PHYSICS *at SMU*

A newsletter for alumni and friends. **Winter 2001-2002**

Chairman's Report

The Physics Department had a very active and productive year with respect to both teaching and research.

UNDERGRADUATE PROGRAM:
We have a healthy and active undergraduate program with approximately a dozen physics majors, and several minors. Our physics students are particularly talented, and we are pleased to have six recent SMU Presidential Scholars including: Anne Burnham, Alonso Gutierrez, April Kramer, Chad Myers, Shannon Thornton, and Clifford Yapp. Additionally, Alonso Gutierrez was selected in a national competition to receive a prestigious Goldwater Scholarship.

RESEARCH PROGRAM:
The department is proud to report that we topped the one million dollar mark and received $1,118,000 in external research grants this past year to support our activities. External sponsors include the US Department of Energy, the National Science Foundation, the Lightner-Sams Foundation, the US ATLAS program, and the Fermilab QuarkNet program.

GRADUATE PROGRAM:
We have been fortunate to recruit top quality physics graduate students in recent years. Of our recent five Ph.D. recipients, all decided to stay in academia and were successful in obtaining postdoctoral positions with excellent groups. Specifically,

- Igor Volobouev (Ph.D. 1997) joined the CDF group at the U. of California Lawrence Berkeley Lab.
- Vasilii Shelkov (Ph.D. 1997) joined the BaBar group at the U. of California Lawrence Berkeley Lab.
- Ilya Korolkov (Ph.D. 1999) joined the ATLAS experimental group at the University of Barcelona.
- Vitaliy Fadeyev (Ph.D. 2000) took a postdoc at the U. of California Lawrence Berkeley Lab.
- Ilya Narsky (Ph.D. 2001) joined the BaBar group at Caltech (California Institute of Technology).

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COMMUNITY OUTREACH:
The Physics Department is promoting a number of community outreach projects.

- ***QuarkNet:*** This summer, we hosted 18 high school physics teachers for a 2-week workshop on incorporating High Energy Physics topics in the High School classroom. This project was funded by the Department of Energy, the National Science Foundation, and Fermilab.

- ***Physics Circus:*** For a number of years now, the department has been presenting a "Physics Circus" to local area elementary and secondary school students to promote interest in science. The most recent presentation by Professors Scalise and Hornbostel was featured in the Daily Campus newspaper.

- ***Science Fair:*** Professor Scalise and Olness are co-directors for the Dallas Science Fair involving high school and junior high school students throughout the Metroplex. Check us out at: www.DallasScienceFair.org

DISTINGUISHED VISITORS:
The department hosted a number of distinguished visitors this past year including Nobel Laureate Leon Lederman who presented a public lecture in September 2001, and Robert Park (author of the best-selling book ``*Voodoo Science*" and APS director of public affairs) who spoke at the Collegium da Vinci in October 2001.

PLEASE KEEP IN TOUCH:

Help us keep in touch and up-to-date by assisting us with the following:

- Please fill out the enclosed information sheet so we have your correct address and contact information.

- Please put us in touch with others who should be receiving the Physics Newsletter.

- Please help us recruit both undergraduate and graduate students by putting us in touch with any prospective candidates.

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SMU PROFESSOR DIRECTS INTERNATIONAL PHYSICS PROJECT

SMU News Release

February 12, 2001

DALLAS (SMU) --A Southern Methodist University physics professor has been named director of a portion of an international physics project that involves building the world's largest scientific instrument.

Ryszard Stroynowski has been named to the leadership of the ATLAS program, one of several components of a large particle accelerator known as the Large Hadron Collider (LHC) being built beneath the ground in Geneva, Switzerland.

The LHC includes a large underground tunnel with two rings that is 26 kilometers around. Protons will be accelerated around the rings in opposite directions. When they collide at an estimated rate of a billion collisions per second, new particles are expected to be released.

The ATLAS is one of two detectors that are being built as part of the collider project. These detectors will determine the energies, directions and identities of particles produced by the head-on collisions of the two beams of protons. The ATLAS, which is 60 feet tall and 90 feet wide, is the largest detector ever built.

"Among the debris from the collisions there should be some interesting material that no one has seen before," Stroynowski said.

From this material, physicists hope to come up with a better picture of how the universe works.

"Our present understanding of physics is not complete," Stroynowski said. "There must be something out there that we haven't seen yet."

The ATLAS project involves 1,500 physicists from 145 institutions in more than 20 countries. "That Ryszard was selected to head this program from among such a distinguished list of physicists shows an enormous respect from his peers," said Gary McCartor, chair of the Physics Department at SMU.

The United States began contributing to the LHC project after the Superconducting Super Collider project in Texas was cancelled in 1993. The LHC project is under the auspices of CERN, the world's leading particle physics research laboratory. Stroynowski began his career as a staff physicist with CERN in 1970 and has been a member of the SMU faculty since 1991.

