



DEPARTMENT OF PHYSICS NEWSLETTER

JUNE 2015

Message from the Department Head

Greetings from the OSU Department of Physics! We have come to the end of another successful academic year in the Department, and this newsletter is an opportunity to reflect on our accomplishments and look forward to next year. I was pleased to see several of our undergraduate students receive their bachelor of science degrees at the Spring Commencement, and two others graduated in Fall 2014. We have a great group of graduate students completing their degrees this summer who participated in the Spring 2015 Graduate College Commencement, and all of our graduates are listed later in this Newsletter.

This is the first newsletter we have published in several years, so first I note some of the changes in personnel over the past five years since I started as department head. In the Physics office, Susan Cantrell serves as office manager, and has been a mainstay of the office for many years. We added two new office staff in 2010, with Tamra Raymond serving as financial officer and Sandra Rowland as administrative assistant. Sandra has moved to a new job at OSU in the Registrar's office this May 2015, and we have hired Alisha Leach as our new office staff member. Melissa Edwards is in charge of the undergraduate labs, and Warren Grider divides his time between undergraduate lab support and general technical support of other department programs. Charles Hunt currently provides support for the new Fourier Transform Infrared (FTIR) spectrometer system funded by NSF, in addition to his normal research support duties. Mike Lucas retired this Spring 2015, and Larry Vaughn has been promoted to the supervisor of the machine shop.



We have several new faces in the faculty since the last newsletter, and some of our colleagues have retired. Paul Westhaus and Tim Wilson retired in 2008, and still make regular appearances in the department. Jim Harmon and Bob Hauenstein retired in 2014, and Jim Wicksted just retired this past Spring, with all three maintaining close connections to the department. New faculty members include Sasha Khanov, Donghua Zhou, Yingmei Liu, Mario Borunda, and Joe Haley. We are also fortunate to be hiring Jongmin Cho as our newest faculty member this Fall. Jongmin will be coming from MD Anderson Cancer Center to support our medical physics program.

John Mintmire
Regents Professor and Head of Department

Yukihara Sabbatical at DKFZ in Heidelberg during 2014-15

Dr. Yukihara is on sabbatical leave this year in Heidelberg at the German Cancer Research Center (Deutsches Krebsforschungszentrum or DKFZ), working in collaboration with Dr. Steffen Greulich and Prof. Oliver Jäkel. Dr. Yukihara's research at DKFZ focuses on the development and application of the Optically Stimulated Luminescence technique in dosimetry of carbon ions used in radiation therapy. The project is performed in collaboration with the Heidelberg Ion-Beam Therapy Center. The research integrates ongoing projects at OSU funded by OCAST and the Stillwater Crystal Growth Division of Landauer. His research group in Stillwater includes our graduate students Md. Foiez Ahmed, Nishan Shrestha, Brandon Doull, Liz Zehren, Tim Gustafson, Adam Coleman, and Solmaz Bastani. The research experience at DKFZ will enrich the group projects with access to proton, helium, carbon and oxygen beams available at the Heidelberg Ion-Beam Therapy Center. Dr. Yukihara's DKFZ stay is supported by a grant from the Alexander von Humboldt Foundation, as well as sabbatical support from OSU.

CAMPEP Accreditation M.S. in Medical Physics

We are pleased to announce that Oklahoma State University's Master of Science Degree in Physics with Option in Medical Physics was granted accreditation by the Commission on Accreditation of Medical Physics Education Programs, Inc. (CAMPEP), on May 15, 2013. Reviewers have commented on the excellent support from the University at all levels for the program, as well as the excellent faculty and strong record in radiation dosimetry research. The Medical Physics is a new program that was approved by OSU and the Oklahoma State Regents for Higher Education (OSRHE) in 2011. Our hats are off to Eric Benton, Eduardo Yukihara, Steve McKeever for their efforts in developing this program, and especially to Jerimy Polf for his efforts in getting the program started. Jerimy worked with us as a clinical professor from 2010-2013 before moving to the University of Maryland School of Medicine in Baltimore. Accreditation by CAMPEP will help our graduates in advancing in their future careers in medical physics.



