the Syracuse Biomaterials Institute; Alan Middleton, professor of physics; Dacheng Ren, assistant professor and coordinator of the chemical engineering graduate program; and Karin Ruhlandt-Senge, professor and chair of the Department of chemistry.

Photo of Cristina Marchetti by Stephen Sartori



Schematic of lipid bilayers interacting with nanoparticles of different diameter, adapted from Y. Roiter et al., *Langmuir* **25**, 6287 (2009).

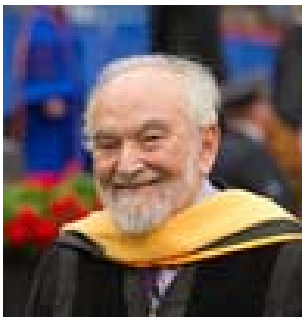
Cottrell Scholar Award—Duncan Brown

Prof. Duncan Brown recived a 2011 Cottrell Scholar Award from the Research Corporation for Science Advancement. Part of the funding will go to Brown's research in gravitational-wave astronomy, and part will go to his research in astronomy education. The goal of Brown's education research is to promote a broad understanding of science and the Scientific Method among the general public. With over 250,000 students taking Astronomy 101 classes nationally every year, improving this introductory science course for non-majors has a major impact the science education of a large number of students.

With an enrollment of 600 students, Astronomy 101 is among the largest introductory science classes in the College of Arts and Sciences at Syracuse. Students enrolled in Astronomy 101 have a wide range of backgrounds and the vast majority are non-science majors. A large number of students enter the course with a belief that science is hard or that science is something that they cannot do. Many of these same students will be future leaders in media, politics and business or tomorrow's K-12 teachers. Brown's approach to teaching is guided by a principle expressed in the National Academy of Sciences' Science Education Standards: science is for all students. Brown has been building on the existing material to improve the student's experience, instill in them an enthusiasm for science and a deeper understanding of the scientific method.

Astronomy 101 has been taught at Syracuse for many years using a traditional lecture-based approach. However, national research by the NASA Center for Astronomy Education has shown that traditional methods used in introductory astronomy courses are failing to produce significant learning gains for the students. This is not a new concept in science education; it has been described as far back as 1973 in a paper by Arnold Arons, but few classrooms have adopted the learner-center techniques that students can use to succeed. As a member of the Collaboration of Astronomy Teaching Scholars (CATS), Brown is introducing learner-centered teaching in the Astronomy 101 classroom and studying their effectiveness. In the learner-centered classroom, interactive lectures, peer instruction, and collaborative group exercises replace traditional lecture-based methods. While interactive group work can be straightforward to implement in a small class, it is more challenging in a classroom of 300 students. By measuring normalized gains for different topics---the difference between what the students know when they enter the classroom and when they leave---Brown has found that students learn concepts significantly better when taught with interactive methods, rather than traditional lecturing. Brown's research is aimed at developing further interactive materials, such as Lecture Tutorials for Astronomy; 15-minute exercises that encourage students to reason critically about difficult concepts in astronomy.

DOCTOR OF SCIENCE, HONORIS CAUSA
Joel Louis Lebowitz



Joel Lebowitz, physicist, teacher, mentor, human rights champion—you are admired around the world for the clarity of your insights into the forces that hold together not only our physical but our social world.

Your penetrating inquiries into matters of matter have opened paradigm-shifting vistas on the physical, biological, and mathematical sciences. Broad appreciation for the enduring significance of your work in statistical mechanics, vibration spectra, and quantum theory have earned you the highest accolades from colleagues worldwide, including fellowship in the most esteemed academic societies and the internationally prized Boltzmann and Planck Medals.

As co-chair of the Committee of Concerned Scientists for the past 30 years, you have drawn upon your survival against the odds in Auschwitz to help shape our shared conscience, exemplifying humility and courage as you marshal global attentiveness to the eternal moral and social responsibilities of scientists and citizens alike.

We at your alma mater are honored to recognize you for your unmatched acuity in exploring and explaining the coherence of matter, as well as your wisdom and leadership in advocating for the coherence of humanity.

Citation by Chancellor Nancy Cantor, May 13,2012

Pictures by Stephan Sartori

See PHYSICS MATTERS V5, 2010 for more about Joel Lebowitz

Soft Condensed Matter Physics

Syracuse University has established a Soft Matter Program with faculty members Lisa Manning, Cristina Marchetti, Jen Schwarz, and director Mark Bowick. Two distinguished Soft Matter Postdoctoral Fellows will be an essential part of the program with the first fellow arriving in September 2012 and the second in September 2013. The Soft Program will host international leaders in the field throughout the year and also reach out to a wider community via public lectures. The Program ultimately aims to secure external funding as a Center. For further information see http://syrsoftmatter.syr.edu/

