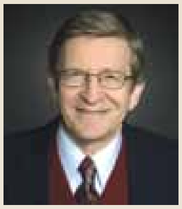
Spring 2011 | Issue 2

Continuum

COLLEGE OF ARTS AND SCIENCES ◆ OAKLAND UNIVERSITY



Dear alumni and friends,

We are devoting the entire spring issue of *Continuum*, the newsletter of the College of Arts and Sciences, to stories about our amazing Department of Physics. When you finish reading these features, you will see why I am justified in using the word "amazing."

Just before going to press, we learned that Distinguished Professor of Physics Gopalan Srinivasan has been named "Michigan Distinguished Professor of the Year" by the President's Council of the State Universities of Michigan — yet another accomplishment for this remarkable professor and his remarkable department. He is the second OU professor so honored. Two years ago, mathematics professor Eddie Cheng was the Michigan Professor of the Year.

Speaking of Professor Cheng, I am pleased to report that he has been nominated as our next Distinguished Professor. A gifted and charismatic teacher and a distinguished researcher, Professor Cheng has been deeply engaged in the life of the university, directs the Summer Mathematics Institute, and chairs the Department of Mathematics and Statistics.

This academic year has also been the inaugural season of the Oakland Symphony Orchestra, which was celebrated at a spectacular concert including hundreds of musicians performing Mahler's Second Symphony ("Resurrection") at the Ford Community and Performing Arts Center in Dearborn. The creation of our own symphony orchestra marks a major advancement for our programs in music.

As I write this, we are grappling with how to move forward while absorbing a cut of between and $8 and $11 million in state funding for Oakland University. More than ever before, your support is needed and will be welcomed with deep gratitude.

Sincerely,

Ronald A. Sudol

Ronald A. Sudol
Dean, College of Arts and Sciences

"Real-world" lessons keep physics class interesting

Much is expected of a physics professor at OU — but walking on water? No, it's not a new requirement for faculty members to establish tenure. Rather, it's a dramatic and very memorable way that one OU physics instructor explains the peculiar properties of "complex liquids" to students in his "Physics of Everyday Life" class.

Alberto Rojo, Ph.D., associate professor of physics, uses a hands-on approach in teaching the basics of physics to OU students whose majors are not in the sciences. To give these general education students a better understanding of underlying scientific principles, Professor Rojo employs what some may consider non-standard approaches to conducting class experiments.

In a recent example, he proposed to "walk on water" during class to demonstrate the unique properties of complex fluids: substances that are liquid but, in certain circumstances, behave like a solid. After students helped stir a mix of corn starch and water into a batter-like consistency, Professor Rojo was able to walk swiftly across a container of the liquid without sinking into it (to view this demonstration online, visit **oakland.edu/rojowaterwalk**).

"It's fun for the students, but we're not doing this for entertainment," explains Professor Rojo. "I'm teaching basic physics, and these kinds of demonstrations show them exactly how the principle works. The hands-on approach seems to work better for many of the students than reading about it from the textbook."

Typically, students learn how to perform experiments using common household items. By using a trash bag and a straw, for instance, students in the class were able to lift a person, which demonstrated how pneumatics work. In another experiment, students learned how to make a working audio speaker by using a straw, a small magnet and a plastic cake box. "The point of this course is to employ the visible to describe the invisible, which really is what the study of physics is all about."

The hands-on — or sometimes feet-on — approach works better than textbooks for some students, says Professor Alberto Rojo.

An OU instructor since 2003, Professor Rojo helped develop the hands-on course in addition to teaching graduate classes in classical electrodynamics and quantum mechanics. "As an educator, I've found this hands-on classroom process gives me new ways of understanding the concepts myself," Professor Rojo says. "It gives me an opportunity to implement new ideas and materials in a different environment." ◆

Boredom-busting prof aims to stimulate lab interest

It's no secret that required science courses are often met with a distinct lack of enthusiasm by general education students. The groan factor is often amplified when the course in question requires them to learn and apply scientific methodologies to complete the course.

That's a challenge that Kapila Clara Castoldi, Ph.D., adjunct associate professor of physics, must meet head-on every term at OU. As an instructor in the introductory General Physics class, she is on the front line in stimulating interest in lab experience among these reluctant scientists.

