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## Bostick continued the work of Riemann and Beltrami

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*Winston Bostick describes how the "pinch effect" would surprise fusion researchers who had ceded the limelight to the Tokamak devices. With an introduction by Charles B. Stevens.*

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We present here Part 2 of "The pinch effect revisited" by the late Winston H. Bostick which first appeared in March 1977 in the Fusion Energy Foundation's *International Journal of Fusion Energy* (Vol. 1 No. 1). Virtually up to his death on Jan. 19, Professor Bostick was working on a joint project with jailed American statesman Lyndon H. LaRouche—under whose initiative FEF was founded—and his collaborators. This project was directed toward constructing a coherent approach to physical science based on the concepts of Beltrami negative curvature and the weak and strong forces as first presented by LaRouche. The Beltrami geometry seen in "force-free" magnetic plasmas, which Professor Bostick's article documents, provides the context for realizing "force-free" models for the atom and its nucleus. Professor Bostick's last two published papers, "The plasmoid construction of the superstring," and "How superstrings form the basis of nuclear matter," in the Winter 1990 issue of *21st Century Science & Technology*, report on the progress he made in this endeavor. In Part 3 of our serialization of Professor Bostick's March 1977 work, we will discuss this ongoing project in greater detail.

While these last two articles deal primarily with microphysics, Professor Bostick has championed the application of the same principles of Beltrami plasma processes to astrophysics. In fact, Prof. Dan Wells of the University of Miami, in Coral Gables, Florida, was a student of Winston Bostick's, who also developed a detailed Beltrami plasma model for the formation of the solar system. Professor Wells notes that he first came across the Beltrami approach in the work of "Chandrasekhar and Woltjer [who] studied these problems utilizing a magnetohydrodynamic model of the stellar and

interstellar plasmas."

The primary inspiration for the application of Beltrami's work to plasmas was the great German aerodynamicist and rocket scientist Adolf Busemann. Busemann had applied the Beltrami concepts to study of plasma vortex filaments generated by reentry vehicles. As the leading protégé of Ludwig Prandtl, Busemann had pioneered the application of Bernhard Riemann's concepts of shock waves to solving the problems of supersonic flight and inertial confinement fusion.

During the early 1960s many of Professor Bostick's students, including Dan Wells, worked with Busemann at the National Aeronautics and Space Administration's Langley, Virginia research center. So, in many respects, the work of Winston Bostick was a direct continuation of that of Riemann and Beltrami.

In Part 1, Professor Bostick described the early history of the "pinch effect," beginning with the discovery in the 16th century by William Gilbert that a candle's flame would be deflected away from a magnet that approached it. In the 20th century, Bostick detailed the U.S. program in controlled thermonuclear fusion research (CTR) and studies of this "pinch" up to the mid-1950s.

Bostick defined the pinch effect as "the self-constriction of a column of deformable conductor which is carrying an electric current. The constricting effect on the column is produced by the magnetic field pressure resulting from this current, or equivalently, by the Lorentz force produced by the current flowing in its own magnetic field. Thus, in a CTR magnetic-containment device of the pinch-effect type, the containing magnetic field is generated chiefly by the currents flowing in the plasma itself."