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Liu Receives NSF CAREER award

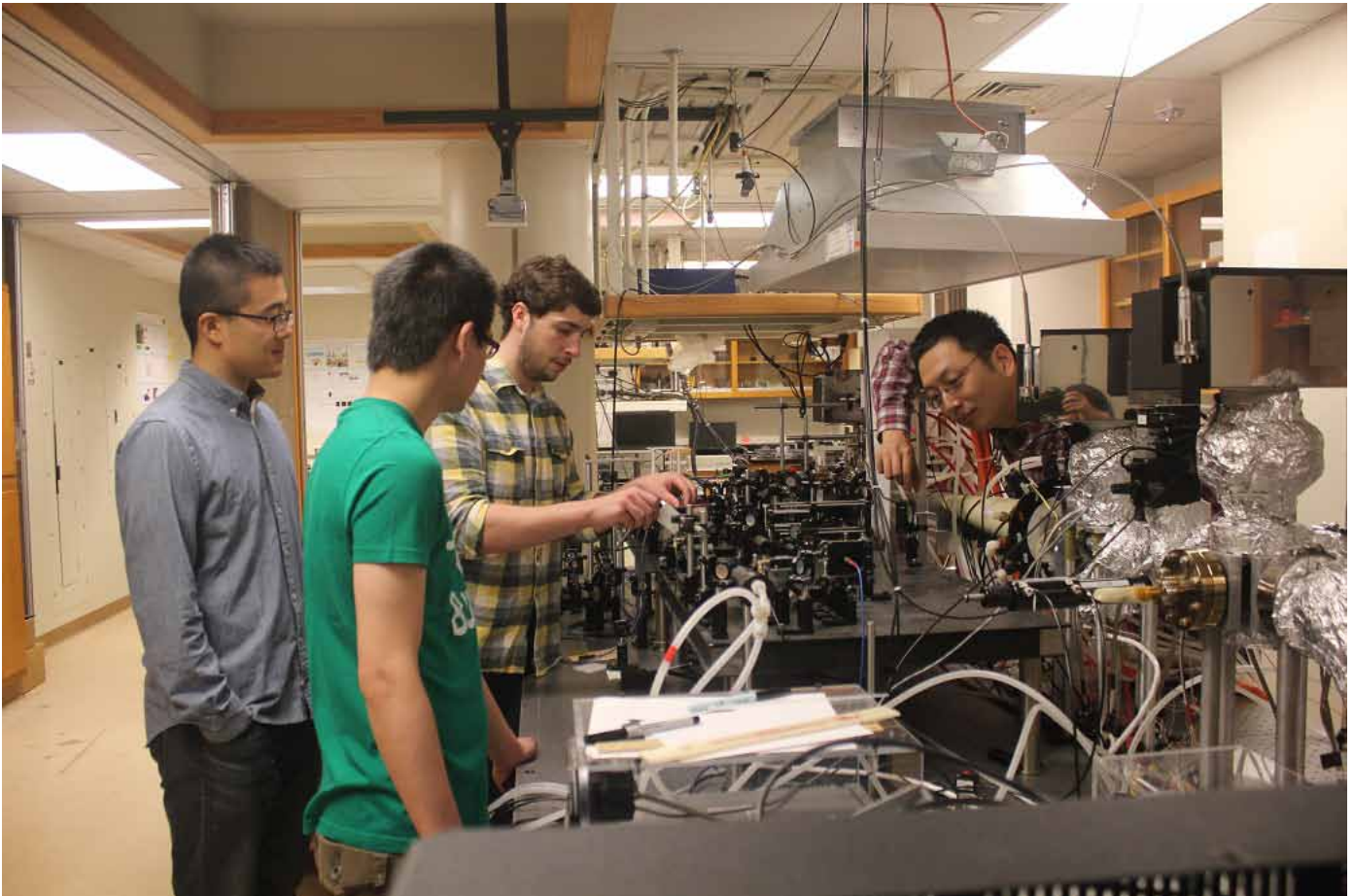
Dr. Yingmei Liu received a National Science Foundation Faculty Early Career Development (CAREER) Award for her research on ultracold atoms, "Sodium Spinor Condensates and Their Applications in Quantum Information Science". The research supported under this CAREER award will apply a sodium spinor Bose-Einstein condensate to generate massive entanglement in the vicinity of Dicke states, and to create spin-squeezing via collectively coupling atoms to a light field with a quantum non-demolition measurement.