Stroynowski said he accepted the ATLAS management position because it is important for the project to stay on schedule.

"I want to be able to participate in those great discoveries before I retire," Stroynowski said.

Stroynowski said the ATLAS detector is expected to be completed in 2005.

"Just getting the pieces down the shaft and assembled will take two years," he said, noting that the accelerator is between 60 and 250 meters underground.

Stroynowski and several other faculty members from SMU have been working on a portion of the ATLAS detector for several years. They have made several important contributions that will help the detector's electronic components survive extremely high levels of radiation.

Although the ATLAS project management office is located at Brookhaven National Laboratory on Long Island, Stroynowski said he plans to do his work from SMU. He has been appointed to the position for one year, but will probably remain in it for longer.

In addition to expanding our understanding of physics, Stroynowski noted that it is likely that there will be other important byproducts of the collider project.

After all, he noted, the World-Wide Web was developed at CERN to help scientists communicate with one another.

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SMU PHYSICS PROFESSOR RECEIVES WHITE HOUSE SCIENCE OFFICE APPOINTMENT

SMU News Release

March 6, 2000

DALLAS (SMU) -- Vigdor Teplitz, a professor of physics in Dedman College at Southern Methodist University, has been named a senior policy analyst with the White House Office of Science and Technology Policy.

Teplitz, former chair of SMU's Department of Physics, took a leave of absence from SMU to accept the appointment, which is through June 2001.

In his new position, Teplitz will help formulate and analyze policies regarding arms control, verification, nuclear nonproliferation, and strategic offensive and defensive forces, particularly regarding their technical requirements and implications. He will represent OSTP in discussions on these topics within the interagency community and with the national technical community.

The OSTP was created in 1976 to provide the White House with timely policy advice and to coordinate the nation's science and technology investment. OSTP has assumed a prominent role in advancing the administration's agenda in fundamental science, technology, education and scientific literacy, investment in applied research, and international cooperation.

Teplitz was with the U.S. Arms Control and Disarmament Agency from 1978 to 1990 and a member of the Scientific and Policy Advisory Committee of the U.S.
Arms Control and Disarmament Agency from 1995 until recently assuming his new duties as a policy analyst.

Teplitz received his Bachelor of Science degree from Massachusetts Institute of Technology in 1958 and his Ph.D. from the University of Maryland in 1962. He has held posts at Lawrence Berkeley Laboratory, CERN (Geneva), MIT, and Virginia Polytechnic Institute and State University. He was senior advisor on international coordination at the Superconducting Super Collider from 1991 until 1993, when Congress voted to terminate funding for the atom smasher located near Waxahachie.

Teplitz has been a member of the SMU faculty since 1990. He is a fellow of the American Physical Society and a member of the American Astronomical Society, American Astronautical Society and the Dallas Committee on Foreign Affairs.

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SMU SOPHOMORE AWARDED PRESTIGIOUS GOLDWATER SCHOLARSHIP FOR 2001-2002

SMU News Release

April 10, 2001

DALLAS (SMU) -- Alonso Gutierrez, a sophomore at Southern Methodist University, has been selected to receive a prestigious Goldwater Scholarship for the 2001-2002 academic year.

The Barry M. Goldwater Scholarship and Excellence in Education Program was established by Congress in 1986 to encourage outstanding students to pursue careers in mathematics, the natural sciences and engineering. The Goldwater Scholarship is one of the premier undergraduate awards of its kind in these fields. The scholarships, which are given to sophomores and juniors, cover the cost of tuition, fees, books, and room and board up to a maximum of $7,500 per year.

Goldwater Scholarship recipients are nominated on the basis of academic merit by faculty members from colleges and universities across the country. Three hundred and two scholars were selected for 2001-2002 from a field of 1,164 mathematics, science and engineering students nominated nationwide. Gutierrez is one of only 16 students from Texas selected to receive the scholarship next year.

Gutierrez is a double major in physics and mechanical engineering at SMU. His career goal is to earn a Ph.D. in high-energy physics and conduct research at one of the particle accelerators such as Fermilab or CERN. This past summer he had the opportunity to do research with physicists at Fermilab, the highest energy particle accelerator in the world.

Gutierrez is the son of Miguel and Noemi Gutierrez of El Paso and a graduate of Montwood High School

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SUMMER PROGRAM AT SMU GIVES HIGH SCHOOL SCIENCE TEACHERS IDEAS ON HOW TO TEACH STUDENTS ABOUT MODERN PHYSICS

SMU News Release

June 8, 2001

DALLAS (SMU) -- In the basement of a college science building, a group of high school teachers are laughing and shouting as they shoot jawbreakers through pieces of plastic tube at a target encased in plexiglass.

