physics flash
news and events from ASU Physics vol.2 | no.7
ASU College of Liberal Arts & Sciences
Arizona State University

In the news…

ASU Physics has recently been ranked in the Top 100 physics departments in the world by the Institute of Higher Education, Shanghai Jiao Tong University (SJTU). The ranking is among the most recognized indicators of institutional excellence.

Compared with other ranking schemes which are often based heavily on subjective opinions, the SJTU ranking measures outcomes directly related to the achievements of the alumni and faculty. Indicators of research performance used in determining the rankings include highly-cited researchers and papers published in prominent scientific journals.

The honor underscores the value and impact of the rigorous ASU Physics program of study and the quality of research being done by ASU Physics faculty and students.

Congratulations to ASU Physics professor Peter Rez on being named fellow of the American Physical Society for his work on theoretical and computational developments in electron microscopy and electron spectroscopy of materials. Rez has received national attention recently and written an op/ed piece regarding his research on radiation concerns associated with the controversial body scanners now in use in United States airports. (cont'd on page 2)

Peter Rez

Lecture hall renamed in honor of former physics professor and chair

The lobby of the Bateman Physical Science F-wing was filled to capacity on November 19 as ASU Physics hosted a ceremony to mark the naming of lecture hall PSF173 in honor of former physics professor and department chair, Howard G. Voss. The ceremony included a poignant reflection by former chair and founding dean of the Emeritus College, Richard Jacob. Jacob, a long-time friend and colleague of the late Voss, spoke of Voss' contribution to the study of physics in particular his ability to craft exciting, engaging lectures. Current ASU Physics chair Robert Nemanich reflected on how far ASU Physics has come since Voss began at ASU in 1969.

Revealing the new sign above the lecture hall named in honor of Howard Voss, Robert Nemanich (center) is joined by professor Voss's sons, Keith (left), Steven (second from right) and Curt (right).

The ceremony, emceed by department manager Peg Stuart, was attended by dozens of former students, colleagues, ASU faculty and staff, and nearly two dozen members of the Voss family who had flown in from as far as Michigan and Hawaii for the event. Voss' sons, Steven, Curt, and Keith assisted Nemanich in unveiling the new sign above the lecture hall door as well as a nearby explanatory plaque.

Following the ceremony, Professor James Kakalios of the University of Minnesota delivered the first lecture in the newly renamed hall. Kakalios, a noted author and physicist, delighted the audience with his often humorous presentation—"The Uncanny Physics of Superhero Comic Books." (cont'd on page 3)

New faculty member joins department

The Department of Physics welcomes Maulik Parikh to the physics faculty who is also a member ASU's Beyond Center for Fundamental Concepts in Science. He shares some insight into his current and future research interests.

Maulik Parikh

I am thrilled to have joined the faculty at the department of physics at ASU, with its impressive cosmology initiative, as well as the Beyond Center for Fundamental Concepts in Science.

The central theme of my research is gravity. I am interested in both the classical and (especially) the quantum aspects of Einstein's beautiful general theory of relativity. I work on a variety of topics in gravity, but particularly on cosmology and black holes.

In the popular imagination, black holes have a fearsome reputation; they are the great white sharks of space. But for theoretical physicists, black holes are fascinating for a different reason: they are ground zero in the confrontation between quantum mechanics and general relativity. The subject took off in 1974 with Stephen Hawking's discovery that black holes could actually radiate, emitting what is now known as Hawking radiation. Hawking used quantum field theory to show that black holes emit blackbody radiation, as if they possess a temperature. But, because of E = mc^2, the energy carried off by this radiation inevitably decreases the mass of the hole, until the black hole disappears. Now for the disturbing part: according to Hawking's calculations, the emitted radiation contains not the slightest trace of the contents of the vanishing black hole. Once the black hole disappears, all knowledge, all information about whatever had fallen inside it is gone. This may seem an abstract concern, but at stake is the quantum-mechanical principle of unitarity: the very power of physics to uniquely connect the future to the past.