Dr. Yingmei Liu started at OSU as an assistant professor in August 2009, and was promoted to associate professor this Summer 2015. Before coming to OSU she worked from 2004 to 2009 with two Nobel-prize winning groups, one with Dr. Wolfgang Ketterle at MIT and the other with Dr. Bill Phillips at NIST. She received her Ph.D. degree in physics from the University of Pittsburgh in 2004.

Dr. Yingmei Liu leads an experimental AMO physics group, a part of a multidisciplinary program in photonics

at OSU. She and her students (Jie Jiang, Lichao Zhao, Ziheng Chen, Micah Webb, and Tao Tang) have realized the first superfluid to Mott-insulator quantum phase transition in a spin-1 spinor Bose-Einstein condensate (BEC). The main research interest of her group is to investigate spin-squeezing with sodium Bose-Einstein condensates near absolute zero temperature, and its immediate applications to quantum information science. This research is both of fundamental interest for advancing our understanding of quantum physics, and of technological significance. Its interdisciplinary character envelops a broad spectrum of fields in physics, computer science, and information theory. Her group's latest work on spinor BECs in optical lattices has just been published in Physical Review Letters in the June 4, 2015 issue.

In addition to her CAREER grant, Dr. Yingmei Liu's research group has been supported by the Department of Defense through Army Research Office (ARO), Oak Ridge Associated Universities (ORAU), Oklahoma Center for the Advancement of Science and Technology (OCAST), and Oklahoma State University.



