

Dr. John Guillory, 1940-2013



Dr. John Guillory passed away on Sunday, July 28, 2013, after a battle with cancer. His life was marked by a love of friendship, physics, antiquarian and modern music. He enjoyed intense and wide-ranging conversations, and had an abiding appreciation of fine (albeit esoteric) cuisine.

John received a B.A. in Physics at Rice University (Phi Beta Kappa, honors) and a Ph.D. in Physics at University of California, Berkeley. He was active in plasma physics research (the physics of ionized gases – the so-called fourth state of matter after solids, liquids, and gases) for more than forty years, and became one of the leading experts in the study of ion and electron beams. This is a field that has extensive applications in astrophysics, where vast beams of particles are emitted from stars during their formation, from accretion disks around black holes, and from the centers of galaxies and active galaxies (i.e., quasars). Ion and electron beams also have particular relevance to dense plasma focus devices which can have applications in nuclear fusion research.

In his academic garb, he taught at the University of Maryland in the seventies, and then started his own company to work on issues related to plasma physics processes applied to a number of areas, including medical device sterilization and the early ideas of charged-particle beams that could be used in missile defense. Later, he helped develop the graduate program at George Mason University's Institute for Computational Sciences and Informatics (CSI), one of the first interdisciplinary institutes for graduate education in the world. He remained at GMU, developing graduate courses in a wide range of topics, and helped guide in the evolution of

interdisciplinary science education at the graduate level through CSI's transformation to the School of Computational Sciences, and later the College of Science. He retired several years ago from that program.

John Guillory was one of those very rare individuals who was able to excel in both science and the arts, being an excellent plasma physicist and a talented and active musician as well. Few people indeed can leave behind them, as John has, a body of work including over 100 physics publications, more than 30 musical compositions and 20 scholarly works on the history of music.

In the mid-eighties, he began a collaboration with colleagues, J. H. Beall, Selig Kainer, and W.K. Rose, on the role of plasma physics processes on the interaction of astrophysical jets. These are linear structures that propagate outward from stars as they form. Jets are also produced by accretion disks around black holes, by supernovae, and by the cores of active galaxies and quasars. That collaboration contributed greatly to our understanding of the processes by which these jets interact with the interstellar material through which the jets propagate. The active collaboration on astrophysical jets continued with former graduate student, Dave Rose, and Jim Beall, until the time of his death.

John also helped Lawrenceville Plasma Physics (LPP) and Eric J. Lerner in their work on focus fusion effort over the years with his theoretical insights, especially with their ongoing effort to simulate the functioning of the plasma focus device. According to Eric, last year John was immensely helpful to their efforts to improve the theory of how beams help to heat the tiny plasmoid where fusion reactions occur in the plasma focus. He studied theoretically the many instabilities that plasmas are capable of, instabilities that have contributed to the formation of stars and galaxies and that here on earth are central to the effort to develop fusion energy.

John was of the leading experts in the extremely complex field of computer simulation of plasmas. He developed the "snapshot" technique for multistage plasma simulations. This was a very clever way to simulate plasma processes that went on at very different time scales. Beginning in 2008, he was the key physicist in LPP's effort to simulate our device, first in collaboration with his former graduate student Dave Rose and later with LPP's contract computer scientist, Dr. Warwick Dumas. In this still ongoing process, John developed an original theory of the initiation of filamentation in plasma, and, working with Eric Lerner, helped to uncover some errors even in the "bible" of plasma physics, the Naval Research Laboratory's *Plasma Formulary*. The initial simulations developed in this work have already led to significant re-designs of FF-1's electrodes and improvements in its performance.

In this work with his many colleagues, John showed his immense strengths as a physicist and teacher. He combined a deep understanding of the physical processes that mathematical formulae describe, a great facility with math and a thorough knowledge of computer simulation methods. That combination was invaluable in working with Warwick, whose background is in math and computer science.

In 1974, he founded Musica Antiqua, an ensemble that performed music of the Renaissance and Middle Ages. He served as director, musicologist, producer and performer with the group until he retired in 1999. He was also director of the Duke of Berry Ensemble, director of the Cur

d'hôte Ensemble, and president of the Washington Early Music Society. He had an extensive collection of replicas of medieval and Renaissance musical instruments, and was known for his demonstrations of these instruments. He also performed with the Story Minstrels, a quartet of musicians who visit schools to present period stories and music.

John was an immense pleasure to work with, in part because he was a man of extraordinary equanimity. Even when confronted with his own imminent death from a painful disease, he seemed to never lose his internal balance. On his 73rd birthday, two weeks before he died, he described to a friend and colleague his own enthusiasm his "Bastille Day" party celebrating the fall of, as he said, "that thieving French monarchy". Despite his increasing pain, he was able to participate in the music-making of the party.

At that time, he expressed to Eric Lerner that he had little time left but said that he was satisfied with and proud of the work that he had done in physics and in music.

He had every right to be proud. We are diminished by his leaving us. But we will carry on his good work as best we can.

n.b. This remembrance was composed by Jim Beall and Eric Lerner on behalf of John's many friends.