"Do not eat any of the protons," instructor Darren Carollo admonishes the teachers.

While this looks like fun and games, there is a serious side to this experiment. It is helping these high school science teachers learn how they can help their students understand complicated concepts such as particle physics.

"When you are talking about muons, leptons and protons the average student can't understand you," Carollo said.

"But when you take a jawbreaker and run it through a tube at 200 to 300 miles per hour and they can see it explode against a rock and fragment, they can understand that. And that gets them interested in high-energy physics."

This summer, 18 teachers from Dallas-area high schools are on the Southern Methodist University campus participating in a program called QuarkNet that is designed to help them and their students learn about the latest discoveries in physics. The program is sponsored by the National Science Foundation, the Department of Energy and two of the world's leading

high energy physics research centers --Fermilab in Illinois and CERN in Switzerland.

Carollo, who teaches biology and physics at Lincoln High School in south Dallas, said he decided to apply for the QuarkNet program after he was charged with finding an experiment that would help high school students understand particle physics. He was accepted for the program, and last summer he spent eight weeks working with SMU physics professors. He also was given the opportunity to visit CERN in Switzerland.

This summer, Corollo is one of three local high school teachers who are working with SMU physics professors to extend the QuarkNet program to other area high school teachers. The 18 participating teachers are at SMU for a two-week workshop that includes a variety of lectures and hands-on labs.

Carollo developed the jawbreaker experiment as a way for teachers to show students what real physicists study with a linear accelerator. As compressed air shoots the jawbreakers into the box, a computer wired to the target enables them to measure velocity, acceleration, force, mass, momentum and the number of particles created when the jawbreakers explode.

Other labs developed for this month's QuarkNet program include one in which the teachers will build a cosmic ray telescope, another in which they will build a cloud chamber to measure radioactive decay and a third in which they will analyze some real data from Fermilab.

Teachers participating in the QuarkNet program this summer will continue to meet throughout this year to share ideas and will return to SMU for another one-week workshop next summer.

SMU physics professors Fred Olness and Ryszard Stroynowski applied to offer the QuarkNet program at SMU so that they could share their research with high school teachers and give these teachers some knowledge they could take back to their classrooms. Both professors are involved with CERN and the construction of the world's largest particle accelerator underneath the ground in Geneva, Switzerland.

"If teachers don't know what we're doing, they can't convey that to students," Olness said. "When students study physics in high school, most of it is old concepts from the 1600s to the 1900s. It is not modern physics."

Norman Thompson, a physics teacher from Crandall, Texas, who is participating in QuarkNet, said he is enjoying this opportunity to learn about cutting-edge topics in physics first-hand.

"When you talk to people who have built the accelerators it gives you a lot better perspective on how it's all done rather than just reading it in a book," he said.

TEACHERS PARTICIPATING IN QUARKNET AT SMU

Cedar Hill
Dirk William Horst, Cedar Hill High School

Crandall
Norman Thompson, Crandall High School

Dallas
Shamsia Ali, Carter High School
Courtney Barber, Woodrow Wilson High School
Darren Carollo, Lincoln High School
Larry Grise, Metropolitan Christian School
Sylvia Pickrell, Skyline High School
Warren Ruckett, Science and Engineering Magnet High School
Pat Spikes, Middle College High School

Farmersville
Jerry Shaffer, Farmersville High School

Garland
Richard Lines Jr., Garland High School
Danielle Reynolds, South Garland H.S.

Irving
Karan Scaife, Irving High School
Robert Brown, MacArthur High School

Muleshoe
Jack Willis, Muleshoe High School

Plano
Kris Whelan, Plano East Senior High School

Richardson
Ken Taylor, Lake Highlands High School
Sandra Lyman, L.V. Berkner High School

PHYSICS MAJOR WINS

SMU Daily Campus

Wednesday, April 25, 2001

By Todd Tomlin

Contributing Writer

Alonso Gutierrez, sophomore physics and mechanical engineering double major, has been selected as the 2001 Goldwater Scholarship recipient.

"I am proud to see Alonso carry on the tradition of Goldwater Scholars at SMU," said Kathleen Hugley-Cook, associate dean for Student Recruiting and Special Programs.

The scholarship allows qualified individuals to study and conduct research in the fields of mathematics, the natural sciences and engineering. The Goldwater Scholarship is one of the premier undergraduate awards of its kind in these fields.

Gutierrez fits the pursuits of a Goldwater Scholar well. In the summer of 2000, he was an intern with Fermilab in Chicago. Fermilab is the highest energy particle accelerator in the world. While there, he assisted in the ongoing research at the facility.

"I really enjoyed the research I did at Fermilab," Gutierrez said. "It was amazing being on the frontier of particle acceleration research."