Science at the Edge: Membrane Biophysics
by Martin B. Forstner

Cell membranes are one of the most important structures of living cells! A bold statement validated not only by the fact that they happen to be the focus of my research. Maybe more enticing should be the fact that the vast majority of today's drugs act by interacting with molecules that are part of the plasma membrane, i.e. the outer "shell" of cells. But then, what else are drugs supposed to do? One of the prime functions of cell membranes is to act as an impermeable barrier, to clearly define an inside and an outside of the cell. In fact, this ability to compartmentalize chemicals and establish sharp gradients has been deemed so important that some say it is an essential ingredient to life. In any case, what we do know for sure though, is that there is no known cellular life that is without a membrane. Thus, any external chemical signal, including drugs, need to be received at the membrane interface and then this information has to be passed actively by one of many mechanism through the membrane into the cell interior, where, fed into the complex biochemical reaction network of cellular signaling, the proper (or desired) response will ultimately occur. For many practical purposes, plastic bags are formidable barriers. What makes cellular membranes however truly remarkable is that they are quasi two dimensional fluids. Membranes are composed mostly of lipids and proteins. An ingenious balance between hydrophobic (water fearing) and hydrophilic (water loving) interactions guarantees that as long as they are surrounded by water, membrane components are confined within a two dimensional surface. Yet at the same time they are free to move about within this interface. We'll never know if that was just a fluke of nature playing with the molecules that were around back in the day, but it is clear that this property is extremely important for the proper biological function of cells. This is, because the molecular recognition events and subsequent signaling mechanisms mentioned above frequently involve reorganization of the membrane surface. Certain molecules need to go over there; others need to be concentrated over here and only if this dynamic restructuring is done successfully is the proper signal passed on. So when I said membranes are fluids then I really meant fluids with dynamic structures on many time and length scales, thus far outclassing the aforementioned plastic bag.

This is where it becomes truly exciting for the physicist. Liquid structures are collective phenomena, defined by their particular composition of molecules and interactions between these molecules. So what are then the physicochemical mechanisms that nature has evolved to use for creation and control of liquid structures in time and space and how is this dynamic organization interrelated with biological functions? These are the big questions that headlines most of the research in our group. In order to get at these basics principles and to understand them in a quantitative way, it is often well advised to leave the complex conditions of living cells with their thousands of different lipids and proteins behind. Instead, we create simplified membrane systems where we can be in command of membrane composition as well as the environmental factors, such as temperature, pH, ionic composition of the aqueous solution, etc. That way controlled experimentation and establishment of cause and effect relations are possible. Since we are interested in dynamic processes in systems that need to be surrounded by liquid water, the choice of investigative tools is somewhat limited. In our laboratory almost all experiments utilize light-based techniques as they are assumed to interfere minimally with the native structures and dynamics of our membrane systems under investigation. In particular we rely heavily on fluorescent techniques where some of the molecules of interest are labeled with small chemical compounds that emit light of higher wavelength when excited by light of lower wavelength. Using appropriate optical filters, one can get high fidelity signals to either image the labeled molecules directly or to perform spectroscopic measurements. For example, in a current project we are revealing how twice positively charged calcium ions can directly create membrane structures that are highly enriched with special lipids carrying a threefold negative charge at physiological conditions. In these studies we image the aggregation process under different conditions and use a spectroscopic method to determine the dynamic behavior of the aggregates with high accuracy. These are very exciting findings as this mechanism directly couples a ubiquitous cellular function, i.e. signal transduction via changes in intracellular calcium concentration, directly to changes in membrane structure.

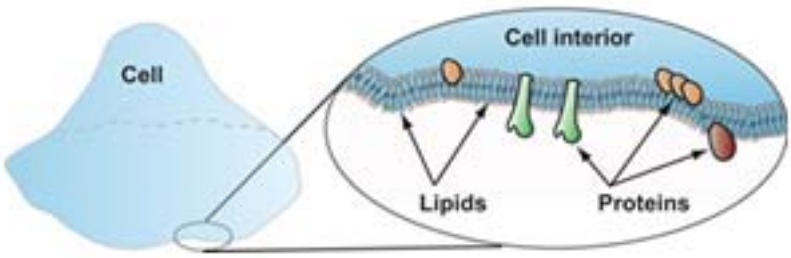


Figure 1: Schematic of a cell membrane. The cell is enclosed by a thin sheet of lipids and proteins. These components are confined to this interface, but are free to move within the membrane

What is this all good for? Maybe the satisfaction of figuring out how living matter and ultimately humans work is not sufficient. However, if one considers the unsettling fact that we have no clue how the majority of drugs work, one might agree that in order to design better drugs it might be beneficial to understand how the target system works. But even more, my hope is that we can learn from nature how to structure fluid interfaces and put this knowledge to good use. Maybe then, maybe even within my lifetime, my old, obsolete computer processor will by the flick of a switch just dynamically reorganize itself into the newest processor type.

Student Recognition

Manu Arul
Arnold and Mabel Beckman Scholarship

Daniel Keppel
Scholar in the Renee Crown University Honors Program

Mallory Ringham
Alt. Senior Class Marshal for 2013

Ryan Badman: Coronat Scholar and Astronaut Scholarship Student

Ryan Badman began his research career in the laboratory of Gianfranco Vidali as a junior in high school. Since he entered Syracuse University as a freshman physics major in the fall of 2009, he has worked in laboratories doing research in condensed matter and high energy particle physics as well as with Simon Catterall, a theoretical physicist, on conjectured new theories of strongly interacting particles which might describe the Higgs boson currently being sought for at the Large Hadron Collider at CERN. In particular, he has worked with the high-energy physics group on a project to build the next-generation particle detectors for the LHCb experiment on the Large Hadron Collider (LHC) ring at the CERN Laboratory near Geneva Switzerland. He spent the past summer at CERN working on this experiment. This has allowed him to find his passion in particle physics which he plans to pursue eventually in graduate work.