Science doesn't have to be dull, says Professor Clara Castoldi. Involving students in lab experiments keeps them interested.

The best way to spark their interest? Let them get their hands dirty — so to speak.

"My students are headed off in many directions, career-wise, some of which aren't in the sciences," she says. "For those whose perception of lab studies is that it is boring, it can be difficult to keep them interested. What I do is get them involved in the lab."

She conducts four to five hands-on activities over the term, in which students get a basic foundation for conducting scientific research. In addition, Professor Castoldi frequently uses real-world examples or parallels in her classroom, making the concepts less abstract.

"I find the bulk of high school students don't have a physics background, so they are always a little lost," she observes. "The hands-on experiments help them understand how to think critically, and the real-world examples put sometimes-difficult concepts in a context they can understand."

Professor Castoldi, who has been at OU since 1996, worked previously as a research associate in high-energy elementary particle physics at Virginia Tech and Northwestern universities. She also worked as a research associate for 10 years at the National Institute for Nuclear Physics in Pavia, Italy.

OU student Kyle Omell gets a first-hand view of the effects of friction during Professor Castoldi's track acceleration experiment.

"My background in research has clearly influenced my way of teaching, which weighs heavily on conceptual understanding," she says. "I always try to give the broader picture and create parallels between fields, such as electricity and gravity, for instance. Bringing in similarities in concepts shows them a bigger view and demonstrates that science doesn't have to be boring." ◆

"Real-world examples put sometimes-difficult concepts in a context they can understand."

Research in Review

Using models and computer simulations, Professor Bradley Roth explores how cardiac defibrillation methods can be improved.

Heart disease is the leading cause of death in the United States. Yet, decades of cardiology research have not resolved many questions about the mechanisms of electrical stimulation of cardiac tissue.

At OU, Bradley Roth, Ph.D., professor of physics, is researching the effects of strong electrical shocks on cardiac tissue. His study may yield important outcomes for medicine in treating heart arrhythmias. Professor Roth's goal is to use mathematical modeling and computer simulations to resolve some of the questions concerning the proper application of defibrillation.

"The effect of a shock depends on how electrical current enters and leaves the heart cells," Professor Roth says. "The distribution of current depends on properties such as anisotropy — the different electrical properties along and across the heart fibers. You can't understand defibrillation without understanding the basic mechanisms of current flow in cardiac tissue."

Understanding the bioelectric behavior of cardiac tissues is crucial to improving lifesaving medical devices, he says. A broader understanding could ultimately lead to technologies that enhance many important medical devices, such as pacemakers and defibrillators.

Professor Roth's research has received considerable attention from other researchers and key external funding agencies, which continue to direct coveted research dollars to support his efforts. ◆

OU labs lead breakthrough research efforts

Yang Xia, Ph.D., (left) and Gopalan Srinivasan, Ph.D., are leading innovative research projects that may have wide-ranging applications.

Two researchers, two laboratories; both within yards of one another at OU. The neighboring research domains of physics professors Gopalan Srinivasan, Ph.D., and Yang Xia, Ph.D., are significantly different, but equally important. Both endeavors are attracting the attention — and all-important grant money — of several external funding agencies.

Honored this year as Distinguished Professor of the Year by the President's Council of the State Universities of Michigan, Professor Srinivasan's primary research is in developing smart composites, which he refers to as "materials by design." Essentially, he engineers materials with properties that answer to specific needs. He does this by combining two existing materials to create something entirely new, one custom-made to accomplish a specific task. His research has led to applications in consumer electronics, national defense and homeland security.

Professor Srinivasan has also gained a reputation for encouraging other researchers and future scientists to participate in his experiments. His lab in OU's Science and Engineering Building is staffed with a diverse support group that includes high school interns, undergraduate and graduate students, postdoctoral students, visiting professors and theorists. He says the variety of backgrounds can be a strength.

"By bringing together people from biology, medicine, physics and engineering, we create collaborative research," he says. "This meeting of the minds can result in something dramatically new."