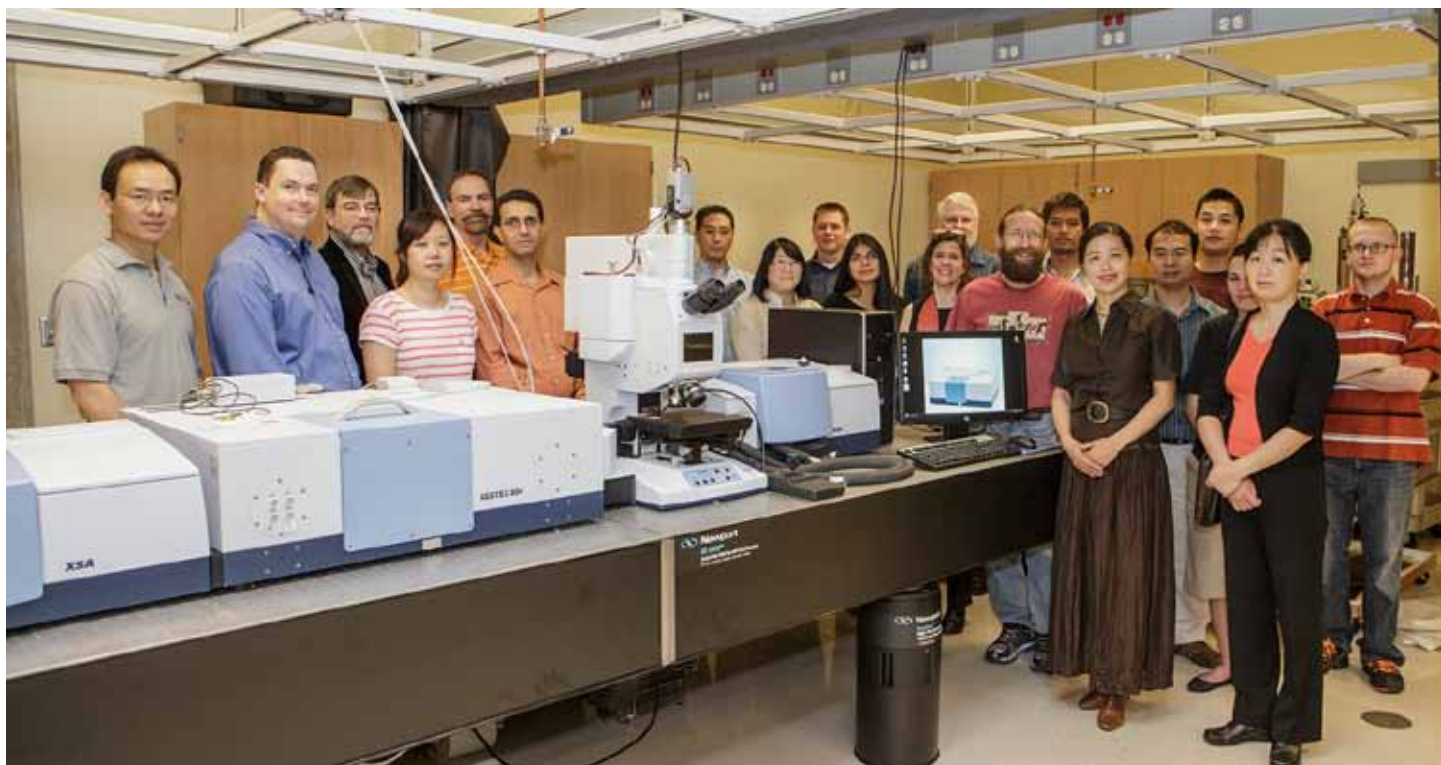
New FTIR Instrument Enables Cutting-Edge Research

The National Science Foundation has awarded a three-year grant of more than one-half million dollars to a multi-disciplinary research team with 17 investigators for acquisition of a unique, state-of-the-art infrared spectroscopic and imaging system to establish a new research facility at Oklahoma State University. Funded through the premier NSF major research instrument (MRI) program, the project will be led by Aihua Xie, professor of physics, in close collaboration with professors Robert Burnap, Junpeng Deng and Wouter Hoff. This integrated, cutting-edge infrared spectroscopic and imaging system will enable unprecedented accuracy in the collection of information about function and formation of proteins, cells and tissues. It will support six independent types of experiments, including very fast measurements (up to 10 nanoseconds) and very low temperature measurements (down to about 5 K) of proteins and materials. It will also provide chemical imaging of single living cells.



From left to right are Robert Burnap, Junpeng Deng, Aihua Xie and Wouter Hoff

This advanced system will have broad applications in biology, chemistry, material science and bioengineering, including drug-protein interactions, development of vaccines, bioenergy and cancer diagnosis. The system will be housed in the new Infrared Core Facility Lab at the Henry Bellmon Research Center on the OSU-Stillwater campus. It will have multidisciplinary users from a total of 17 research groups: 13 users are from OSU, one is from the University of Oklahoma, one is from California, and two are from New York.



In Memoriam: William A. Sibley

The Department of Physics laments the loss of our colleague, William A. Sibley, who passed away on May 12, 2014.

Born in Texas, Bill attended primary and secondary schools in California and Oklahoma, graduating from Central High School in Oklahoma City. He studied physics at the University of Oklahoma and received his bachelor's, master's, and doctorate there. He then did postdoctoral work in Aachen, Germany. A retired major in the U.S. army reserves, he was a combat veteran of the Korean War.

