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Profile

Physicist with 35 years of experience in academia as a professor, researcher in experimental elementary particle physics and leader of multi-national scientific collaborations now working for URS on sustainability solutions, on technical issues in support of the US Navy and Marines and on establishing collaborations between industry, the military and academia.

Education

Canisius College – Buffalo, NY
B.S. Physics 1964
University of Notre Dame – Notre Dame, IN
Ph.D. Physics 1969

Appointments

California Institute of Technology – Pasadena, CA
Research Fellow 1969-1971
Senior Research Fellow 1971-1973
Indiana University – Bloomington, IN
Assistant Professor 1973-1976
Associate Professor 1976-1979
Professor 1979-2004
Chancellor’s Professor 2004-2006
Chancellor’s Professor Emeritus 2006 – present
National Science Foundation – Washington, DC
(On leave from Indiana University)
Program Officer for Particle Physics 1982-1983
European Organization for Nuclear Physics (CERN)
Geneva Switzerland
(On leave from Indiana University)
Scientific Associate 1985-1986
Thomas Jefferson Laboratory – Newport News, VA
Distinguished Visiting Fellow 2006-2008
URS Federal Services Inc. – Odon, IN
Physicist 2008-present

Academic Experience – Teaching

Introductory Physics (non-calculus) (F-1)
Introductory Physics (calculus-based) (F-2)
Introductory Honors Physics (calculus-based) (F-2)
Electricity and Magnetism (S-2)
Analog and Digital Electronics (J/S -2)
Geometrical and Physical Optics (J/S-2)
Analytical Classical Mechanics (J/S-2)
Mathematical Physics (G-2)
Elementary Particle Physics (G-2)
Experimental Methods (G-1)

Legend: F=Freshman; S=Sophomore; J/S=Junior/Senior; G=Graduate

1=one-semester course; 2=two-semester course

Almost all of the classes listed above were taught multiple times

Honors Physics: *I developed the two-semester Introductory Honors Physics course in 1994 and taught the course for eight non-consecutive years. The course is still being taught. Honors physics is a limited and restricted enrollment course for students of high academic achievement. The professor meets the class 5 days a week in a room dedicated to the course and available to the students 24/7 throughout the academic year. Meetings are a blend of lectures, discussions, problem solving and an introduction to computational techniques, experimental techniques and data analysis. Students carry out multi-week experimental projects outside of class time. Many of the students have gone on study at top graduate, medical or law schools in the country. I am currently writing a text book based on this course.*

Applied Physics: *In 2003, I started the Applied Physics track for students majoring in physics who are interested in working in industry or labs after receiving their B.S. degrees. Students in this track take a slightly modified curriculum of courses that emphasize instrumentation and data analysis. Students are also required to spend at least one summer as a paid intern in one of our partnering industries and labs (e.g. Cook Inc., NSWC Crane, Fermilab, Jefferson Lab, ProCure).*

Research Experience for Undergraduates: *Starting in 1990, I employed between two and four undergraduates per year in my elementary particle physics research group. The students worked part-time during the semester and full-time during summer months. They participated in detector and equipment design,*

construction and testing, in data-analysis and in weekly group meetings where they were expected to make presentations.

Academic Experience – Doctoral Mentorship

Seven students received their Ph.D. in physics under my mentorship

Academic Experience – Service

Throughout my academic career at Indiana University I served (and continue to serve) on committees within the Physics Department, within the College of Arts and Sciences, and within the broader national and international communities.

Examples of some of these committees:

Departmental:

- *Executive Committee (by election)*
- *Graduate Admissions Committee (chair)*
- *Undergraduate Recruitment Committee (chair)*
- *Space Allocation Committee (chair)*
- *Curriculum Committee (chair)*

College of Arts and Sciences:

- *College Policy Committee (by election)*
- *Faculty Promotions Committee*

University:

- *Member of the Honors Faculty*
- *Honors Scholarship Committee*
- *Herman B. Well Scholars Committee*
- *Faculty Grant-in-Aid Committee (I still serve)*
- *Goldwater Scholarship Committee (I still serve)*
- *Indiana Cyclotron Facility (IUCF) Director Search (chair - recent)*
- *IUCF-MPRI Financial Arrangements Committee (recent)*
- *Chemistry Department Conflicts Resolution Committee (recent)*

National and International:

- *Brookhaven National Lab Users Executive Committee (chair)*
- *DOE Review of the National Lattice Quantum Chromodynamics Program (recent)*
- *Member of the Review Committee of the U of California at Santa Cruz Honors College*
- *Trustee-at-Large of the Southeastern Universities Research Association (from 2002 to 2008)*
- *Member of the Board of Examiners for the Graduate Record Exam in Physics (Educational Testing Services) (from 1998 to 2008)*
- *Member of the Review Committee for the Center of the Subatomic Structure of Matter at the University of Adelaide in Australia (2001 and 2002)*

Academic Experience – Community Service

From 1990 through 2006 I gave talks to high school students in Greene, Marion and Monroe counties and from 1992 to 2000 twice-yearly science demonstrations for the Eastern Greene Elementary School.