I first became interested in black holes as a graduate student at Princeton. There I discovered Frank Wilczek, an amazing physicist who worked at the Institute for Advanced Study and lived in Albert Einstein's house (which I once got to house-sit), and who would later receive the Nobel prize. Frank and I tried to understand Hawking radiation intuitively. Why is it that a black hole emits nothing classically but falls apart quantum-mechanically? When a classically stable object becomes quantum mechanically unstable, it is natural to suspect tunneling. The problem was that nobody had ever identified the barrier through which the Hawking radiation particles were supposedly tunneling out of the black hole. Frank and I found the secret barrier and moreover found a correction to Hawking's thermal formula. Years later I realized that the correction we had found was precisely what one would expect if unitarity remained valid for black holes, for which I was awarded the Gravity Research Foundation's first prize in 2004.

After obtaining my PhD in 1998, I went on to Utrecht University in the Netherlands for a post-doc with Gerard 't Hooft, followed by another post-doc at Columbia University in Brian Greene's group. I then joined the faculty at the Inter-University Centre for Astronomy and Astrophysics (IUCAA) in Pune, India as an assistant professor, before joining ASU physics in September. Over the years my research interests have broadened to include many other areas in gravitational physics.

Today the equation I find most fascinating is this: $S = \frac{Akc^3}{4G\hbar}$,

This astonishing equation may well hold the key to grasping the true nature of space and time. It says that the entropy, S, of an event horizon is proportional (with all the fundamental constants in physics appearing in the proportionality factor) to its area, A. It is now widely believed that this equation applies not just to event horizons but to any region of space-time. Since entropy is a measure of the information contained in a system, the formula says that, in a gravitational theory, the information in a box scales not as the volume of the box, but only like its area. It is as if all the information in the box were encoded on the surface of the box. (With gravity apparently you really can judge a book by its cover.) An entire dimension of space has thus somehow become redundant. These ideas have been most fully realized within string theory, and they interest me intensely. They make me wonder whether gravity is even a fundamental force.

The truth is that, more than 300 years after Newton and his apple, we still don't really understand what gravity is. With that in mind, I think I better get back to work!

In the news… (cont'd from Page 1)

ASU Physics was featured prominently at the 17th International Microscopy Congress (IMC) in Rio de Janeiro, Brazil in September. This quadrennial event features the latest research and development related to electron microscopy.

ASU Physics was well represented. Regents' Professor John Spence and Professor Martha (Molly) McCartney both chaired symposia. Spence also served on the IMC17 International Advisory Committee. Regents' Professor David Smith and Research Professor Uwe Weierstall were invited keynote speakers, and Professor Fernando Ponce presented several talks and posters.

The ASU Physics contingent "returned to ASU with renewed enthusiasm, full of exciting ideas for future research proposals," noted Smith.

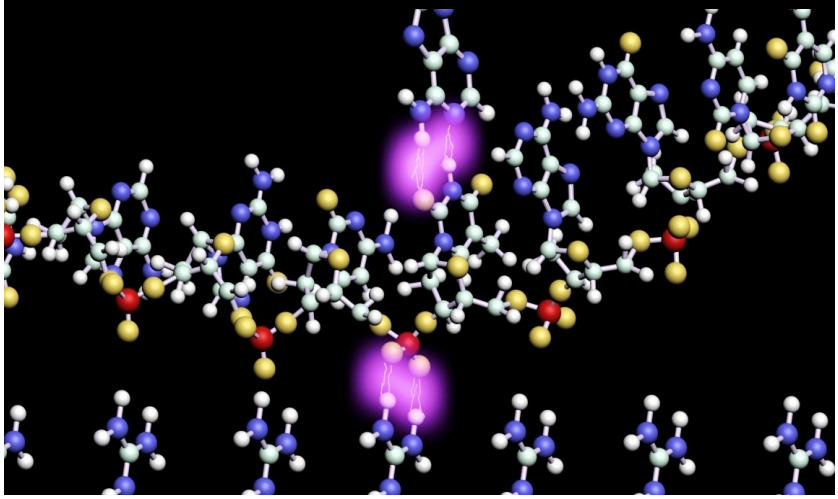
E=mc^{CARES} appreciation program announces semester winners