He began his career in physics in 1961 as a researcher at Oak Ridge National Laboratory in Tennessee. In 1970, he moved to Stillwater, OK to become head of the physics department at Oklahoma State University where he eventually became Assistant Vice President for Research. In 1979 he was named as Outstanding Teacher at OSU. In 1988, Dr. Sibley became program director at the National Science Foundation in *continued on page 8*



In Memoriam: N. V. V. J. Swamy

Nyayapathi Venkata Vykuntha Jagannadha Swamy, known to his relatives, friends and colleagues simply as "Dr. Swamy", a resident of Stillwater and Professor Emeritus at Oklahoma State University, passed away on June 13, 2013, in his hometown of Visakhapatnam, Andhra Pradesh, India, where he was born on March 28, 1924.

After completing his bachelor's of science (1949, in Mathematics) another bachelor's of science (1950, in Physics) and master's of science (1952, in Nuclear Physics) degrees from Bombay University in India, Swamy completed his doctorate (1958, in Theoretical Nuclear Physics) at Florida State University, after which he did postdoctoral work at the University Maryland and Duke University. Later, he taught physics at Karnatak University, India, before returning to the United States. There he joined the faculty of the Department of Physics at Oklahoma State University in 1963, the first Indian-American professor at the university. He taught at Oklahoma State until 1965. After that, he returned to India for three years and came back to rejoin OSU as associate professor of physics in 1968. In 1977, he became a naturalized citizen of the United States.



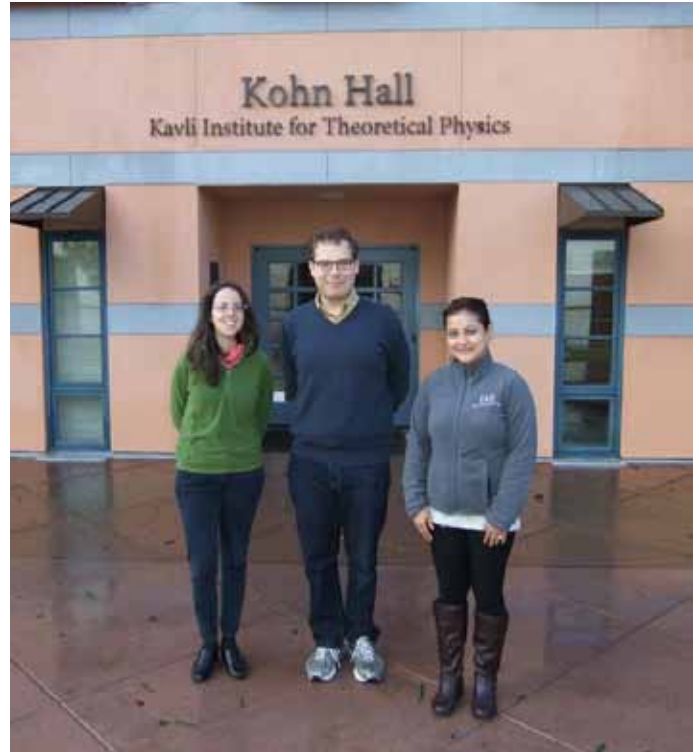
Swamy was a mathematical physicist, well known for his contributions to the physics of relativistic harmonic oscillators which found wide applications in *continued on page 8*

OSU Graduate Student Awarded Fall 2014 KITP Graduate Fellowship

Shreyashi Chakdar became the first graduate student from the OSU Physics Department to receive the recognition of becoming a Kavli Institute of Theoretical Physics Graduate Fellow for Fall 2014. She is a graduate student in the OSU high energy physics theory group working with Dr. Satya Nandi.

The Kavli Institute of Theoretical Physics (KITP) is a research institute of the University of California, Santa Barbara and is one of the most renowned institutes for theoretical physics in the world. The purpose of the KITP Graduate Fellowship Program is to offer a unique opportunity for a group of selected particle physics graduate students in the United States to spend a semester in KITP, participate in KITP research programs and collaborate with some of their Scientists. Four graduate students were selected from different US institutions for the Fall 2014 semester as Graduate Fellows and Shreyashi Chakdar from OSU was one of them.