Academic Honors

- **Five Physics Department Excellence in Teaching Awards** (1995-1999)
- **Two Indiana University Trustees Teaching Awards** (2000-2001)
- **Indiana University Distinguished Research Lecture Award** (2004)
In accepting this award I gave a public lecture: “Exotic Mesons and the Confinement of Quarks.” An interesting consequence was that Prof. Don Freund of the IU School of Music composed a fantasy for a wind ensemble that he named after my lecture. His composition premiered at the IU Musical Arts Center on February 15, 2005. The music is available on my website under Research.
- **Named Chancellor’s Professor of Physics (2004)**
This distinguished professorship rank is awarded for excellence in teaching and research

Professional Honors

- **Elected Fellow of the American Physical Society in 1998.**

Research – Principal Investigator

From 1985 to 1990 I was Co-Principal Investigator of a 6-faculty member Department of Energy (DOE) Grant for High Energy Physics Research. From 1990 until 2008 I was Principal Investigator of our DOE Particle/Nuclear Physics Grant which supports two faculty members, a Senior Scientist, three postdoctoral fellows, an electronics engineer, a technician and three graduate students. The annual grants varied between \$300K and \$400K depending on the level of construction for experiments.

Research – Collaboration Leader

High energy/nuclear physics experimental research is typically carried out by multi-institutional collaborations led by a spokesperson. Spokespersons

coordinate the activities of the collaboration, present the science and technical case to funding agencies and national review committees and generally officially represent the collaboration. I have been spokesperson for several collaborations.

- **Meson Spectroscopy at Fermilab** - I was spokesperson for an experiment at Fermilab (near Chicago, IL) to study the spectrum of mesons at ultra-high energies. The experiment took data from 1976 to 1980.

- **Meson Spectroscopy at Brookhaven** - I was the founding spokesperson for the so-called E852 collaboration at Brookhaven National Lab to study the spectrum of mesons. The project was approved in 1990. My group at Indiana University was responsible for the largest detector subsystem, a \$3M photon detector consisting of 3000 blocks of lead-glass. The group designed the detector, read-out electronics, including 3000 channels of fast encoding ADC's and mechanical support. We finished data-taking in 1995 and published several papers.

- **GlueX** - This collaboration consists of 75 physicists from 20 institutions in the US, Canada, Europe, Russia and Australia. I was the founding spokesperson of this collaboration until 2007. The collaboration was formed in 1997. The project is a search for a new state of matter, exotic mesons, using multi-GeV photons as a probe. In order to carry out the project, a new detector will be housed in a new experimental hall at the electron accelerator at Jefferson Lab. The cost of the GlueX experiment is \$30M and the accelerator will be upgraded in energy to carry out this experiment. During the last 10 years we have carried out a program of R&D on new detector technology. The project has undergone successful external reviews and construction will start in about 18 months with first beam to be delivered in 2014. GlueX is the flagship physics project for the \$300M upgrade of the Jefferson Lab accelerator. The physics of the project is described a cover story article in American Scientist, for which I was lead author. The article can be downloaded from a link (under Research) on my website.

Research – Publications and Talks

- **Publications:** I have co-authored 85 articles in peer-reviewed journals. A list of my publications can be found on my website under Research.

- **Talks:** From 1990 to 2007 I gave between two to five invited talks per year at national and international meetings and conferences on high-energy particle/nuclear physics.

- **Book:** I am preparing a monograph on nuclear power for the Indiana University Press.