This past year, as a junior, Badman was a Renée Crown University Honors student and a Coronat Scholar, the highest award presented in The College of Arts and Sciences. As a Coronat Scholar, he has had to carry out a research project of his own. The paper he submitted was based on his research at Cornell on accelerator physics supported by the NSF Research Experience for Undergraduates program. During the past year, he was supported by an Astronaut scholarship which is awarded by the Astronaut Foundation, supported by 70 US astronauts. For his senior year, Ryan has received a 2012 Goldwater and a Remembrance Scholarship. The former is a highly competitive, national award that is presented to outstanding students who are pursuing careers in the fields of mathematics, the natural sciences, and engineering. Badman is one of 282 nationwide scholars to receive the 2012 award. The Goldwater Scholarship program, which pays $7500 toward tuition and books, was created in 1986 to honor Senator Barry M. Goldwater and is the premier undergraduate award of its type. The Barry M. Goldwater Scholarship and Excellence in Education Foundation, a federally endowed agency, administers the program.

Undergraduate Research Day, Matt LaHaye

This was the sixth year that the Syracuse Physics Department has hosted URD, which is geared towards physics majors at schools within a few hours driving distance from Syracuse, and provides them with a forum to present their research and meet other physics undergraduates, as well as introduce them to the Syracuse Physics program. This year's event attracted 60 attendees from 11 institutions, many of whom were repeat attendees from previous years. Throughout the day undergraduate students participated in a series of talks and a poster session, which underscored the diverse range of research being conducted at nearby colleges and universities. Among the many exciting topics were experimental investigations of supersolidity in He4, the use of Anderson localization of phonons for enhancement of thermoelectric-based energy harvesting, and the development of new nanofluidic devices for studying the DNA-binding properties of the p53 protein to provide greater insight into the progression of cancer. There were also four SU faculty talks (Plourde, Manning, Soderberg and Brown) and a tour of five SU faculty research labs (Plourde, Forstner, Movileanu, HEP, & Ballmer), which served to outline the diversity of research topics and graduate research opportunities in the Syracuse Physics Department. To start the day, Prof. Carolina Ilie from SUNY Oswego gave a talk on career options for physics majors.

East Coast Gravity Meeting, April 21-22, 2012 by Scott Watson

The 15th Annual East Coast Gravity Meeting was held at Syracuse this past April, preceded by a one day workshop to honor the accomplishments of Professor Emeritus Josh Goldberg. The meeting was organized by Professor Scott Watson (left) and sponsored by the American Physical Society. The East Coast Gravity meetings are an informal gathering of area researchers working in the fields of gravity and cosmology, whose goal is to increase the visibility of research being done at nearby institutions and foster collaborations. This year's meeting set a record for the largest participation, with over 150 participants from more than 35 institutions, and around 80 talks scheduled during the duration of the event. A broad range of interests were represented at the meeting, which saw cosmologists, relativists, and string theorists come together with a common goal of unraveling open questions tied to the theory of gravity and its observations. Topics ranged from detection of gravitation waves with LIGO to more formal topics such as string theory and its role as a theory of quantum gravity, with the Syracuse LIGO group making a strong showing in the former. It is a tradition of the East Coast Gravity Meeting to award the best student talk with a $200 cash prize sponsored by the American Physical Society. Professors Watson and Armendariz-Picon were presented with the daunting task of identifying the best student presentation from roughly 30 speakers. Given the large number of speakers and the strong quality of this year's talks there were two winners: Eva-Maria Mueller of Cornell University for her presentation "Constraining the Effective Field Theory of Gravity," and Godfrey Miller of the University of Pennsylvania for his talk entitled "Spatially Covariant Theories of a Transverse, Traceless Graviton." Three students received honorable mention, including Syracuse's own Prayush Kumar for his presentation "Model waveform templates to use to search for gravitational waves in Advanced LIGO era." Next year's East Coast Gravity Meeting will be held in Toronto, Canada.

Richard Galvez
Syracuse

JoshFest by Peter Saulson

Ed Glass

On April 20, 2012, we had a wonderful opportunity to celebrate the career of Professor Emeritus Josh Goldberg.

The initial impetus for the celebration came from his Ph.D. students, Ed Glass and David Robinson, who conceived and then gave birth to a special issue of *General Relativity and Gravitation* entitled "Physics, gravity, and the work of Joshua Goldberg." Altogether, 26 articles were written in response to their call, published as Volume 43, Number 12 of the journal in December 2011 on topics ranging from reminiscences and historical reflections to research articles at the frontiers of classical general relativity, quantum gravity, cosmology, and the philosophy of mathematics.

Ed then contacted me to suggest that we hold a small event in Syracuse at which Josh could be presented with a copy. I brought the idea to Josh who had been stunned by the special volume. At first, he modestly demurred, but upon reflection he realized that it would be a nice occasion for a reunion party. Thus was born what blossomed into JoshFest. At Scott Watson's suggestion, the event preceded the East Coast Gravity Meeting that he was organizing.

The event was as enjoyable and happy as one would have expected. About 25 guests came by invitation. At the appointed time, close to 100 people were in Stolkin Auditorium for the formal afternoon program. Following the presentation of the special volume to Josh by Ed Glass, there were four colloquium-level talks on different aspects of Josh's career. John Stachel gave a graceful historical review of general relativity in the post-WW II years, covering a large cast of characters. I presented a brief history of gravitational waves, emphasizing the role played by Josh in launching what has now blossomed into LIGO. Mark Trodden discussed the puzzles of cosmology related to the accelerating expansion of the universe. Last but not least, Rafael Sorkin reviewed the field of quantum gravity, giving special attention to the causal set program in which he has played such a big role.