Fred Olness, associate professor and director of undergraduate studies in physics, believes it was this research that helped Gutierrez become a Goldwater Scholar.

"In addition to his excellent grades, I believe Alonso's summer research experience at Fermilab was important in distinguishing him from the other candidates," Olness said. "This experience certifies that not only can Alonso enter a laboratory without getting electrocuted or blow up the lab, but that he can also make substantial contributions to a first-rate research program."

Olness wrote a recommendation for Gutierrez, who had been in his class as a first-year, as part of the application process for the Goldwater Scholarship program. To apply for the Goldwater Scholarship, a student must be nominated by their school. Hugley-Cook is on the committee that nominates SMU students for the scholarship.

"Of the students we've nominated for the Goldwater Scholarship, Alonso is the 14th at SMU to receive the honor of a Goldwater Scholar over the past 11 years," Hugley-Cook said. "This is amazing seeing that this year 1,164 students nationwide were nominated with only 302 scholars being selected."

The statistics become smaller when reflected against the fact Gutierrez was one of 16 students from Texas selected to receive the scholarship.

"It's astonishing to me that I received this award," Gutierrez said. "It is such an honor. It will help me immensely in applying to graduate school."

Goldwater Scholars are expected to pursue advanced degrees. This is a course of action Gutierrez had already planned to take.

The Goldwater Scholarship will assist Gutierrez in reaching his goals. The scholarship covers the cost of tuition, fees, books and room and board up to a maximum of $7,500 for two years, which will allow him to graduate.

"Once I graduate from SMU I hope to earn a Ph.D. in high-energy physics and conduct further research in the field of particle acceleration," Gutierrez said. "Discovering what everything around us is made of fascinates me."

Other areas the Goldwater Foundation Board of Trustees evaluates when choosing a scholar include career objectives and the extent to which the individual has the commitment and potential to make a significant contribution to his field. Additionally, a nominee must have outstanding academic performance and be in the top fourth of his class.

The foundation was established to honor Sen. Barry M. Goldwater, who served his country for 56 years as a soldier and statesman, including 30 years of service in the U.S. Senate.

SCHOLARS AWARDED FOREIGN HONORS
SMU PROFESSORS RECEIVE PRESTIGIOUS HONORS AND DISTINCTIONS FOR THEIR RESPECTIVE DEPARTMENTS

SMU Daily Campus

Tuesday, September 19, 2000
By Kristen Holland
Senior Staff Writer

Two professors have earned bragging rights for their respective departments. Physics professor Ryszard Stroynowski and Anthropology professor Lewis Binford were recently awarded international appointments and honors.

Stroynowski, a native of Poland, was appointed a member of the Steering Group of the NATO Science Committee's Science for Peace Program.

Though the committee's role is to approve or deny proposals, the overall program is designed to bring together scientists from NATO countries and those from former communist countries to work on projects that could assist the former communist countries.

"The role of the group is to help maintain and preserve some of the old scientific infrastructure," Stroynowski said. "The way to do that is to have support of the scientists in collaboration with centers inside the NATO member countries."

Stroynowski will travel to Brussels, Belgium, on Sept. 25-27 for the Steering Group's next meeting. The group is expected to review 900 proposals during the three-day event.

Outside of Stroynowski's international commitments, he is also involved in three ongoing research projects at SMU.

Gary McCartor, chair of the SMU Physics Department, said that Stroynowski plays a pivotal role in the international science community. "Ryszard is one of our most distinguished professors at SMU. He's done a lot of work in high-energy experimental physics," McCartor said. "Right now, he's working on one of the largest machines that's ever been built."

McCartor also said that the machine, known as the LHC (Large Hebron Collider), will allow scientists to look at matter at closer distances then have ever been possible. Construction recently began in Geneva, Switzerland.

Stroynowski joined the SMU Physics Department in 1991, the same year Lewis Binford came to work as a Distinguished Professor in the anthropology department. An instructor since 1960, Binford's resume lists positions in anthropology departments across the country, including UCLA and the University of New Mexico, where Binford served as the Distinguished Leslie Spier Professor of Anthropology.

The Netherlands' University of Leiden awarded Binford an honorary degree for his accomplishments and expertise in the field of anthropology and cultural archaeology. This is not the first degree foreign universities have granted Binford.

In 1999, Mendez France University in Grenoble, France, presented the professor with an honorary degree. Great Britain's University of Southampton presented him with one in 1983. The British Academy elected Binford as a corresponding member in 1997.

"It's [the degree] an honor and countries differ in why they give them," Binford said. "Here in the U.S. they mainly go to politicians and major donors, but in Europe they go to scholars."

In return, honorary degree recipients often teach courses at the university or college that bestowed the degree upon them. Though exact dates have not been set, Binford said he plans on teaching a course at the University of Leiden in the future.

