Space Wars and UNISOR: Leigh Harwood Recalls His Undergrad Days

Just for the record, Leigh Harwood didn’t really program video games on the computer in Lee Riedinger’s lab. At least that’s his official response to Glenn Young’s assertion in the last issue of Cross Sections that he added an early version of “Space Wars” to the PDP machine the nuclear physics group was using for research in the 1970s. “Glenn gives me more credit than I’m due. That program came ‘free’ with the equipment,” Dr. Harwood said laughing. “I was only doing programming for our new data acquisition system.”

Dr. Harwood is a 1974 UT graduate with a bachelor’s degree in physics. The son of a Baptist minister, he was born in Memphis but spent time in Virginia, Tennessee, and Missouri growing up. “I’m nominally a Tennessean, but I had other influences,” he said.

It was while attending grade school in Western Tennessee’s Lake County that he decided he wanted to attend “the big UT” in Knoxville. His sister went to UT-Martin, but he set his sights on Knoxville with a major already settled on.

“I wanted to go into what I thought was atomic physics but would later find out was nuclear physics,” he said.

As things worked out, Knoxville had another attraction for him. “I was in a very small rural high school. The math and science was very limited. In the summer of 1969 I spent a couple of weeks with my sister who was working on a M.S. in microbiology at UT. During that visit I learned about the early admissions program. Those days in that program you could be admitted to UT without a high school diploma, provided your GPA and college boards met the right criteria. Fortunately, mine did and I was able to avoid ‘wasting’ another year in high school. The irony is that even though I have a Ph.D., I’m ‘officially’ a high school drop-out.”

His introduction to the University, however, was not without its hiccups.

“I moved into Carrick Hall. It was somewhat intimidating; Presidential Complex housed more people than my home town.”

Dr. Harwood also explained that the spelling of his first name often leads people to conclude that “Leigh” is a “she.” During his first fall term at UT he received a nice letter on official University stationery in an official University envelope. It was from the Dean of Women.

“I had been invited to pledge the freshman honors sorority,” he said.

Although he thought that it would be a great joke to attend the sorority tea described in the invitation, he decided instead to go to the Dean of Women’s Office, where he presented both his letter and his ID card.

“I think there’s been a mistake,” the receptionist said.

Life in physics, however, was a bit less complicated. Dr. Harwood worked with Lee Riedinger, Bob Lide, and Carrol Bingham through an independent study and as a work study student.

“I sort of double-dipped,” he explained.

He was also one of only a handful of students pursuing physics.

“By about my sophomore year, but definitely by my junior year, there were only four of us left that started together as freshmen,” he said. “There weren’t many of us physics majors back in those days.”

Though they may have been few in number, physics majors had the opportunity to work on major research projects. For Dr. Harwood, that opportunity presented itself in UNISOR, the University Isotope Separator at Oak Ridge. The project was established to enhance research on fundamental nuclear structure and involved 11 universities including Vanderbilt, Georgia Tech, and Furman.

“It was pretty exciting to be around in the early days of UNISOR,” Dr. Harwood said. “Lee and Carrol did a lot to make the early days work. I got to be involved in very useful ways. That was my first time to be on the ground floor of something like that.”

After graduating from Tennessee, Dr. Harwood headed to Florida State to continue his studies in experimental nuclear physics, earning a master’s degree in 1977 and a Ph.D. in 1978.

“It was a great place to be a grad student,” he said. “In a small lab like that you get involved in all aspects of doing the experiments from running machining parts for setups through running the accelerator to writing the data acquisition and analysis software. And THEN you get to work on your own data. The beaches were very nice too,” he added with a laugh.

Next he went to Michigan State as a post-doc. Eventually he earned tenure there on the research staff.

“Around that time I decided to work on the cyclotron as opposed to doing experiments in nuclear physics,” he said.

The National Superconducting Cyclotron Laboratory at Michigan State is home to two cyclotrons: the K500, which was the first cyclotron to a superconducting magnet; and the K1200, which Dr. Harwood helped design.

One of Dr. Harwood’s projects at NSCL resulted in a technique for purifying beams of exotic nuclei.

“Back in 1980 we were planning the research program for the K800 (later
these experiments is the advance in computing power they encourage.

“Because these effects are so small, you need a lot of computing and data storage,” Dr. Spanier said. “What we have presently in our experiment is the world’s largest database. We just discovered, very unexpectedly, a new light particle, because other experiments never looked before in a certain corner of their dataset or could not afford to store the information at all. There was a very significant peak not picked up at all.”