For the evening, guests moved to the Goldstein Alumni and Faculty Center for a cocktail reception sponsored by the family of Josh's physicist nephew Ross Berbeco. After dinner, Ted Newman regaled the guests in his inimitable style. The event wound up with numerous impromptu testimonials to Josh's physics acumen, his character, and his and Gloria's hospitality.

Faculty News

Scott Watson spent a month at DAMPT at the University of Cambridge, England and gave several invited talks on cosmology. In addition, he organized *Northeast Cosmology Workshop* at McGill University, Montreal, Canada (September 30 – October 2, 2011)Texas A&M Workshop: 'Conformal Symmetry in Greater than Two Dimensions' (March 12-16, 2012), and the

Sheldon Stone and the HEP group have found some evidence for violation of charge conjugation in the decay of B mesons, but that is still not fully confirmed. Several talks on the results of their observations have been given by Marina Artuso,

Mitchell Soderberg: received an NSF grant entitled "Neutrino Physics with Liquid Argon Detectors" in the amount of $420,000 over 3 years. He has given several talks on properties of neutrinos.

Richard Schnee received funding to continue his search for dark matter with the CDMS group at the mine in Soudane. He has given several talks on results of the search so far as well as co-organizing a workshop on simulations of underground experiments.

Eric Schiff gave an invited talk "Plasmonics and light-trapping in thin-film solar cells" at the **SPIE Optics and Photonics Conference**, San Diego (August 21, 2011). He gave several other talks on similar subjects and together with Qi Wang (G '93) gave a one-day tutorial "Thin film silicon and related materials for solar cells and displays", at the Spring Meeting of the Materials Research Society in San Francisco (April 9, 2012).

Britton Plourde received an NSF grant "Coupling a Single Vortex in a Superconductor to a Single Microwave Photon" for $345,000 over three years started Sept. 15, 2011. He was invited to join the New York State Superconductor Technology Summit 2011 in Schenectady, NY on Aug. of Superconductivity.

Liviu Movileanu has had a very busy year. He was elected a member of the Editorial Board of the International Scholarly Research Network (ISRN) Biomathematics (2011-). He has given several talks on nanoelectronic devices and engineered nanopores as well as continuing his collaborative research with Tohoku University (Prof. Makoto Ohta)..

Matt LaHaye gave a colloquium talk at Amherst College as well as a seminar in the Physics Department at Queen's University (Kingston, Ontario). These talks were based on his research on quantum measurement.

Lisa Manning gave an invited talk, "Structural Soft Spots Control Flow in Ordered and Disordered Solids", and was a session chair at the *Complex Dynamics of Dislocations,Defects, and Interfaces* workshop at the Center for Nonlinear Studies at Los Alamos National Lab (November 14-16, 2011).

Jay Hubisz was an organizer of an ongoing workshop, *MC4BSM-2012: Monte Carlo Tools for Physics Beyond the Standard Model*, Cornell University (March 22-24, 2012).

Simon Catterall was lecturer at the international summer school "Lattice QCD and Hadronic Structure" at the Institute for Nuclear Research, Dubna, Russia. He gave seminars at the University of Colorado at Boulder and the Perimeter Institute on his work applying lattice calculations to quantum gravity and an invited talk at Fermilab.

Mark Bowick gave invited talks, "Defect-Driven Structures for Self- Assembly" and "Facets of Order" at the *International Congress on Industrial and Applied Mathematics 2011 (ICIAM 2011)* and the *2011 Soft Condensed Matter Physics Gordon Research Conference* , respectively. He also gave seminars "On Shape and Order" at Georgetown University and "Facets of Order" at Northwestern University.

Marina Artuso was invited to give a review talk "Heavy flavors at the LHC", August 2011 Meeting of the Division of Particles and Fields. She also gave talks on hadronic b-hadron decays at the *Europhysics Conference on High Energy Physics 2011* and the *Brookhaven Forum 2011*: *a first glimpse at the Terasccale.*

Stefan Ballmer received an NSF grant, "Searching for a Stochastic Background, a LIGO Rare Transient Monitoring and Optical Mirror Trapping", in the amount of $450,000 over three years.

Erich Harth. A short biography

I was born November 16, 1919 in a small town near Vienna, Austria, grew up and went to school in Vienna and entered military service there in 1937. In 1938 Hitler marched into Austria, and my regiment became part of the German Wehrmacht. Several months later I managed to leave the army and Austria, reaching Portugal via Italy and Algiers. I intended to get to Spain to join the International Brigade, but the civil war there was rapidly coming to an end and the borders between Portugal and Spain were all in Franco's hands. After one year in Lisbon I secured a temporary visa to Brazil, stayed in Rio de Janeiro for several months, and after a brief stint in Santos harbor carrying coffee bags, wound up working on a cocoanut plantation on an island off Brazil's coast for about a year.

In December 1940 I arrived in the United States on an immigration visa. An agency in New York told me chances for securing work would be better upstate. I was given a letter of introduction to somebody called Norman Jehiel Whitney who was then the head of the Syracuse Peace Council and a faculty member at the English Department at SU. The Peace Council was then helping a number of refugees who had come to Syracuse from Europe.