At this point, however, Binford plans to finish creating the index for "Constructive Frames of Reference," a book aimed to teach readers how to use personal knowledge to address ignorance.

After finishing the book, Binford plans to tackle a long list of smaller projects. He spent the last nine years compiling the book, which will be published by the University of California.

"I'm sick and tired of doing long things," Binford said. "I've got a whole list of things I'm interested in doing. I probably will accept a Fulbright [grant] to go to India for a year or so."

SMU PROFESSOR TAKES ON THE WORLD

SMU Daily Campus

Thursday, March 01, 2001

By Whitney Aronoff
Contributing Writer

SMU physics professor, Ryszard Stroynowski has been chosen to lead a portion of an international physics project called ATLAS and is involved with building the world's largest scientific instrument.

ATLAS is part of a large international collaboration and one of several components of a machine known as the Large Hadron Collider. It is located at CERN, the European Laboratory for Particle Physics and birthplace of the World Wide Web in Geneva, Switzerland.

The LHC is designed to unravel the great mysteries of matter, forces and the building blocks of our universe. The LHC will produce head-on collisions of protons of energy. The ATLAS detector will be used to study these collisions and the new particles that they create.

ATLAS is one of two detectors being built as part of the collider project and at 60 feet tall and 90 feet wide is the largest detector ever built. ATLAS is designed to improve fundamental understanding of matter of forces. Physicists hope to come up with a better understanding of how the universe works.

"They are trying to replicate the big bang theory," said Ellen Mayou, assistant director of news and information. "Stroynowski is working on a detector that's going to be a part of this whole thing."

The ATLAS project involves 1,500 physicists from 145 institutes in 20 countries.

"Since Ryszard was selected to head this program from among such a distinguished list of physicists, it shows an enormous respect from his peers," said Gary McCartor, chairman of the physics department.

Stroynowski, who has served as a staff physicist for CERN since 1970, said he accepted the ATLAS management position because of the opportunity to be apart of a great discovery. "The most interesting part of this job is problem solving and how to make it happen." Stroynowski said.

As of last week, the official date the ATLAS project will conclude is 2006. Stroynowski said the work being done in the United States must be completed by 2004 because the ATLAS detector will take two years to install in Switzerland.

Along with Stroynowski, three other SMU faculty members have been working on a portion of the ATLAS detector for three years. The ATLAS management office is located at Brookhaven National Laboratory in Long Island, N.Y.

"I travel a lot, every other week," Stroynowski said. "The last two weeks I've been in Geneva. I travel to the Brookhaven office a lot too. Scientifically, it's not very rewarding. One spends more time traveling than doing science."

But Stroynowski said that being a part of the project is worth all the long hours. "The problems are enormous," he said, "but I love the challenge of making it happen."

FOUR SMU FACULTY MEMBERS RECEIVE AWARDS

SMU News Release

September 12, 2000

DALLAS (SMU) -- Four Southern Methodist University faculty members were honored recently as outstanding teachers and scholars.

Fred Olness, Ph.D., associate professor of physics, received the President's Associates Outstanding Faculty Award. This award honors tenured faculty members who have sustained high achievement as both teachers and as scholars in their professions. Olness joined the SMU faculty in 1991 and has taught general physics, solid state physics and classical mechanics. He has co-authored a new textbook, Mathematica for Physics, which incorporates computer software into the physics curriculum. He also has published works in several leading journals, including Physical Review D, Nuclear Physics B and Reviews of Modern Physics.

William Barnard, Ph.D., associate professor of religious studies, and Thomas W. Carr, Ph.D., assistant professor of mathematics, received the Golden Mustang Outstanding Faculty Award. This award is given to junior faculty members whose teaching is consistently excellent, whose courses reflect thoughtful curricular development and whose scholarship makes a meaningful contribution to their discipline and to student learning. Barnard has been a member of the SMU faculty since 1994. He is author of the book Exploring Unseen Worlds: William James and the Philosophy of Mysticism, and has published several works in journals such as The Journal of the American Academy of Religion, The Journal of Religion and Paradigms. Barnard has previously received SMU's Mortar Board Honor Society Award for teaching excellence.

Carr joined the SMU faculty in 1996 as the first David W. Starr Assistant Professor of Mathematics. He has received grants from the National Science Foundation and the Naval Research Laboratory in support of his research and has published findings in Physics Reviews E, Physica D and Physics Letters, among other journals.

Ellen Smith Pryor, professor of law, received the United Methodist Church Scholar/Teacher of the Year Award. Pryor is co-author of the torts casebook, The Law of Torts, and the author of numerous articles on tort, insurance and disability compensation. She is a member of the prestigious American Law Institute and was recently appointed by the Institute as an advisor to the Restatement of Torts.