The adjacent photo shows Shreyashi (on the right) in front of Kohn Hall at UC Santa Barbara, along with two other KITP graduate fellows: Aline Ramires from Rutgers and Philip Dumitrescu from UC Berkeley. She notes that the KITP Graduate Fellowship was a



great learning experience for her in her graduate education, and that she is grateful to her advisor, Dr. Nandi, for nominating her for this prestigious award as well as to the Department of Physics and Graduate College for their support.

Recent Physics Graduates

Bachelor of Science

Spring 2014

Aaron Braly	Jared Smith
Kyle Stoltz	Matthew Zarachoff

Summer 2014

Nicholas Melko	Micah Webb
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Fall 2014

Nathan Depaulo	William Vernon
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Spring 2015

Matthew Ciesler	Aaron Downey
Justin Vernon	

Master of Science

Jonathan Monson (Medical Physics)	Spring 2014
Kirill Klimov (Physics)	
Liz Zehren (Medical Physics)	Summer 2015
Joseph Ross (Medical Physics)	

Doctor of Philosophy (Ph.D.)

Hatim Hegab (Physics)	Spring 2014
Ayon Patra (Physics)	
Zhouyang Kang (Physics)	
Durmus Karabacak (Physics)	
Nathan Lindy (Physics)	Summer 2014
Shreyashi Chakdar (Physics)	Summer 2015
Lian Duan (Photonics)	
Penghui Lin (Photonics)	
Mingxian Su (Physics)	
Amanda Taylor (Photonics)	

Department Highlights

- **Stephen McKeever** has returned to regular faculty status, and has stepped down from his previous positions as Vice President for Research and Technology Transfer and as Director of the National Energy Solutions Institute at OSU. Steve is still active as the Secretary of Science and Technology for the State of Oklahoma. His current emphasis is on his research program, and we note that he will be recognized with a Doctor of Science degree from Bangor (Wales) this summer.
- **Girish Agarwal** attended the meeting of the Sectional Committee of the Royal Society in London this past January. Girish, in addition to being the OSU Endowed Chair in Laser Physics, is a Fellow of the Royal Society. He is also the author of a new graduate-level textbook in quantum optics available from Cambridge Press.
- The first OSU Biophysics Symposium on Protein Structure, Dynamics, and Functions was held May 21 at the OSU Noble Research Center. This symposium was organized by **Aihua Xie**, **Donghua Zhou**, Smita Mohanty (Chemistry), and Wouter Hoff (Microbiology), and was cosponsored by Physics, Microbiology, and Biochemistry. The symposium included one keynote presentation, six invited talks, and seventeen poster presentations. Prof. Gabriel Cook (Chemistry) chaired the symposium, with Profs. Donghua Zhou and Aihua Xie from Physics giving invited talks, with a total attendance of about 50 OSU faculty, postdocs, and students.
- The Physics Department staff, students, faculty put together a softball team, the Sonic Boom, during Summer 2014. Last summer they won two games, and are taking a hiatus this summer to prepare for an intense 2016 season.
- An interdisciplinary team with researchers from OSU Tulsa and Stillwater campuses was awarded a \$750,000 grant from NASA in 2014 for a project to develop a composite material that will protect astronauts from radiation on space missions. The project leaders include Ranji Vaidyanathan (OSU-Tulsa Materials Science and Engineering), Raman Singh, OSU-Tulsa Helmerich Research Center director, Mechanical and Aerospace Engineering), and **Eric Benton**. Dr. Benton's effort will emphasize testing and modeling the properties of the shielding materials developed by his collaborators.
- Have you wondered why the grass in your lawn can exhibit exotic patterns after the first frost in the autumn? **Bruce Ackerson** has recently published a paper on "Ground level air convection produces frost damage patterns in turfgrass," co-authored with Richard Beier and Dennis Martin, in the International Journal of Biometeorology.