I arrived in Syracuse on a very cold winter morning with less than $10 in my pocket and no coat. Mr. Whitney took me to the Hotel Syracuse for a job (bus boy) which sustained me for the next two years and paid my tuition at Syracuse University. The head of the Physics Department, William Fredrickson, persuaded me to switch my major from philosophy to physics ('this is where the action is'), and I completed undergraduate work in two years because of advanced credit received for schooling in Austria.

In the spring of 1943 I received a graduate assistantship in the Physics Department. The US was now fully engaged in World War II, and after a few months in graduate school my draft deferment was revoked, and I was in the army again, this time the US Army.

I volunteered for the paratroops and spent the next 2 ½ years in the South Pacific and, after the war, with the occupation forces in Japan. I returned to Syracuse in 1946 with a Combat Medical Badge and two battle stars. I resumed graduate work in physics, chose cosmic ray research with Prof. Kurt Sitte as my advisor, and after building a large Wilson cloud chamber and operating it for two summers at high altitude on Mt. Evans in Colorado, received my PhD in 1951. The subject of the dissertation was high energy cosmic ray air showers.

Earlier I had met and married Dorothy Feldmann, an instructor in the Department of Romance Languages at SU. We had our first son, Peter, when I received my PhD. My second son, Richard, was born a few years later when Dorothy received her PhD. Dorothy has been my helpful companion for the past 61 years.

My first job was with the US Naval Research Laboratory in Washington DC were I headed a small group doing nuclear research using a betatron. I was back in high energy physics when the opportunity arose to collaborate with Ralph Shutt of Brookhaven National Labs and Martin Block of Duke University on data taken with a hydrogen diffusion chamber exposed to a 1.75 Bev proton beam at the cosmotron. Later I accepted a post-doctoral position with Block at Duke.

Bubble chambers had just been invented and caused a revolution in high energy physics. For the first time interactions could be observed in large volumes of chosen target material. Liquid hydrogen soon replaced propane and some papers by Lee and Yang suggested that helium nuclei would make interesting targets for a K(minus) beam. Such beams had just become available at the Berkeley bevatron. Among other problems, the possibility of observing He(4) and H(4)) hypernuclei in K-minus-He collisions promised to establish the k-lambda relative parity.

We decided to build the first liquid helium bubble chamber with the enthusiastic support of Duke's low temperature group under Bill Fairbank. After a successful pilot project, the construction of a 3 ½ liter helium chamber was launched. After a long run in the k(minus) beam at the bevatron, this instrument proved to be a most successful research tool which provided years of data for high energy groups at Duke, Johns Hopkins, Oak Ridge, and Syracuse (after my being appointed to the faculty of SU in 1957). This effort resulted in the publication of many research papers. The Syracuse portion of the effort was strengthened by the appointment to the SU faculty of Jack Leitner who had collaborated with me in the design of the helium chamber at Duke, and Nahmin Horwitz who was instrumental in building the k-minus beam at Berkeley. The first He(4) hypernuclei were observed at Syracuse and established as odd the k-lambda relative parity.

In the mid sixties my attention was drawn to the efforts of several small groups of physicists who sought an understanding of the workings of the human brain by studying the dynamics of assemblies of neuron-like elements, mostly by computer simulations. With the help of a few students I published a number of papers around 1965 showing that randomly connected populations of neurons exhibited hysteresis effects that could account for memory formation, and were able to simulate a number of different reflexes. Later our group showed that lateral inhibition, a symptom that is ubiquitous in sensory processing, and in which a local stimulation causes depression of activity in surrounding neural areas, has the effect of stabilizing images upon repeated reflections in the presence of neural noise.

More recently my main interest has been drawn to the central problem of neuroscience, that of the nature and neural mechanisms involved in the phenomenon of consciousness. I published a number of papers on the subject and two books for the general reader: *Windows on the Mind* (1990) and *The Creative Loop* (1993). Two unique features are stressed as possible sources of awareness. One is the altered function of time in the human brain, the other the appearance of positive feedback all along sensory pathways. reciprocally connecting peripheral sensory areas to more central portions of the brain. I envision processes in which higher cognitive centers are able to generate, examine and manipulate *from above*, images created near the periphery of the sensory pathways in what I called the *sketchpad model* of human thought processes.

1950's picture above by Irv Kofsky

Discovery, at last! - Steve Blusk

Many theories in physics exploit symmetries in nature, and the theory of matter and forces, the so -called 'Standard Model', is no exception. Unfortunately, it was realized early on that just adding particle masses into the fundamental equations destroyed that cherished symmetry.

The Higgs mechanism, suggested more than 50 years ago by Peter Higgs, was a way to circumvent this problem. In essence, the fundamental particles acquire mass by the way they interact with the 'Higgs field' that permeates all of space and with a related physical particle, called the 'Higgs boson' that should be produced, albeit very rarely, in very high energy collisions. For the last two years, the LHC has been colliding high energy protons into one another with the expectation that, once in a rare while, a Higgs boson will be formed. After over 50 years of searches, the CMS and ATLAS collaborations at the Large Hadron Collider at CERN announced that they had discovered this elusive particle. It's role cannot be understated: it existence is critical to our understanding of what "mass" really is.