While Professor Srinivasan and his group study the creation of new materials, Professor Xia is focused on repairing old materials — human tissue, actually. His research is aimed at detecting degradation of articular cartilage that leads to osteoarthritis, a disease that affects nearly a third of the U.S. population.

Osteoarthritis is the most common form of arthritis and is caused by the degeneration and eventual loss of articular cartilage in a joint. This cartilage is a thin layer of very stiff, protective tissue that provides a cushion of support. When it breaks down, bone rubs painfully against bone.

Professor Xia's work involves the use of microscopic imaging, which may reveal a way to provide an early diagnosis of the disease. The goal, he says, is not to find a "cure," but to detect subtle changes in the cartilage that could lead to early intervention and preservation of tissue.

"By the time you feel the pain in your joints, it is often too late," says Professor Xia. "We are looking for a set of 'markers' that could become useful in terms of diagnosing disease early, before symptoms appear."

Professor Xia's research is unique — and on the cutting-edge of both science and medicine.

"What we do in terms of imaging at the moment no one at a hospital can do," he emphasizes. "There just isn't anything more advanced out there."

Professor Xia hopes that one day his techniques in cartilage imaging can be extended to the general clinics, since both microscopic MRI and clinical MRI are based on the same physics and engineering principles. ◆

Research in Review

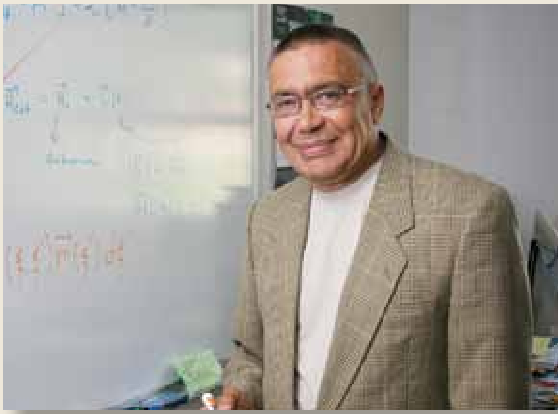
The project on his workbench is so small, it's invisible. Unseen to the naked eye, the minute magnetic structures that Andrei Slavin, Ph.D., professor of physics, and his team of OU researchers are working on could lead to major breakthroughs in communication technology.

At OU, Professor Slavin is conducting extensive theoretical research on nanomagnetism and novel effects in magnetization dynamics induced by transfer of the electron spin.

His work is based on the fact that electrons carry not only an electric charge, but also their own magnetic movement or spin. He has developed the state-of-the-art theory of novel nonlinear spin-torque oscillators, which has many potential applications in the computer and communications industries.

"This is the modern frontier in magnetism," says Professor Slavin. "My group is working on the development of the theoretical basis of a new-generation of spintronic microwave signal processing devices and artificial magnonic materials, which may completely revolutionize the microwave signal processing technology."

Professor Slavin's research has drawn considerable interest internationally and been supported through numerous external grants from sources that include the National Science Foundation and the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC). ◆



Andrei Slavin, Ph.D., is developing analytic models to explain the invisible world of nano-magnetism.

Book explores the mystery of black holes

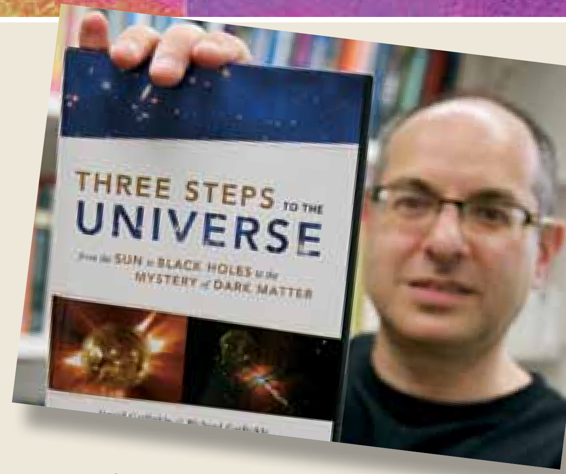
It isn't the pull of gravity that draws David Garfinkle, Ph.D., professor of physics, to study the mystery of black holes, but the challenge of understanding them. Professor Garfinkle and his brother, Richard, a science fiction writer, have published *Three Steps to the Universe: From the Sun to Black Holes to the Mystery of Dark Matter* (The University of Chicago Press), which attempts to make difficult science subjects more accessible to all.

