Winston Bostick, a man of great 'physical intuition'

The great physicist, who pioneered in fusion energy research and in the theoretical elaboration of the electron, will be missed. The Fusion Energy Foundation's Charles B. Stevens remembers him.

Dr. Winston H. Bostick, pioneer in particle physics, radar technology, fusion energy research, plasma and astrophysics, died on Jan. 19. Bostick, 74, was an innovative thinker and teacher who inspired many with his ability to give physical-geometrical descriptions to the abstract particles and forces that fill the theoretical world of physics and quantum mechanics. For more than half a decade, Bostick carried on an unrelenting struggle against cancer, while simultaneously increasing the output of his creative scientific work. His most recent scientific paper, published in the Winter 1990 issue of *21st Century Science & Technology,* is an example of how he used his work in experimental plasma physics to develop geometric configurations and dynamics for electrons, protons, neutrons, and other *onta*. (He called them *onta* to avoid designating them as particles or point masses.)

In late 1976, I had the task of delivering to Prof. Harold Grad of the Courant Mathematics Institute a copy of Winston Bostick's manuscript for "The Pinch Effect Revisited," whose serialization we begin below, which was to appear in the first issue of the Fusion Energy Foundation's *International Journal of Fusion Energy*. Grad was on the advisory board of *IJFE*. He was also something of a living legacy, having been among the protégés of Richard Courant. Courant had come to the United States in the 1930s from Göttingen, Germany, where he had been the leading collaborator of David Hilbert, a scientific descendant of Carl Gauss, Lejeune Dirichlet, Carl Jacobi, and Bernhard Riemann, the great minds of modern mathematical physics.

The Göttingen school of mathematics was renowned for its emphasis on "physical intuition." Riemann, for example, had always presented his most far-reaching mathematical investigations in the context of a physical problem; a proposal for a crucial experiment so to speak.

While the Courant Institute had become the leading mathematics center of the United States, if not the world, the Göttingen spirit of physical intuition had atrophied to a large extent. But Harold Grad was the happy exception. In this he excelled. His entire life's work had been rigorously embedded in the leading problems of physics and magnetic fusion in particular. His contributions to magnetic fusion were so outstanding that he had become a leading light of the fusion research establishment—an establishment that Winston Bostick most vociferously attacks in his paper.

It was therefore with some surprise that I recorded Grad's first reaction to the illustrations of Winston Bostick's paper. A sparkle came to his eyes and he said, "Winston has the most marvelous physical intuition." Bostick had presented geometrical constructions for the dynamics of plasma vortices, which at one stroke provided the basis for solutions to problems that would engulf the lifetimes of a score of less imaginative mathematical physicists. While I did not know it at the time, Grad was not merely glancing over his neighbor's field of study; Grad had just recently immersed himself in the study of plasma vortices, and not without some spectacular and most controversial results of his own. (One of his papers had even been rejected by a leading journal because it called into question that holy of holies of hydrodynamic science, the Helmholtz conservation of vorticity theorem.)

Similarly, Lyndon H. LaRouche was often overheard noting the originality and scope of Winston's physical intuition. The most amazing thing, LaRouche commented frequently, is how a Winston Bostick could have emerged and survived in 20th-century America.

Winston Bostick devoted his life to harnessing the virtu-

ally unlimited energy potentials of controlled thermonuclear fusion. He was a pioneer of the controlled thermonuclear research (CTR) program. And while he devoted his life to fusion plasma science, his work left virtually no field of physical science untouched.