While the observation is indeed a once-in-a-lifetime discovery, much more remains to be done. In the last 15 years we have learned that in our Universe there exists a new form of matter, dubbed "dark energy". This new form of matter differs from "ordinary matter", such as hydrogen, carbon, stars, galaxies, etc, in that it neither produces nor reflects light. It drives the expansion of the universe, and most shockingly, there is about six times more of it than "ordinary matter" in the Universe. Our best guess is that it is in fact a new heavy subatomic particle, and if that is indeed the case, it would demand a deeper theory of matter, since all the particles in the Standard Model have now been discovered! There are other deep questions as well that lead physicists to believe that a deeper theory is just around the corner, and waiting to be exposed at the LHC.

The LHC's primary goal is to reveal a deeper theory of matter and forces by searching for new particles, The experimental high energy physics group at Syracuse ((M. Artuso, S, Blusk, T. Skwarnicki and S. Stone) is actively engaged in the search . Together, these experiments will push our quest forward to uncover a deeper and richer theory of matter, forces and the very Universe we live in.

"I WAS ONLY SAYING TO THE WIFE LAST NIGHT PROFESSOR, THIS HIGGS BOSON PARTICLE BUSINESS - WHAT DO YOU MAKE OF IT?"

Advanced LIGO is taking shape—Stefan Ballmer

The quest to listen to our universe through vibrations of space-time is about to go into the next phase. The Laser Interferometer Gravitational-Wave Observatory (LIGO) is using Michelson interferometers with 4km arm length to measure the tiny fluctuations in space-time that are the fingerprint of cataclysmic cosmic events, such as the merger of two neutron stars.

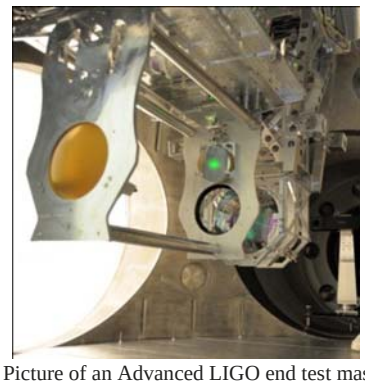
LIGO has seized its observation runs with the initial hardware two years ago, and began installing the Advanced LIGO interferometers at the two sites in Washington state and Louisiana. Advanced LIGO is designed to observe mergers of neutron stars in a volume of space about 1000x bigger than initial LIGO.

Over the last two years, all of the initial hardware was decommissioned and taken out of the vacuum tanks. The new Advanced LIGO equipment, such as active in-vacuum seismic isolation tables, multi-stage pendulum suspensions for test mirrors, and a new 200Watt laser source were gradually installed and commissioned. As an early test of the new hardware, the first light was circulating in one arm of the Hanford interferometer this summer.

The installation of heavy equipment is expected to continue until 2014. After that, the fine-tuning of the interferometers will begin. Over the following three to five years every source of excess noise has to be identified and eliminated. During this period the interferometer sensitivity is expected to steadily increase, and a few short initial observation runs will be conducted. By 2019 the two LIGO observatories in Washington state and Louisiana will be fully operational.

In parallel, the LIGO project is also pursuing the construction of a third observatory in India. The selection of a new site in India is currently ongoing. LIGO India is expected to be operational around 2020. India was chosen because the large distance between the existing U.S. and the new Indian observatories will greatly aide the source identification. Indeed the three LIGO observatories, together with the European Virgo Observatory near Pisa, Italy, and the newly-constructed Japanese KAGRA observatory in Japan, will form a global network, listening to the universe in a spectrum never before accessible to mankind.

The Syracuse University Gravitational Wave Group is playing a vital role in many parts of the LIGO project, with contributions to the search for binary mergers, the computing infrastructure, the quality assessment of LIGO data and the research of technologies for future improvements to Advanced LIGO.



Picture of an Advanced LIGO end test mass suspended by glass fibers (mirror at the far end) and the folded transmission monitor telescope assembly. A glass reaction mass hangs between test mass and telescope assembly which is used as a quiet actuation platform and carries the electrodes for the electrostatic drive . The green light visible on one of the telescope mirrors is used for initial alignment and lock acquisition.

Passing Thoughts...Arnold Honig 1928-2012

Arnold Honig, emeritus professor of physics, passed away on January 31, 2012. He had come to Syracuse University as an assistant professor of physics in 1956, and he spent his entire faculty career here. Arny was a proud graduate of the Bronx High School of Science. He did his undergraduate work at Cornell University and was admitted to Columbia University for doctoral work in physics. Arny did his thesis in the lab of Charlie Townes who invented the maser. Arny shared a piece of Townes' Nobel Prize and Arny said that he regretted not keeping the check as a souvenir, but he needed the money for his family. At this time he was married to Alice Honig, a professor in Child and Family Studies in the Falk College.

Arny spent a postdoctoral year in France, where he mastered the new field of magnetic resonance in semiconductors. While there, with the recommendation of John Trischka who knew him at Columbia, he was hired by Syracuse University where he joined the distinguished group of physicists who had come after World War II. He built up one of the first laboratories in the United States for magnetic resonance at low temperatures. The 1950s and 60s were an era of plentiful support for physics research, and Arny used the opportunity to create a thriving laboratory from which 30 doctoral students ultimately graduated. Many of Arny's students went on to distinguished careers of their own, and a number returned for a reunion two years ago (PHYSICS MATTERS V5, 2010).

