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In Memoriam

Raymond C. Grimm (1944–1984)

Raymond C. Grimm died August 6, 1984 at the age of 39. He suffered a heart attack while playing a basketball game.

Ray was born on November 10, 1944 at Adelaide, Australia. He received his education there, earning a B.Sc. with first class honors at Adelaide University and a Ph.D. in theoretical physics at Flinders University. After spending two and a half years in the Theoretical Division of the United Kingdom Atomic Energy Authority Culham Laboratory in England, Ray joined the Theoretical Division of the Princeton University Plasma Physics Laboratory in 1972. He quickly rose to the rank of Principal Research Physicist at the Laboratory and Lecturer with rank of Professor in the Astrophysical Sciences Department at the University. He also served as a Visiting Professor in the Computing Science Department at Rutgers University. Ray returned to Australia in the spring of 1984, joining the Australian Atomic Energy Commission Research Establishment at Lucas Heights, New South Wales, as a Senior Principal Research Scientist. He was made responsible for organizing and leading the Commission's Fusion Physics Research Section of the Applied Physics Division. In addition, he was appointed the first Professorial Fellow at the University of Sydney. This joint appointment was set up to enable him to collaborate with the Wills Plasma Physics group in the University's School of Physics. Ray was a Fellow of the American Physical Society.

Ray's Ph.D. thesis was devoted to the development and application of Monte Carlo techniques for calculating atomic energy levels. This pioneering work has received many citations. While at the Culham Laboratory he began a long-time collaboration with one of us on studies of magnetohydrodynamic models of plasma confinement in toroidal systems. He immediately demonstrated his quick grasp of the physical significance and uselfuness of the models as well as his thorough understanding of numerical analysis, computational techniques, and the capability of computer hardware.

Computational physics emerged as a field in its own right while Ray was at Princeton, with Ray being recognized as a leader in its development. His approach was to combine extensive analytical analysis with computation, and he was most at home with problems that taxed all the available tools. He deserves the credit for developing the PEST (Princeton equilibrium, stability, and transport) codes which have been instrumental in designing several large tokamak experiments including the PDX, PBX, and TFTR devices. These codes also serve as tools for the analysis of data from these and other tokamaks. Ray spent several years working on the problem of determining the eigenfunctions and eigenvalues of resistive instabilities in two-dimensional systems where most of the action takes place in a boundary

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layer which is orders of magnitude smaller than the radius of the plasma. Using these and other codes, he and his students have carried through a thorough study of the nature of the spectral properties of tokamaks. The outstanding characteristic of Ray's work was the care he took in validating and understanding his results. When Ray was ready to state a result or conclusion, one could be sure that it was correct.

Ray was a regular contributor to the *Journal of Computational Physics*, both in his earlier work on the numerical solution of the Schrödinger equation and his extensive work in computational magnetohydrodynamics. He also contributed an outstanding chapter to the book, "Methods in Computational Physics," Volume 16, which is a collection of papers on computational fusion physics. At the time of his death, Ray was an Associate Editor of the *Journal of Computational Physics.*

Although Ray's technical contributions to the fusion community were impressive, he deserves equal recognition for his administrative accomplishments. Shortly after he joined the Princeton staff, his knowledge of computer hardware and ability to evaluate the possibility of successfully carrying through large calculations led to his being made head of the Princeton Plasma Physics Laboratory's (PPPL) Computer Center. Under his leadership, the Center integrated into the National Magnetic Fusion Energy Computer Center at Livermore, California, and installed a Cyber 172 system at Princeton. Ray also served as Deputy Head of the Theoretical Group at the PPPL, organizing most of the work on MHD studies, modeling, and computational activities. His sound judgment and technical expertise made him a valued member of several PPPL committees and of many advisory groups for both Princeton University and the U.S. Department of Energy.

Probably the strongest memory Ray leaves is his sense of personal integrity and caring. His belief in doing what is right could be seen in the spirit with which he filled out his income tax, his resistance to the blandishments of computer salesmen, and his careful preparation of credits and knowledgments in his papers. His lectures were always well prepared and skillfully presented, and his office door was always open to students who wanted help, advice, or just conversation. Many administrative duties, including supervision of the group's secretaries, evolved on him because of his ability to work things out so that everyone was satisfied. He possessed an instinct to recognize the potential of the new young physicists at the PPPL, and several staff members owe thanks to Ray for seeing that they received a fair chance to display their talent and guiding them to take advantage of the opportunity. He was very supportive of his "team," especially in preparation for the deliberations involved in proposing promotions. The only place where Ray's gentleness did not show was in his action in team sports, such as soccer and basketball, where his competitiveness could be felt all over the court. He loved these activities and entered every game with the zest that made every minute of his life fully lived.

Besides his many friends, Ray leaves behind his wife, Elaine, and two children, Natasha and Toby. His friends have set up a memorial prize in his name for outstanding graduate students in the Princeton University Computational Plasma

Physics program. Information concerning this memorial can be obtained from Barbara Sarfaty, Princeton University Plasma Physics Laboratory, P.O. Box 451, Princeton, NJ 08544; telephone (609) 683-2400.

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