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SMU PROFESSORS RECEIVE INTERNATIONAL HONORS, APPOINTMENTS

SMU News Release

September 13, 2000

DALLAS (SMU) -- The following professors at Southern Methodist University have recently received international honors or appointments:

Ryszard Stroynowski, professor of physics, was appointed a member of the Steering Group of the NATO Science Committee's Science for Peace Programme. The program is designed to bring together scientists from NATO countries and scientists from former communist countries to work on projects that have economic potential or application to environmental problems in former communist countries. Steering Group members help the Science for Peace Programme assess the hundreds of proposals they receive for funding.

Stroynowski will travel to Brussels for the Steering Group's next meeting Sept. 25-27.

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'PHYSICS DAY" MAKES STUDENTS WISE

By Reed M. Johnson

SMU Daily Campus
January 24, 2002

In the wee hours last Saturday morning, professors Dr. Randall Scalise and Dr. Kent Hornbostel of SMU's physics department came early to teach local elementary children basic physics principles and concepts.

The physics circus was the primary attraction at this year's "Physics Day," hosted by members of Women In Science and Engineering (WISE).

"The physics circus was a beautiful combination of education and entertainment," WISE co-director Christina Leone said. "To have a faculty that is so dedicated to the pursuit of knowledge and education, such as the physics department here on campus, is a testament to the quality of education here at SMU."

"Physics Day" was held for fifth and sixth grade girls from four local elementary schools. The day began at 8:30 a.m. with breakfast and icebreakers. The morning games were designed by the WISE officers to give the girls the opportunity to interact with their peers from other schools.

After the icebreakers, participants were brought to Fondren Science Building where Scalise and Hornbostel presented their physics circus.

"The concepts of basic physics can be confusing to some college students, and more so to elementary school kids," said engineering doctoral student Arunn Narasimhan. "This morning's circus was specially designed to break through the misconceptions inherent in the field of physics and introduce some of the fundamental principles of deductive reasoning."

The circus focused primarily on the fundamental principles of thermodynamics and the solid-state physics in materials. Using liquid nitrogen, Scalise and Hornbostel were able to introduce to elementary school children some of the basic ideas of atomic motion and interaction.

"It's inspirational to see members of the SMU physics faculty take time off from their busy schedules of researching and teaching, to work with children on their understanding of basics ideas," said co-director Julie Gonzalez. "It's wonderful to see SMU faculty and students working together to help the Dallas community."

The secondary focus of "Physics Day" was the basic principles of motion and electromagnetic theory. Working with physical demonstrations as a foundation of learning, Hornbostel and Scalise were able to show the students the magic behind the world around them. Throughout the day the children were encouraged to ask questions about the demonstrations and the principles that allowed them to work.

"It's those moments of one-on-one interactions between the girls and professors that make these days such a success," WISE officer Ashley Scully said.

For more information on WISE youth mentoring programs, faculty and students can contact the organization by e-mailing wisewomen001@yahoo.com

Thomas Edward Coan
Associate Professor

Ph.D. University of California at Berkeley, 1989.
B.S. Massachusetts Institute of Technology, 1980.

Related Experience

- Los Alamos National Lab
- European Laboratory for Particle Physics Geneva, Switzerland
- Group leader designing ring imaging Cherenkov radiator

Physics Research

Coan's research concentrates on the experimental study of "CP violation," the phenomenon that characterizes the subtle but clear differences in behavior between matter and antimatter. Noting the differences is preliminary to an understanding of why there is any matter - galaxies, stars, planets and people - in the universe at all.

Modern theories of the evolution of the universe predict that the very early universe, soon after the Big Bang, contained equal amounts of matter and antimatter. Yet today, we see around us only normal matter - protons that have positive charge and electrons that have negative charge. Where did all the antimatter go and why didn't it annihilate with normal matter and leave us a Universe filled exclusively with light? It is far from clear that current theoretical explanations are even approximately correct in their description of our curious state of affairs.

Coan has designed and constructed novel devices that measure the properties of antimatter and matter. One such device was recently built in the basement of Fondren Science building and was used to measure the speeds of sub-atomic particles. It was built from 120 square feet of specially grown lithium fluoride crystal tiles.

Yongsheng Gao
Assistant Professor

Ph.D., 1995, Physics, University of Wisconsin-Madison
M.S., 1988, Physics, Shandong University
B.S., 1985, Physics, Shandong University

Related Experience

- European Laboratory for Particle Physics, Geneva, Switzerland
- Laboratory of Nuclear Studies at Cornell University

Physics Research

Under the leadership of Yongsheng Gao, we propose to create a dedicated computer ``farm" at SMU. The analysis of CLEO III data will require a large computing effort both for data analysis and for Monte Carlo simulation. In particular the Monte Carlo production will require a dedicated computer ``farm". A ``farm" of dedicated LINUX based processors together with tape robot and sufficient disk space can generate about 1/3 of the simulated data required for the projected CLEO III run. The choice of the associated hardware has not been made at the time of this writing. A separate proposal for the necessary CPU and storage devices will be made after the choice of the computing platform will be made by the CLEO Collaboration.