In his later career, Arny's lab became the place where special, "nuclear spin-polarized" materials could be made best in all the world. He only closed his lab a few years ago, and he was active in the department the week before he died. Arny's ideas, experimental techniques, and former doctoral students were crucial for a recent, important physics experiment. It seems entirely possible that they will ultimately be needed for making energy with nuclear fusion and for improving MRI machines.

Arny was a colorful and irrepressible figure on campus. Lunch with friends was often in one of a succession of university dining halls – Slocum, Schine, and Eggers – where it was always possible to find Arny's table quickly as his voice could be heard everywhere over the noise, along with the jolliest laughter in the hall. Apart from his physics, Arny was passionate about politics, music, and especially his family.

Shortly after he died, Cristina Marchetti and Mark Bowick wrote, "He was a physicist's physicist - in it solely for the joy of shedding new light on the perplexities of the natural world before once again plunging into the darker depths of our ignorance. We need more Arny's!"

By Eric Schiff

Departmental Teaching Awards

Fall 2011

Teaching a Large Class Dinner Award goes to Prof. Duncan Brown for AST 101

Two Teaching a Small Class Lunch Awards:

Prof. Britton Plourde for PHY 215

Prof. Alan Middleton for PHY 531.

Spring 2012

Teaching a Large Class Dinner Award goes to Sam Sampere for PHY 221 and 222.

Teaching a Small Undergraduate Class Lunch Award goes to Mitch Soderberg for PHY 361

Close runnerup Smoothie or Ice Cream Award goes to Stefan Ballmer for PHY 425.

Teaching a Graduate Class Lunch Award goes to Richard Schnee for PHY 795.

Milestone Anniversaries

Steven Blusk

10 years

Carl Rosenzweig

30 years

Edward Lipson

35 years

Eric Schiff

35 years

Henry Levinstein
December 4, 1919 – June 20, 1986

Professor Henry Levinstein joined the Syracuse University Department of Physics in 1947 and took over a research program, supported by the Air Force, to develop infrared detectors initiated by retiring Professor Woody Johnson. Those students who graduated before 1970 may remember hearing about Mrs. Jennings wooden leg. It was a large beam supporting the floor next to Mrs. Jennings desk in Steele Hall. Over that beam was a safe that contained papers related to those contracts. Experimental PhD graduates still climb the leg, now in the basement of the Physics Building, to attach a brass plate bearing their name, topic, and year.

Henry loved toys – especially toys with which he could demonstrate an interesting concept in physics. He collected over 600 toys. Around 1970, he began giving talks on the physics of toys that developed into a one hour course . That course was oversubscribed with students sitting on the stairs in Stolkin Auditorium and enjoying his wit as he explained the operation of a simple or not so simple toy. This course was given every year until he died of a heart attack in June of 1986.

He was born in Themar, Germany in December 1919. His father was a religious teacher and the family lived in a building that also served as a community center. However, the rise of Hitler and the Nazi party made life very uncertain. So, in 1935, at the age of 15, Henry was sent to live with an uncle in the United States. He completed high school and entered the University of Michigan in 1938. After receiving his Bachelor's degree in 1942, he remained at Michigan for his MS in 1943 and PhD in 1947. As an undergraduate, Henry supported himself by waiting on tables in the Catskills for tips in the summer and during the term as a kitchen worker in a fraternity.

In his laboratory, Henry and his students studied the properties of photovoltaics, the diffusion of cadmium-indium alloys into lead-tin telluride (PbSnTe), photoconductivity indium arsenide-gallium arsenide (InAs-GaAs) alloys, and made measurements of photodiode spectral response. Most notably out of the laboratory came mercury-doped germanium materials and mercury cadmium telluride (HgCdTe) for use in infrared detectors which did not require the use of liquid helium for cooling. In a eulogy, Don Bode, among his first students, said that Henry "helped educate a large percentage of the nation's key people in the infrared detection industry".

Henry was a Fellow of the APS and the Optical Society of America; a member of Phi Beta Kappa, Sigma Xi, AAPT, and AAAS. He helped establish and was long time president of IRIS (Infrared Information Symposium), now MSS (Military Sensing Symposium). The MSS Detector Specialty Group gives an annual award, now the Henry Levinstein award. Henry and five of his students were recipients of this award. On receiving the award, Paul LoVecchio said, "He was a technical celebrity who stimulated all levels of students and scientists. He was a great man. Dr. Henry L. Levinstein and his detectors sensed what life is really about at many levels".

Henry was also a devoted family man. In 1962 he married Betty Strauss and helped raise her three boys.

Paul Lovecchio, PhD '71

Note from Manolis Dris ,Phd '75

I am Professor Emeritus (for the last 3 years!!!, time goes…) at NTUA (*National Technical University in Athens, sic*). I went to Demokritos after the Univ. of PA. I was for sometime Group Leader and primarily worked with DELPHI. Then I became associate Professor at NTUA and later (Full) Professor. I was group leader and Greek representative for ATLAS (3 Universities are involved at *LHC, sic*).

I was Vice Rector for three years. It is not easy to do research especially experimental, in Greece, but we try to do our best. We have some very very good students undergraduate and graduate ones.

I used to teach for several years the graduate course of Eloctromagnetism at the level of Jackson with my touch. Now I teach the graduate course of Analytical Dynamics and try for years to write a kind of a book. It is at the level of Goldstein with many differences. I am never satisfied and always change it!!