Congratulations to student workers Victoria Bourbeau, Raiza Dottin, Jered Jim, Jarrod Lavine, Morgan Texeira, and to Nanoscale & Materials Physics Coordinator Ebony Shalley for their recognition through the E=mc^{CARES} program. The program invites anyone to leave a small note of appreciation for staff and faculty that have gone that 'extra mile' to advance the department . Notes are posted on a special bulletin board located in the ASU Physics main office (PSF470).

(l-r) Ebony Shalley, Raiza Dottin, Jered Jim, Victoria Bourbeau, Jarrod Lavine, and Morgan Texeira

Bourbeau, Dottin, Jim, Lavine, Texeira, and Shalley either received the most or tied for the most comments left in either September, October, or November this year. Comments ranged from appreciation for speed and quality of service, extra effort in team building, dedication, flexibility, attention to detail, initiative and creativity.

The E=mc^{CARES} is a project created by General Studies Coordinator Diana Sesate as a way to communicate day-to-day appreciation between members of the ASU Physics community. Congratulations to all who appeared on the E=mc^{CARES} board this semester!



Lecture hall renamed (cont'd from page 1)

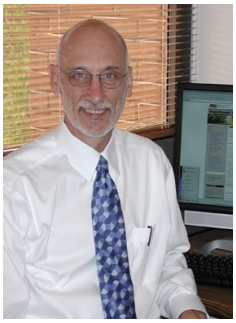
Voss passed away on March 29, 2010 after a long career at ASU that began first as a graduate student and then as an assistant professor in 1969. He was promoted to associate professor in 1976, full professor in 1984, and served as chair from 1994 until his retirement in 2000.

During his tenure, Voss taught thousands of students in PSF173 and led the design of the Physics Service Course Facility which exists to enhance the learning experience for students enrolled in introductory physics courses.

Howard Voss

Without question, Howard Voss helped advance the quality of physics instruction at ASU. The Howard G. Voss Quasi-Endowment was established to accompany the dedication of the hall and continue his legacy. This special fund will provide resources to enhance physics demonstration in the Howard G. Voss Lecture Hall and may also support other initiatives in the department including student research support, scholarships, workshops, and seminars.

For more information on how you make a donation in memory of Howard Voss, please visit www.asufoundation.org/HowardVossPhysics.



Robert Nemanich

From the Chair…

Physics at ASU: Linking learning and discovery

When does learning end and discovery begin? We often speak of the dual roles of a research university as education and research, but learning and discovery occur together particularly for our students at ASU. Earlier this semester, I spoke to my freshman seminar class about the how the properties of a single layer of carbon atoms (called graphene) could enable future electronics technologies. Our colloquium and seminar committees had scheduled visits and talks from several accomplished researchers in this field. Of course, the Nobel Committee also recognized the importance of this very recent advance in presenting the 2010 Nobel Prize in physics to Andre Geim and Konstantin Novoselov. This combination of events generated tremendous excitement with our students and faculty.

The same process is developing in all of the areas of our department, and indeed we have structured our programs to enhance the contact between students and researchers. Our department supports a weekly colloquium along with three seminar series on Biological Physics, Cosmology-Particle-Astrophysics and Nanoscale Science and Materials Physics. Many ideas for new research begin with the seeds that are planted during these interactions which bring together students, faculty and noted experts.

In definitions of the word 'scholarship', discovery and learning are often linked through the development of knowledge. Indeed this is what we expect from our students and in most cases it is what they look for in their university studies. Over the last few months, undergraduate and graduate students have achieved notable recognitions for their work and many have contributed to recent peer-reviewed publications. Everywhere you look in our research labs you will find our students committed to both learning and discovery (i.e. scholarship).