Gao's research concentrates on questions regarding the properties of the most fundamental constituents of matter and the laws governing their behavior. The symmetry breaking between matter and ant-matter (i.e. CP violation) and the origin of mass (search for Higgs particle) are among the most important questions that Gao's research at CLEO and ATLAS is trying to address. Gao's recent research work at CLEO includes the first observation of hadronic b to u transition

($b \rightarrow \pi^+ \rho_0$ and $\pi^+ \rho$- decays) and the first observation of Cabbibo suppressed D* K*- decays. These decay processes can be used to test the CP violation scheme in the Standard Model.

Kent Hornbostel
Associate Professor

Ph.D., 1988, Physics, Stanford University
B.S., 1981, Physics, Duke University

Kent Hornbostel works in the NRQCD collaboration, a group that does lattice calculations, including error estimates, suitable for comparison with data. The group has produced calculations of α_S and the mass of the b-quark, which are among the most accurate in the world. They have also produced a measurement of the mass of the c-quark. Currently they are working to improve their error estimates, to improve their methods for systematically improving Lagrangians, to improve their estimates of the mass of the c-quark and to devise methods to include light sea quarks in their calculations. Hornbostel is also performing calculations on the breaking of QCD strings using light-cone methods.

Gary Don McCartor
Professor

Ph.D. Texas A&M University, 1969
A.B. Occidental College, 1965

Physics Research

McCartor attempts to develop better ways to solve the equations which we think govern the behavior of our world at its most fundamental level.

Theoretical work in High Energy Physics and Elementary Particle Physics is cast in a mathematical framework called Relativistic Quantum Field Theory,

McCartor monitors both the Threshold Test Ban Treaty (TTBT) and the Comprehensive Test ban Treaty (CTBT). His algorithms and software help operate the International Bata Center, the instrument of the United Nations Conference on Disarmament which will monitor the CTBT if it enters into force.

Fredrick Olness
Associate Professor & Chair

Ph.D. U. of Wisconsin, 1985
M.S. U. of Wisconsin, 1982
B.S. Duke University, 1980

Related Experience

- Author of 80+ research articles
- "Most Cited Paper" in HEP-PH for 1999
- Dallas Science Fair Co-Director
- 2000 SMU President's Associates Outstanding Faculty Award
- Organizer/Lecturer at 8 International Summer Schools
- "Mathematica for Physics" textbook now translated in Japanese
- Popular public lectures on "The Physics of Music" and "Physics Circus"

Physics Research

A theoretical particle physicist, Professor Olness is at the forefront of the search for the fundamental building blocks of matter. He analyzes newly proposed theories, and compares them with the latest precision experimental data. Such discriminating tests allow us to discover signs of new phenomena such as SuperSymmetry, Higgs Bosons, and SuperStrings.

Randall J. Scalise
Senior Lecturer

Ph.D., 1994, Theoretical Elementary Particle Physics, Pennsylvania State University
B.A., 1987, Cornell University

CTEQ is ``The Coordinated Theoretical-Experimental Project on QCD". Randall Scalise created and continues to maintain the group's World Wide Web Page at http://cteq.org, which has accumulated over 9,760 hits since its creation on 23 February 1996.

This page is the primary distribution site for the CTEQ parton distribution functions, which are available in several formats. CTEQ Workshop and Summer School information, CTEQ Symposia transparencies online, and CTEQ preprints are also found there.

Scalise has reformatted the CTEQ Handbook of Perturbative QCD [12] to make it available electronically.

The Handbook is now accessible online, where it can be updated immediately to include the latest experimental and theoretical results without having to wait for the next printing of the paper edition.

Scalise will also contribute two sections to the next version of the handbook, one on the running of the strong coupling and one on selected integrals used in renormalization by dimensional regularization.

Ryszard Stroynowski
Professor

Ph.D. University of Geneva, Switzerland, 1973
M.Sc. University of Warsaw, Poland, 1968

Related Experience

- Field of Specialization; Physics of Tau Lepton, Search for new physics phenomenon
- Taught at: Stanford, Caltech, UCLA, Lausanne
- Lead Physicist of GEM magnet group (91-93)
- Liquid Argon Calorimeter Project Leader- LHC
- American Physical Society Fellow

Physics Research

Stroynowski is searching for new phenomena in the fields of elementary particle physics where current theoretical descriptions of the particle's interactions are inadequate.