In his roles as research physicist and professor, Garfinkle, with his brother, uses down-to-earth examples to illustrate complex scientific theories.

Last year, Three Steps to the Universe won OU's Marian Wilson Award for writing in the sciences.

"It's always great when you explain something to someone and they get it," he says. "We wanted to give readers a better understanding of the science, rather than just being spoon fed some facts."

Professor Garfinkle notes that black holes and dark matter continue to puzzle scientists, but that the book helps illuminate what is known so far. "We hope to convey the excitement of trying to work out the answers to the mystery." ◆



David Garfinkle sheds light on black holes in a book he authored with his brother, Richard.

Physics majors gain an "OU edge"

Undergrad Andrew Poterek uses OU's new high-tech microscope in a research project.

Perhaps it's not the easiest path an undergraduate can take, but declaring physics as a major at OU has some definite benefits. The department offers some opportunities that may be more difficult to take advantage of at universities other than OU: the ample opportunity to work with top researchers as an undergraduate student and — in some cases — even author or co-author the published findings.

OU senior and physics major Andrew Poterek currently works with Yang Xia, Ph.D., professor of physics, and his team of researchers, graduate students and undergrads in conducting experiments in microscopic imaging of articular cartilage.

In Professor Xia's high-tech lab, Poterek has gained valuable hands-on experience in Fourier transform infrared imaging and polarized light microscopy.

"It's been a great opportunity for an undergrad like me, and one that I probably couldn't get at many other universities, due to professor to student ratio and my field of study," he says. "It's an incredible feeling to know that at the end of the day, your work in the lab has a chance to be published, even as an undergraduate."

Poterek, who says he would like to become a teacher and is enrolled in the department's Secondary Teacher Education Program (STEP), sees the research opportunity as an advantage for students going on to higher academia.

"I think it's a great advantage, if you want to go on to post-grad studies, to have undergraduate research experience. To collaborate with experts and apply what you study as an undergraduate is beneficial and gratifying in all regards."

For Shiyang Wang, a fifth-year medical physics Ph.D. student, the well-established connection OU has with Henry Ford Hospitals allows her to be part of a world-famous study team.

As one of several graduate students who were invited to work with OU's Michael Chopp, Ph.D., distinguished professor of physics and one of the world's most prominent specialists in medical physics and neuroscience, she is involved in researching the effects of trauma and diseases (such as stroke, hemorrhage and multiple sclerosis) on brain tissues.

"I'm working in the neurology department NMR lab, where we use the Magnetic Resonance Imaging (MRI) technique to quantify the biological structure of brain tissue," she explains. "We are trying to learn more about how brain tissue is affected by injury and disease. It may help provide answers on how best to treat those conditions."

She points out that the collaborations OU maintains with Henry Ford and Beaumont hospitals opens up unique possibilities for students in her field.

"It is a wonderful opportunity as a student to work with such respected researchers," she adds. ◆

Shiyang Wang works with the world-renowned neuroscience study team at Henry Ford Hospital.

Historic magnetics lab eyed for renovation

The Kettering lab at OU was at the forefront of gyro-magnetic research activity. (Photo courtesy of Kresge Library Archive)

Nestled among the trees in a remote part of OU's campus, the Kettering Magnetics Laboratory was once a hub of research activity and scientific discovery. No less than the theories of Albert Einstein were put to the test by physicists in the facility, which possessed characteristics unlike any other lab.

Now there's growing interest in restoring and reviving the historic lab to help OU researchers make modern-day discoveries. Mothballed in recent years, the facility is being considered for renovation, which would open a new chapter in its storied history.

Launched in 1964 and named after Charles F. Kettering, legendary inventor and director of the General Motors Research Laboratories, the lab was chosen specifically for its location. To conduct experiments in gyro-magnetism, researchers needed a lab well-isolated both from mechanical vibrations and magnetic disturbances.