Professional Society Membership

- **American Physical Society**
 - **Division of Nuclear Physics**
 - **Division of Particle Physics**
 - **Division of Particle Beams**
 - **Group on Hadronic Physics**
 - **Group on Energy Research**
- **American Nuclear Society**
- **American Association of Physics Teachers**
- **American Society of Naval Engineers**
- **IEEE**
- **Sigma Xi – The Scientific Research Society**

Work at URS

81-mm Mortar: From August 2008 to June 2009 I worked in support of Office of Naval Research sponsored work associated with improving the fires accuracy of the 81-mm mortar. In particular, I wrote Monte Carlo simulation code to determine the error budget contributing to the fires inaccuracy associated with the mortar ballistics, taking into account pointing accuracy and uncertainties in the knowledge of meteorological (MET) parameters (temperature, air density, winds). I worked with a meteorologist (at the White Sands Missile Range) specializing in numerical weather prediction to understand the accuracy of forecasting and also to provide realistic weather information as a function of space (3-D) for my simulation model. I also worked with manufacturers of LIDAR systems and their MET accuracies to include in my simulations. The goal was to determine if a man-portable ground-based LIDAR could be used to significantly improve fires accuracies by inputting LIDAR-obtained MET data into the ballistics computation. My work and conclusions were summarized in a 50-page technical note in March 2009. In May 2009 I organized and led a Workshop on Ballistics and MET in Crystal City, VA which brought together MET and Ballistics experts from the Army, Navy and Marines. The two-day workshop concluded in a plan, which will be carried out by others, to conduct live-fire tests that would include artillery and LIDAR.

Energy:

Hydropower: *In November 2009 I wrote a white paper on the feasibility of re-activating the hydropower plant at Williams Dam as a potential source of power for Crane. I worked with members of the URS water resources group in Denver to develop this concept further and a Due Diligence Study was completed in September 2010. We have also studied the possibility of employing a high-temperature superconducting generator at reactivated powerhouse. Further discussions are underway with NAVFAC as possible sources of funding are identified. The Due Diligence Study has been reviewed by the Army Corps of Engineers (favorably) and is currently being reviewed by the National Renewable Energy Laboratory.*

Metering: *In 2010 I performed a detailed analysis of electrical power use at NSA Crane and within the URS building in WestGate, using interval power data provided by the utility companies Duke Energy and REMC respectively. The power use every 30 minutes and 15 minutes (respectively) were captured and archived over the course of the year. Results of the analysis were presented in two technical notes. In collaboration with the School of Informatics at Indiana University, we submitted a proposal, in response to a DOD SERDP installation energy solicitation, to develop software to mine data that will be collected by the Advanced Metering Infrastructure deployment of several hundred water, gas, electrical and steam meters throughout the Crane base.*

Small Modular Reactors: *We are examining the possibility of using small modular nuclear reactors (SMRs) at NSA Crane and/or Camp Atterbury to make one or both of these installations islands of energy self-sufficiency. I have assembled a team from academia, government, industry and the two bases, to look at the technical, economic and political issues involved and to educate the public about the benefits and risks associated with nuclear power. Our group had its first formal meeting in June 2011. The next meeting took place at Camp Atterbury in January 2012. Discussions are also underway with Duke Energy and with SMR vendors (NuScale, Hyperion and Babcock & Wilcox). We are organizing a SMR Symposium to be sponsored by the National Defense Industrial Association in October 2012. We have met a number of local, state and federal government officials about this possibility and also presented this concept to Board of the Bloomington Economic Development Corporation.*

Meetings and Symposia: *I helped organize the URS presentations and booth material for the September 2011 ASNE Global Deterrence and Defense Symposium. I produced a video on the Williams Dam Project, gave an overview talk on energy and organized and moderated a panel discussion on small modular reactors. In June 2011 I attended the Current Strategy Forum at the Naval War College and participated in a group seminar.*

Collaboration with Academia: Along with the Indiana University Research Technology Corporation, we are preparing an agreement between URS and Indiana University that will allow faculty members from Indiana University to participate in classified research for the U.S. Navy.

Personal Information

- *I was born in Buffalo, NY on March 27, 1942*
- *In January 1986 I married Linda who is a broker and owner of Dzierba Real Estate Services in Bloomington*
- *I have three older children from a previous marriage:
Alex Jr, (42) – a critical-care nurse and teacher at Queens Hospital in Honolulu, HI
Robert (41) – an optometrist technician in Denver, CO
Carolyn (40) – a PhD chemist with Bristol-Myers in Middletown, CT*
- *Linda and I have a 22-year son, Christopher, who is a student at IU and a broker-associate at Dzierba Real Estate*
- *Linda and I live near Eastern Greene Elementary School where we enjoy our horses, dog, cats and reef tank. We personally built and maintain all of our outbuildings (barns, sheds, woodworking shop). We also love to cook, read and are avid scuba-divers and underwater photographers.*