'L'chaim onta'

This universality of his work came to the fore during the 1980s series of seminars on physical and biological science sponsored by the Fusion Energy Foundation (FEF) and chaired by Lyndon H. LaRouche, held in Leesburg, Virginia. The first of these seminars was devoted to reviewing work inspired by Bostick on superconductivity. The last such seminar was focused on developing the broader implications for the physical geometry of space-time in general, of the work of Eugenio Beltrami, the great Italian collaborator of Riemann, whose work Winston first brought to the FEF's attention in 1974 at its founding conference. Bostick would always present the most profound conceptions with a good dose of humor. This agapic quality is captured in his last article for *21st Century,* in which he used the term *l'chaim onta,* after the Jewish toast "to life": "Nature unified all forces and energy with electromagnetism years ago, for which we are devoutly thankful. The greater cause for rejoicing now is the *l'chaim* electron, photon, fermions, and all *l'chaim onta* are bringing quantum mechanics, the prodigal son, back into the family of classical physics. Gone will be the schizophrenia of duality—the apartheid syndrome in scientific thought represented by Aristotelian logic. In its place will come the analogue of the *Filioque* (the principle that the Holy Spirit envelopes and proceeds from both the Father and Son), with its ecumenical message of electromagnetism. The divisive, misleading, jealousy-producing tenet of [Newtonian] lump mass will be buried forever."

Bostick received both his BS (1938) and doctorate (1941) in physics from the University of Chicago, precisely at the time that this institution spawned the Manhattan Project to build the atomic bomb. Chicago was also one of the centers for the birth of modern high-energy particle physics—the study of subnuclear processes. Bostick, at the time, was doing his thesis work under the direction of A.H. Compton and M. Schein; it was concerned with the use of cosmic rays to generate subnuclear events for particle physics experiments.

It was also during this time at Chicago that Winston came to know Dr. Robert Moon, a major contributor to the Manhattan Project, who was also a founding member of the Fusion Energy Foundation.

Following his graduate work, Bostick became a staff member of the second great scientific crash program of World War II, the effort centered at the Massachusetts Institute of Technology's Radiation Laboratory to develop new radar systems. His work was primarily directed toward development of pulse transformers to generate the high voltages—the higher power densities—needed for more powerful radars. In his later work on the plasma pinch, Winston saw this to as a means of achieving even greater power densities.

Following the war, Bostick continued to work at MIT on a new type of bubble chamber for particle physics measurements which he had invented. He then worked with J.C. Slater on the MIT microwave linear accelerator until 1948. From 1948 to 1954, he was on the faculty of the Physics Department of Tufts University. He then took a leave of absence to work at Lawrence Livermore Laboratory on the early Controlled Thermonuclear Fusion Research (CTR) program until 1956. From 1956 until 1986, Bostick was the George Meade Bond Professor at the Stevens Institute of Technology in Hoboken, New Jersey. During 12 of these years, Bostick was head of the Stevens Department of Physics. During 1961, Winston Bostick worked at Fontenay-aux-Roses in France and at the Culham Laboratory in England under a National Science Foundation Senior Postdoctoral Research Fellowship. In 1970 he held a UNESCO visiting professorship at the University of Buenos Aires, Argentina where he helped set up an experimental plasma physics program. Also in 1961, he won first prize in the Gravity Foundation Research essay contest with a paper, "The Gravitationally Stabilized Hydromagnetic Model of the Elementary Particle"—a model for elementary particles of matter based upon his work on plasma pinches. His last paper published in *21st Century Science & Technology* concerned further developments along these same lines.

Bostick wrote hundreds of scientific papers, mostly on plasma physics, including contributions for *Scientific American, Colliers Encyclopedia,* and *Encyclopedia Americana.* During the mid-1980s, Bostick took leaves of absence from Stevens to work on relativistic electron beam particle accelerators at the Air Force Weapons Laboratory in New Mexico.

Bostick never compartmentalized his creative scientific work from his broader social and cultural responsibilities. In 1966, Bostick was a Democratic primary candidate for the U.S. Congress, and two years later he was a delegate from New Jersey, pledged to Eugene McCarthy, to the Democratic National Convention in Chicago.

Love of great music

It is a well-known story that Richard Courant would make it a prerequisite for prospective mathematicians at his institute to demonstrate a level of competence in performance of classical music. He was heard to comment, we can always teach them mathematics, but music is a bit harder to master and much more essential for serious scientific work. In this regard, Winston Bostick not only played the violin, but even mastered the skills needed to make his own instruments. Those who have attended any of the many international meetings of the Schiller Institute know that his optimistic spirit never shone brighter than when he was playing with the Schiller Institute orchestra.