The OU site was given the nod after a survey of the earth's magnetic field there revealed an ambient uniformity. The building was specially constructed using non-ferromagnetic materials (wood, aluminum, copper, brass) to assure that the structure itself would not alter the magnetic field. Heavy concrete pads underpinned the end of each wing to isolate the building floor and provide a vibration-free environment.

In this controlled setting, researchers were able to perform experiments that required mechanical stability and a near-zero ambient magnetic field.

In the 1960s, Gifford G. Scott — who later became an adjunct research professor at OU — conducted historic measurements of the Einstein-deHaas effect in ferromagnetic materials. Today, these measurements are still regarded as the best and most extensive available.

In the 1970s, Professor Emeritus Norman Tepley used a very sensitive detector in the lab to measure the magnetic fields created by blood flow in OU students. This work gave Professor Tepley the impetus needed to launch a highly successful research program at Henry Ford Hospital, in which measurements of the body's magnetic fields due to blood flow and those due to neural brain activity have provided a great deal of new medical information.

A cost analysis for the lab's renovation is currently underway.

"This unique lab is a part of OU history," says Professor Andrei Slavin, chair of the physics department. "Now we hope to make it a part of our future."◆

(Historical information courtesy of Robert M. Williamson, professor emeritus)

Physics dept. leads OU in external funding

Despite today's challenging economic conditions, Oakland University's Department of Physics has remained a leader in attracting external funds to support its nationally renowned research efforts.

In fact, about 20 percent of OU's overall external research budget can be traced to the department, which has gained a reputation for its high research productivity and high quality of teaching.

That says a lot about the department's efforts to raise OU's profile as a center of physics expertise, says Andrei Slavin, Ph.D., professor of physics and department chair.

"One of our aims as a department is to create great opportunities for both our undergraduate and graduate students," says Professor Slavin. "We believe we can best prepare them for leadership in physics by positioning our department at the forefront of this exciting field."

The department provides undergraduate students with numerous opportunities for research, he says, and many OU undergraduate students have published peer-reviewed scientific papers in leading physics journals in collaboration with their faculty supervisors.

The undergraduate program can lead to BA and BS degrees in physics, and BS degrees in medical physics and engineering physics, along with the Secondary Teacher Education Program (STEP) in physics.

Publishing output in 2010 by the Department of Physics increased by 10 percent over the previous year

"Our undergrad program produces more bachelor degrees per faculty member than any other physics department at comparable universities in Michigan," Professor Slavin says.

He points out that all faculty members of the Department of Physics are leading scientists in their respective fields, actively engaged in research in one of three areas: medical physics, condensed matter physics or gravitational physics.

Three of its faculty — professors Slavin, Bradley Roth and David Garfinkle — are Fellows of the American Physical Society (one of the world's preeminent organizations in the field of physics). Another, Michael Chopp, is a Fellow of the American Heart Association.

The department's research is supported by grants from various external agencies, including the National Institutes of Health, the National Science Foundation, and the U.S. Army Research Office.◆

Outreach efforts help take physics beyond the classroom

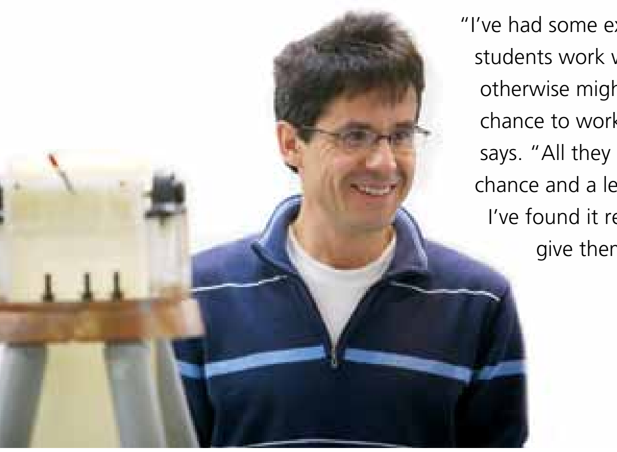
Physics at OU is not confined to its labs and classrooms in Rochester. Members of the department are also involved in outreach efforts that extend into the surrounding community — even to other parts of the world.