- Our high-energy group collaborated with the OSU Library to sponsor an on-campus virtual visit with the ATLAS facility at the Large Hadron Collider (LHC) in Europe on March 12, 2015. Joe Haley, Flera Rizatdinova, and Sasha Khanov were here at the OSU side of an intercontinental teleconference event, where the OSU public could have live discussions with the staff at the LHC.

William A. Sibley continued

Washington, D.C., and served as acting director of the Division of Materials Research during the summer of 1990.

In 1990, Bill returned to education to serve as Vice President for Academic Affairs and Professor of Physics at the University of Alabama, Birmingham. While at UAB, Bill served as Assistant to the Provost and was named a recipient of the UAB President's Medal for outstanding dedication and service. From UAB, Dr. Sibley went back to the National Science Foundation to work as the program director for the Centers for Research and Excellence in Science and Technology.

Following his service at NSF, the Sibleys "retired" to Oklahoma where Bill became president of the Oklahoma Center for the Advancement of Science and Technology (OCAST), an organization which he helped develop several years earlier. Following his retirement from OCAST he focused on research as a visiting professor at the University of Central Oklahoma.

Bill was not only an incredible man of distinction, but he touched many lives from all walks of life and throughout the world. A new endowed scholarship fund has been created at the OSU Foundation in Bill's name to support graduate students, initiated by Dr. Michelle Shinn and his other students and former colleagues.

Alumni Connections

We hope all our alumni and other friends of the department enjoyed reading this newsletter, and we hope to hear from you soon. If you have contributions for future editions of the newsletter or other suggestions, please send an email to physics@okstate.edu or go to our web page for alumni input at:

<http://physics.okstate.edu/alumni>

You can help us accomplish our department goals through donations to our scholarship and general funds at the OSU Foundation. More information is available on the alumni page at the OSU Physics web site given above, or donations can be made online to the Physics General Fund. ***Click here*** to make your donation!

N. V. V. J. Swamy continued

atomic, nuclear, and high energy physics. He was also well known for his group theoretical contributions to mathematical physics. His textbook, co-authored with Mark Samuel in 1979, *Group Theory Made Easy for Scientists and Engineers*, was widely adapted.

Before he retired in 1987 from Oklahoma State, Swamy lectured at several universities, was a guest scientist in Julich, Germany and Cambridge University, taught at the University of Innsbruck in Austria, and several universities in India during his sabbatical leaves from Oklahoma State.

After his retirement, Swamy divided his time between Stillwater and India, providing voluntary services to educational institutions in India. His last teaching stint was at Gayathri University in his hometown, starting in November 2011, after his last visit to Stillwater.

Swamy took an avid interest in Vedic astrology and spent numerous hours studying the subject, preparing horoscopes for whomever asked for them, and making predications based on his research. He was instrumental in founding the Tennis Club of Stillwater and, in his spare time, he played a mean game of tennis, enjoyed watching cricket and tennis matches on TV, and discussing Indian philosophy and ancient Indian religious texts.

He was a connoisseur of and enjoyed Carnatic music, a type of Indian classical music associated with the southern part of India that evolved from ancient Hindu traditions. He was a great storyteller to children of all ages and was known for his exceptional memory which allowed him to rattle off facts and figures with effortless ease. He had a cheerful disposition and will be greatly missed by his large number of friends around the world.

Swamy is survived by his grandniece, Subhadra Singh of Houston, S.V. Rangarajan, his nephew in India, and several other nieces and nephews in India. A memorial service was held on the OSU campus in Bennett Chapel on August 24, 2013. A new Dr. Swamy Endowed Scholarship for undergraduate and graduate students has been created at the OSU Foundation, funded by a bequest from his estate.