As the Fall semester comes to an end, the segment of the formal quest for classroom learning is completed and now our students have ever more tools to advance their quest for knowledge. It is a pleasure to hear students discussing the creative approaches they applied in their physics courses. In my mind physics is at the center of discovery and learning, and physicists are playing increasingly important roles in areas such as energy, information technology and medicine and disease. To those who graduated this semester, we hope your quest doesn't end here and that you apply the skills you've learned to grow even further. We are immensely proud of you.

The holidays give us all a short break from the unbelievable pace of the university's Fall semester. It is a time to gather with and appreciate family and friends and to share our successes and adventures. I believe our physics scholars will be excited to describe their studies and research. You may find that it is difficult to separate the two.

Wishing you a holiday of discovery with family, friends, and scholars.

Sincerely,

Robert J. Nemanich
Chair & Professor of Physics

Welcome Samira!

ASU Physics instructor Pushpa Wijesinghe and her husband Janaka welcomed their newest little boy —Samira — on November 5. Samira weighed in at 6 lbs/8oz and joins proud big brother Thilina. Mom and baby are doing fine.

Congratulations!

'Twas the night before Winter Break...

'Twas the night before Winter Break and Physics was still,
Not a student was stirring, they'd all lost their will.
The grades were all figured and entered for Fall,
In hopes that dear Blackboard would not lose them all.

Undergrads were nestled all snug in their beds,
While visions of Mazatlan danced in their heads.
Their studies of thermodynamics all done,
They might have a chance to again see the sun.

The labs were all quiet, tidy and prepped,
And worn-out grad students all grinned while they slept.
Advisors had just sent them notes to confirm
They'd all have appointments as RAs next term.

Staff lie in silence, hitting the flasks
From anxiety caused by PeopleSoft tasks
Their eyes all glazed over and barely alive
They do what they can and they take it in stride.

When out on the mall there arose such a clatter,
I sprang from the desk to see what was the matter.
I peered through a window I'm not 'spose to open,
Facilities Management has said that's verboten.

The moon on the crest of the new-fallen snow
Gave the luster of mid-day to skateboards below.
When, what to my wondering eyes should appear,
But a miniature sleigh, and six tiny reindeer.

With a little old driver, so lively and kind,
I knew in a moment it must be Einstein!
More rapid than eagles his coursers they came,
And he whistled, and shouted, and called them by name!

"Now Mass! now, Photon! now, Relativity!
On, Motion! On, Particle! on, Cosmology!
Atop Physical Sciences! To the top of the wall!
Now dash away! Dash away! Dash away all!"

As department chairs before budget meetings do worry,
When they meet with revertments, do bustle and scurry;
So up to the roof-top the coursers they flew,
With the sleigh full of grants, and jolly Einstein too.

And then, in a twinkling, I heard on the roof
The prancing and pawing of each little hoof.
As I gasp at the sight, and was turning around,
Through the chem hood Einstein came tumbling down.

He was dressed all in tweed, quite simple and plain,
But covered in chalk and a big coffee stain.
A bundle of grants he had flung on his back,
And he looked like – well – a physicist, just opening his pack.

His eyes-how they twinkled! His dimples how merry!
His cheeks were like roses, his nose like a cherry!
His droll little smile was cheery and bright,
And the hair on his head - like two cats in a fight.

He was rumpled and messy, a true physics elf,
And I laughed when I saw him, in spite of myself!
A wink of his eye and a twist of his head,
Soon gave me to know I had nothing to dread.

He spoke not a word, but went straight to his work,
Approving proposals, then he turned with a jerk.
And laying his finger aside of his nose,
And giving a nod, through the chem hood he rose!

He sprang to his sleigh, to his team gave a whistle,
And away they all flew like the down of a thistle.
But I heard him exclaim, 'ere he drove out of sight,
"Happy Holidays to all, and to all...

~~Make sure you run a shadow account on sponsored salaries because PeopleSoft encumbers them through the end of the fiscal year~~ —**A GOOD NIGHT!**

Seasons Greetings and best wishes for a Happy New Year from ASU Physics!