Locally, George Martins, Ph.D., associate professor of physics, has been involved for three years in an effort to attract more students into science. Each year, four students from the Pontiac public school district and two from Oakland Community College are invited to work with Martins and other physics faculty members on various projects with the idea of exposing them to possible careers in science.

"Most of these kids face huge obstacles in completing their education," Professor Martins says. "They're just as smart as kids in other communities, but they just need a chance to apply that intelligence. We really need more scientists in this country, so it's an opportunity we shouldn't miss out on."

Professor Martins explains that many grants from the National Science Foundation are designed to encourage the greater involvement of under-represented minorities in the sciences.

"I've had some exceptional students work with me who otherwise might not have had a chance to work in the lab," he says. "All they really need is a chance and a level playing field. I've found it rewarding to help give them that chance."



Science studies may help open career paths for minorities, says Professor George Martins.

Half a world away, Alberto Rojo, Ph.D., associate professor of physics, has been instrumental in opening doors for students in his native Argentina. He is helping with an initiative to provide laptop computers for three million high school students in that country — the largest program of its kind in the world.

Professor Rojo, along with a biologist and an historian, was selected to lecture as part of the "Conectar Igualdad" program, a nationwide initiative led by Argentine President Cristina Fernandez de Kirchner that aims to put new netbooks into the hands of students and boost their educational opportunities.

Before a panel that includes Argentina's President Cristina Fernandez de Kirchner (at right), OU's Alberto Rojo demonstrates the equivalence of the acceleration of gravity at an event promoting education in that country.

For the kickoff event last fall, Professor Rojo was asked to create an interactive presentation for the students to learn how to use new software.

"As an educator, I found in this process new ways of understanding concepts myself, and have an opportunity to implement new ideas and materials in a different environment," Professor Rojo says. "I am able to use my work at OU as a basis for this back and forth interaction."

Professor Rojo hopes these interactions and exchanges could result in collaboration with OU and educational institutions in Argentina.◆

Research in Review

Understanding cell growth may help in fighting tumors, says Professor Evgeniy Khain.

The newly developing field of biological physics has experienced a tremendous growth in recent years. At OU, Evgeniy Khain, Ph.D., assistant professor of physics, is leading groundbreaking research to identify and describe basic physical mechanisms which govern complex biological processes.

He investigates the collective behavior of a large number of living cells (or biological multicellular systems) that exhibit numerous physically interesting and biologically important collective phenomena, ranging from wound healing to tumor growth.

"My primary goal is to model the growth of malignant brain tumors, which cannot be treated effectively by current therapies," he says.

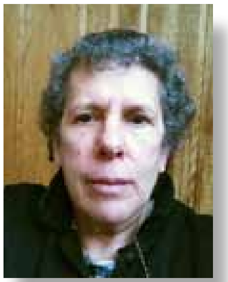
Understanding how tumors grow may one day help researchers find a way to prevent them, he says.

Taking a physical approach to the problem, Professor Khain formulates minimalist models with a small number of parameters in order to determine the role of basic biological processes, such as cell proliferation, cell motility or cell-cell adhesion, in growth patterns of brain tumors.

"As a result of these studies, we can explain — and sometimes predict — complex patterns of malignant cells," he says. "This may lead to a better understanding of the self-organization of living cells and complex multicellular patterns, which occur in tumor growth and morphogenesis."◆

Former OU professors gain positions at National Science Foundation

Uma Venkateswaran now leverages her physics expertise as a policy maker.



Former physics chair Beverly Berger now assesses research proposals for the National Science Foundation.

Having distinguished themselves at OU, some physics department faculty members have gone on to even bigger things. Currently, two former OU professors are among the ranks of the decision makers at the National Science Foundation (NSF), the independent U.S. government agency responsible for promoting science and engineering through research programs and education projects.

Beverly Berger, Ph.D., formerly an OU physics professor and chair of the department (1996 – 2001) is now the program director of a joint NSF/NASA task force that is investigating computational issues in the area of gravitational wave physics and astrophysics. Her role is assessing the research proposals the NSF receives and recommending who should receive funding.

"I'm basically involved in providing oversight for the field of gravitational physics, which is my area of expertise," she says. "Since the NSF is the main source of funding for this field, I'm in a position to influence the priorities in research."