At the same time I am writing a book on Electronics and another on physics problems.

I get involved a little bit with the research related to ATLAS our group is doing.

It is very good that all of you people are on contact with each other. I keep some contacts with students and post doctors from Syracuse and the Univ. of Pa and Fermilab.

…….I was both an Undergraduate and Graduate student benefiting from wonderful teachers such as Henry Levinstein and Herbert Berry …. As a graduate student I was fortunate to have had Henry Levinstein, otherwise known to his graduate students as "Doc" for my thesis advisor. For most of his graduate students "Doc" was not only a guiding mentor in our dissertation studies, but also a warm friend always willing to lend a sympathetic ear. I received my Ph.D. in 1971 in the field of infrared detectors as did all of Doc's graduates. Many of Doc's graduates remain in touch because the infrared detector field is such a small field but also because by the time we had earned our Ph.D.s we had become a closely knit family wanting to stay in touch through all of the future ups and downs of life. At annual conferences on infrared detector advances we would look forward to sharing family photos and "catching up". Several years ago I was honored with the "Levinstein Award" at such a conference. This award has been given annually by the Military Sensing Symposium for "Lifetime Contributions to Infrared Technology". …The infrared detector technology and knowledge that I gained at Syracuse University under Doc's mentoring has proven to be an extremely satisfying career path for my entire life. This path has always had challenges but has resulted in continual progress to this day. We began doing research on materials for single element infrared detectors measuring one mm on a side in the 1960's in Doc's laboratory. Most recently infrared detector arrays of greater than four megapixles are being fabricated with detectors as small as six micrometers or less on a side. These detectors form the foundation of much of our nation's strategic and tactical defense systems.

Degrees Granted—2012

Doctor of Philosophy:

Anosh Joseph	Pramod Padmanabhan	Zhenwei Yao
David Quint	Chunhua Song	Zafar Ahmed
Michele Fontanini	Abudureyimu Reheman	Riccardo Penco
Larne Pekowsky	ShiliYang Xu	Naeem Shahid
Collin Capano	Levon Vogelsang	Michael DeFeo

Masters:

- Irina Ramanandraitsiory
- Kun Gao
- David Kelley*
- Hardik Panjwani
- Ibrahim Nsanzineza*

*Concurrent with PhD

Bachelors:

- Diamond Breland
- Shane Dunn
- Ryan Ellis
- Christopher Hammond
- T.J. Iacoviello
- Samantha Hay
- Jared Inouye
- Daniel Jardin
- Daniel King
- Hiebin Kwon
- Stephen McMillan
- Sarah Spencer
- William Swartz

Undergraduate Commencement Awards—2012

Neil F. Beardsley Prize—Samantha Hay
Paul M. Gelling Scholarship—William Swartz
Award for Academic Excellence—Jared Inouye, Daniel Jardin, Hiebin Kwon, Sarah Spencer

Contributions can be made to the following:

_____Henry Levinstein Fellowship Fund—this **graduate** fellowship is to foster graduate student research with members of the Physics faculty, based on academic excellence of the nominee and promise of excellence in research.

Henry Levinstein (1919-1986) came to Syracuse University in 1947 and established a laboratory to study the properties of various lead salts sensitive to the infrared spectrum. He introduced a once a week lecture course on the Physics of Toys which was oversubscribed and overfilled Stolkin Auditorium. Much loved by his students, the Henry Levinstein Fellowship Fund was established by them.

_____ William Fredrickson Fund— this **undergraduate** fund was established to provide a partial tuition scholarship for an incoming freshman who indicates an interest in physics.

William R. Fredrickson came to Syracuse University in 1928 and was Chairman of the Physics Department from 1939-65. With the end of World War II, he began to build the department by choosing a faculty with strong interests in research. He was admired for his warmth and consideration of both the students and faculty. For his 75th birthday, former students, faculty, and university colleagues contributed funds for the William R. Fredrickson Scholarship Fund.

_____Niel F. Beardsley Prize—an award to an **undergraduate** physics major, based on outstanding academic achievement and contributions to the department.

Niel F. Beardsley was not a student at Syracuse University. He was both the monitor at Wright Patterson Air Force Base of some of the research carried out in Henry Levinstein's laboratory and a contributor to that research. When he died in 1962, friends and colleagues raised the funds to establish the Neil F. Beardsley Memorial Award whose undergraduate awardee would be selected by the Syracuse University Physics faculty.

_____Paul M. Gelling Fellowship Fund—a memorial scholarship fund made to an outstanding **undergraduate** physics major based on outstanding achievement.

Paul Gelling was a long time jack-of-all-trades in the department from 1949-84. He set up the demonstrations, printed laboratory manuals, constructed laboratory space, and generally took care of the building. When he died in 1984, his children, Paul D. and Susan Gelling and Mary Gelling Merritt, recognized Paul's identification with and devotion to the department by establishing the Paul M. GellingFellowship.

_____General Department Gift Fund: At the discretion of the Chair, funds are used to support teaching, research, travel and other general departmental needs.

Checks should be made out to *Syracuse University* with an indication of the selected fund, and sent to:
Chair, Department of Physics, Syracuse University, 201 Physics Building, Syracuse, NY 13244-1130.

Syracuse University
Department of Physics
201 Physics Building
Syracuse, NY 13244-1130

Physics Matters

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Steele Hall circa 1950