At SMU since 1991, Stroynowski, Coan, and Gao collected data with the CLEO detector. Stroynowski is presently leading a team that is studying properties of heavy quarks and tries to find time reversal violation in a system of "bottom" quarks.
Stroynowski also collaborates with scientists from around the world on ATLAS, a large detector under construction at the European Large Hadron Collider (LHC) in Geneva, Switzerland. He is leading the construction of a major component of the detector and is designing fast electro-optical data links for one of the detector subsystems.

The experiment will search for effects responsible for the differentiation of particle masses and possibly for the origin of matter-antimatter asymmetry in the universe. ATLAS is expected to begin operations

Vigdor L. Teplitz
Professor

Ph.D. University of Maryland, 1962
S.B. Massachusetts Institute of Technology, 1958

Related Experience

- Currently on loan to the Executive Office of the President as senior policy analyst in the White House office of Science and Technology Policy (OATP)
- Senior Advisor Supercollider, 91-93

Physics Research

Suppose, instead of the universe being filled with neutral, weakly interacting particle (wimps), it is filled with neutral, strongly-interacting, massive particles (simps). Strongly interacting means the particles can feel a force from the protons and neutrons that make up the nuclei of atoms. This means that they can be captured by nuclei.

Three years ago, Teplitz and a colleague from the University of Maryland showed that such particles would tend to be captured by large nuclei. Two years ago he was joined by two colleagues from SMU and calculated for gold, which has very large nucleus, what the abundance would be of anomalously heavy gold nuclei - ones that had been close to the surface of the earth and captured a simp. Teplitz has been working with SMU's Geoscience Department to locate gold samples that geologists know have been near the surface for millions of years so that a millionth or billionth or trillionth of their nuclei have captured a simp (if simps exist). An experiment has been running for several months at a small nuclear accelerator at Purdue.

It is thought possible that there exists matter in a form much different than that of ordinary matter; big chunks with the density of nuclei, about a trillion times denser than dirt or than a piece of gold. It would be hard to find because a big piece (by weight) would be very small (in size). Such would be the case if matter ade of what are called Up, Down, and Strange quarks were to be stable and not decay immediately to ordinary matter, which is made of just Up and Down quarks condensed into protons and neutrons. We are searching for the seismic signals that would be heard by seismic stations if ton-sized "nuggets" of this "strange quark matter," which would be about the size of a red blood cell, were to pass through earth.

Roberto Vega
Associate Professor

Ph.D., 1988, Physics, University of Texas at Austin
M.S., 1982, Mathematical Physics, Georgia Institute of Technology
B.S., 1978, Physics, University of Puerto Rico

Related Experience

- Research Associate, Stanford
- The Next Linear Collider Working Group

Physics Research

Scientists living during the past century made remarkable progress in the age-old quest to understand the basic constituents of matter and determine the laws that govern their interactions. However, we remain as perplexed as those living when Democritus first put forth the idea of the atom. Although we presently have a very successful theory that beautifully synthesizes almost all experimental observations, there remain many questions the theory does not answer.

Perhaps the most compelling question is that of the origin of mass. In the current particle physics paradigm, the question is intimately connected to a very general principle, called the *electroweak symmetry*, a symmetry in an internal abstract space. One consequence of this principle is that the physics of a system of particle will not be altered if we replace a particle of a given species with a particle of a different species. Theoretically then, this symmetry in an atom would allow us to replace a proton with a neutron without changing the physical characteristics of that atom. This is obviously not true; if you replace the proton with a neutron in a hydrogen atom, you would no longer have a stable system. Nevertheless, there is other experimental evidence that gives definitive proof that the electroweak symmetry is indeed a symmetry of nature. How this apparent paradox is resolved is inextricably connected to the origin of mass of the elementary particles.

Some time ago peter Higgs (a British physicist) discovered that when you impose a particular structure in the dynamical equations describing the interactions of massless elementary particles, the original equations are transformed into those describing the interactions of massive elementary particles. This approach required the existence of three particles, the W and Z particles which were discovered at CERN in 1983, and the Higgs particle which remains elusive, waiting to be discovered.

Vega researches the ways in which the Higgs particle (or particles) can be detected at future supercolliders, such as the Large Hadron Collider (LHC) scheduled for completion in Geneva Switzerland during 2005.

Jingbo Ye
Research Associate

Ph.D., 1992, Physics, Institute for High Energy Physics, Swiss Federal Institute of Technology
B.S., 1986, Physics, University of Science and Technology of China

Within the ATLAS Collaboration, Jingbo Ye along with Richard Stroynowski and Prof. Gary Evans from the SMU Electrical Engineering Department, are responsible for about 2000 fast digital optical data links for the Liquid argon Calorimeter. The links have to work at the speed of at least 1.28 Gbps. Typical transfer protocols use additional control bits increasing the minimum transfer rate to 1.6 Gbps.

PHYSICS *at SMU*

A newsletter for alumni and friends. **Winter 2001-2002**

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