Given her background at OU as both researcher and administrator, the NSF position was a natural next step, she says.

"I think being on the faculty of a smaller university can encourage you to take a broader perspective than those at larger universities, since it means you almost have to be in contact with people outside your institution. Having already established those relationships can help open a lot of doors."

Another OU professor now with the NSF is Uma Devi Venkateswaran, Ph.D. She is a program director for the Experimental Program for Stimulation of Competitive Research (EPSCoR), whose goal is to reduce the geographic concentration of NSF funding.

"The aim is to help build research capacity in states that historically have received less funding," she explains. Michigan is not one of them, however.

Professor Venkateswaran, whose research at OU into condensed matter physics involved using lasers to analyze and explore the optical properties of material, is currently on leave from OU to work as a policy maker at the NSF. She points out that her research at OU was supported in part by NSF grants.

"External funding is crucial to research and education efforts at most universities," say Professor Venkateswaran. "It's also important to give students the opportunity to participate in research. I know that in my lab, we included a lot of undergraduate students in research, which was an integral part of the proposal for the funding. It created a lot of opportunity for undergrads, an experience that broadens and enriches their educational background." ◆

"External funding is crucial to research and education efforts at most universities."

Research in Review

Patterns occur everywhere in nature, whether in the leaves of trees or the undulating ripples of sand at the seashore. Most of us take this at face value, appreciating the symmetry that surrounds us.

But Ken Elder, Ph.D., professor of physics, wants to learn more about pattern formation — what causes it, whether it can be predicted and how it can be exploited.

He's not the only one interested; the National Science Foundation recently awarded him a grant to explore molecular patterns that form while various materials undergo change in states. Such patterns occur in the vast majority of man-made and naturally occurring substances and play a key role in determining material properties and function.

Using mathematical modeling to develop a better understanding of the forces at work, he hopes to help establish methods of controlling these patterns. Applied to manufacturing, this research could have significant impact on the quality and capability of microelectronics, for example.

"There are patterns everywhere in nature," Professor Elder observes. "Our challenge is to predict how they form so that we can harness the immense potential of designing materials with specific properties." ◆

Professor Ken Elder studies the science behind naturally occurring patterns.

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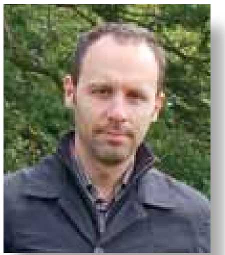
Alumni profile: Sean Cordone



An OU physics degree gave Sean Cordone solid footing for his business endeavors.

OU physics grads find that their career path can lead them anywhere. For Sean Cordone, CAS '93, the "physics bug" he got as an undergrad at OU has taken him to Europe — as a Fulbright scholar — and back, to earn advanced degrees in cosmology at Brown University and the University of Wisconsin.

Cordone is now the vice president of engineering for ISCO International, a telecommunications company based in the Chicago area.

"I'm involved on the engineering side of things now, which has brought me full circle since I started out in engineering at OU. But when I took an experimental physics course from Professor W. Donald Wallace (an OU instructor from 1970 to 1999), I was awestruck by how, with the modest apparatus we had in the lab, you could do these really fundamental things, like measuring the gravitational constant or the speed of light. There's a beauty to physics that I found utterly fascinating."

Cordone says he was further inspired to pursue physics by OU professors Andrei Slavin and David Garfinkle, who offered him his first exposure to research and were his early role models as professional scientists. Later, when he left academia to enter the business world in 2000, Cordone says his background in physics gave him an excellent footing.

"As a physicist, you develop a powerful view toward problem solving that is widely applicable, in fields as disparate as engineering, finance and government policy," Cordone says. "The skills you learn are a valuable asset in any career you choose." ◆

Make a Gift

Gifts to Oakland University's College of Arts and Sciences (CAS) demonstrate confidence in the university's direction, affinity with classmates, as well as a desire to help the next generation of students through a tradition of generosity that links us all.

Every gift, small or large, makes a difference. Please use the enclosed envelope to make your donation. Or, visit **oakland.edu/donate** and click on "Make a Gift," then select the College of Arts and Sciences as your Gift Information category option. You will be able to view all CAS gift funds.

Thank you!