With the large number of collaborators involved (BaBar involves 550 physicists from 72 institutions) good communications are an absolute necessity.

“SLAC has [a] connection to the fastest data transfers around the earth,” Dr. Spanier said. In fact, they reached a certified data transfer speed record in February, sending 6.7 gigabytes in 58 seconds from Sunnyvale, California, to Amsterdam.

Dr. Spanier has 20 new computers in the Science and Engineering Research Facility and hopes, in time, to put together 60 more. They will be high-performance, high-speed machines, all linked together for internal communication. The electronic workshop of the physics department and a graduate student are working with him to set up the networking and clusters that will keep Dr. Spanier’s experimental data organized. Systems such as this feed into the next generation of computing: a decentralized grid design that aggregates a pool of computing power to be accessed on an as-needed basis. A broker machine distributes the data for analysis and sends the results back to the researcher. Of course, with the future potential of commercial interest, Dr. Spanier said, “what is called a broker may turn into a real broker.”

Since joining the faculty last fall, Dr. Spanier has been preoccupied with setting up his computing system on campus while maintaining his research interests at SLAC. He has also been involving other physics faculty in BaBar.

He is also getting involved in undergraduate physics education. Dr. Spanier is teaching Physics 102: How Things Work, to explain the basic principles of physics to non-physics majors and demonstrate how they fit into everyday life. He is also involved in TECOP (the TEnnessee Cosmic ray Observation Project), a research endeavor initiated by the Society of Physics Students.

Another asset to the University is that his wife Mahalaxmi Krishnamurthy, is a post-doc in physics working with the FOCUS collaboration at Fermilab. She also provides analysis support for the BaBar experiment.

Dr. Spanier is a graduate of the Johannes Gutenberg University in Mainz, Germany, having earned his diploma in physics in 1991 and his Ph.D. in 1994. He was awarded a CERN fellowship and worked as a post-doc at the University of Zürich from 1994 until 1998. From there he went to SLAC as a research associate before coming to UT last year.

Dr. Spanier said he has now been able to enjoy “the Alps in Geneva, the coast in California, and the Smoky Mountains in Tennessee.”

We are pleased to welcome Dr. Spanier to the physics department at UT.

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SERF Equipment
Continued from Page 5

Another key element in the group’s on-campus research efforts is the Crystal Growth Facility, co-managed by Drs. Pengcheng Dai and David Mandrus. These new labs in SERF house a NEC Machinery Corporation SC-2-MDH-11020 infrared (IR) image furnace; as well as seven Lindberg Box furnaces (four 1500 C, one 1700 C, two 1200 C), two 1100 C Mini-Mite Tube furnaces and one 1500 C Lindberg Tube furnace. The facility’s IR image furnace is used to grow single crystals of transition metal oxides and other materials suitable for neutron scattering, transport and optical investigations.


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Alumnus Profile: Leigh Harwood
Continued from Page 5

particularly its application to the cavities used for beam acceleration.”

In addition, he was head of the beam physics and instrumentation department for two years.

“I just can’t hold a job here,” he said laughing.

Currently he is leading the project to double CEBAF’s energy to 12 GeV.

“They asked me to lead that program,” Dr. Harwood said. “I’ve been working on that for about three years now. The whole project, accelerator plus experimental system upgrades, will be around $200M. We’re waiting now to get approval from the Department of Energy to proceed.”

Occasionally he gets to do some technical work, but primarily it’s budgets, meetings, and scheduling. He said that like the typical physicist, he comes in on Saturdays and spends a great deal of time on work, but he is not a man without other interests. At present scuba diving is his favorite distraction, a hobby he discovered during his undergraduate days.

In the past few years he has renewed his enthusiasm for the sport and traveled to Honduras, the Red Sea, and Micronesia (the south Pacific) to dive. He also finds time to play a little music, a little volleyball, and to volunteer with the Appalachian Trail Conference.

As for his UT days, that’s an experience Dr. Harwood is quick to praise.

“I am grateful that I came to UT for school,” he said. Of the three universities he has been affiliated with, he said that “UT was the most geared toward the positive welfare of the students.”

From the financial aid office to the physics department, he said the people he met at Tennessee “always seemed genuinely interested and concerned about the students. We weren’t just a number and a file.”

Dr. Harwood has one son, Benjamin, who is a 21-year-old college student.

“He’s a math major who wants to teach. Abstract algebra is his specialty. I’m proud to say that he’s already had a paper published.”