



Derek Charles Robinson

bilities of plasmas during his year in the Soviet Union, as shown in papers he presented at the 1969 Dubna conference: "Stability Close to the Magnetic Axis in a Toroid for Vanishing Pressure Gradient" and "A Criterion for the Hydromagnetic Kink Instability of a Cylindrical Pinch Discharge."

Derek returned to Culham Laboratory, which by then had become the UK's center for fusion research. As one of the first tokamak experts in the West, he played a big part in pushing forward this new line of research. He was the driving force behind the construction of several new tokamaks at Culham in the 1970s and 1980s—those were relatively small but specially designed devices aimed at investigating critical issues. More recently, in the 1990s, Derek helped to pioneer an innovative variant of the conventional tokamak, known as the spherical tokamak, which shows considerable promise as a power plant concept in the longer term and which is now being actively pursued in several other countries including the US.

On the international front, Derek contributed to the design of a large tokamak JET, the Joint European Torus, which was subsequently built and exploited as a European project at Culham. And then, as the UK person on several of JET's supervisory bodies, he helped to guide JET to many successes, most notably the attainment in 1997 of physical conditions very close to those needed in a fusion power plant. More recently, he also made important contributions to the design of ITER, a larger JET-like tokamak currently being proposed as a world project to produce sustained burning plasmas in the power plant regime.

Derek was very active in building

up the international fusion program that exists today in nearly 50 countries. As well as his year in the Soviet Union, he spent several months in Japan and Australia and made one of the first tours of Chinese laboratories by a Western scientist. He also had many interactions with scientists in small or less-developed countries and helped those scientists get started in fusion research. Derek took a special interest in younger staff; he maintained a significant involvement with students throughout his career and helped to create the next generation of fusion scientists, many of whom have now moved on to senior positions in fusion centers around the world, as well as in other scientific fields.

In 1996, Derek was appointed director of the Culham Science Centre and subsequently guided the laboratory through an important period of change, including the construction of a larger spherical tokamak, the Mega Amp Spherical Tokamak, also known as MAST; the reorientation of JET as a user facility; and a UK government review of fusion—all of which went well. In 2001, Derek became a vice president of the Institute of Physics and, later that year, chairman of the IOP's publishing board. He held those two positions until his death. He was elected a fellow of the Royal Society of London in 1994.

Derek was a great ambassador for fusion, promoting its potential in meetings with politicians and other decision makers. On that front, he traveled widely, making contact with key people in many countries and achieving much progress in gaining support for the pursuit of fusion as a future source of energy.

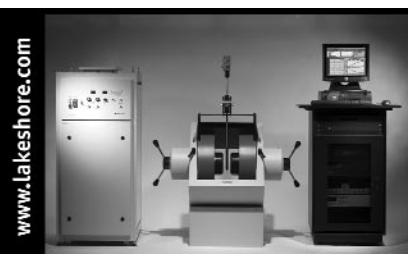
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Douglas Howard Sampson

Douglas Howard Sampson, a renowned theoretical atomic physicist and a professor emeritus of astronomy and astrophysics at the Pennsylvania State University, died from a hemorrhagic stroke on 8 December 2002 in State College, Pennsylvania. He had retired in 1997 after 32 years of service to the university, and had maintained an active research program up to the day of his death.

Doug was born in Devils Lake, North Dakota, on 19 May 1925. He was raised without running water or electricity on a homestead, built by



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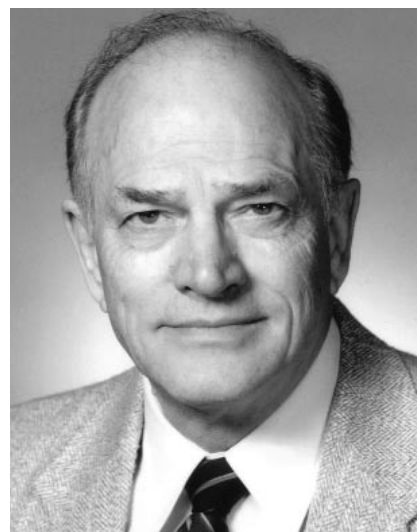
his ancestors, in Edmore, North Dakota. He was one of two children in his class at a two-room rural elementary school, and no physics or advanced mathematics classes were offered at his small high school, where he graduated as valedictorian.

Beginning in 1945, Doug served in the US Army for nearly two years and spent some of that time as a military policeman in the Philippines. His military service provided him with the opportunity to attend college under the GI Bill. Because he had to work on the family farm, he started college a month late every fall and took exams a month early each spring. Nevertheless, Doug graduated with a BA in 1951 as co-salutatorian from Concordia College in Moorhead, Minnesota, where he majored in physics and mathematics. He went on to receive his MS and PhD in theoretical physics from Yale University in 1953 and 1956, respectively, under the guidance of Henry Margenau. Doug's doctoral thesis was on the solid-state spectral line-broadening problem.

The same year he received his doctorate, Doug became a staff member of the theoretical division of Los Alamos Scientific Laboratory, where he stayed until 1961. He performed calculations of fundamental atomic cross sections to determine opacities for radiation transport simulations. The calculation of high-quality atomic data would end up being a lifelong pursuit.

During his time at Los Alamos, Doug was also a visiting staff member in NASA's theoretical division in 1959. In 1961, he joined the Pennsylvania-based Valley Forge Space Center of the General Electric Co, where he was group leader of atomic and radiation physics. He concurrently took advanced courses in relativistic quantum mechanics and field theory at the University of Pennsylvania. He joined the faculty of Penn State in 1965 as an associate professor in the recently created department of astronomy, and became a full professor in 1969.

Doug's research at Penn State focused on developing theory and corresponding computer programs for calculating cross sections or rates for various atomic processes in very high-temperature gases, or plasmas, that commonly occur in astrophysics, fusion-energy research, and x-ray lasers. His early work primarily involved electron-impact processes for nonrelativistic ions. One goal was to perform large-scale, computer-intensive calculations of the fundamental cross sections and then fit those results to various functional



Douglas Howard Sampson

forms to enable plasma modelers to obtain the data quickly and accurately. Doug had noted that for a hydrogenic ion, the relevant matrix elements used to calculate excitation cross sections scale with the nuclear charge. He realized that it would be possible to obtain accurate cross sections for more complex ions by scaling the hydrogenic results by an effective charge. He worked out angular algebra coupling for complex ions with many bound electrons and included the effects of configuration and intermediate coupling mixing in the target states. In that way, he was able to generate cross sections for isoelectronic sequences with affordable computational time. He applied that method to both electron-impact excitation and ionization.

By 1985, Doug had turned his attention to treating the electron-ion collision problem in a fully relativistic manner, in support of x-ray laser research. He and his research group developed an approach and associated computer programs, including an atomic structure program and electron-impact excitation and ionization programs, that were based on solving the Dirac equation. At the time, supercomputers could provide much-needed computer power for a fully relativistic treatment of heavier elements. Doug was able to apply the factorization method of Avi Bar-Shalom, Marcel Klapisch, and Joseph Oreg, which greatly reduced the required computing time while preserving the accuracy of the calculations. His sustained effort, which spanned about 17 years, resulted in a suite of robust codes that can be used to determine fundamental atomic cross sections or rates for a wide variety of plasma modeling applications. In addition, Doug applied the fit-

ting procedures to vast quantities of those relativistic data and made them readily available to a broad audience of researchers.

Although his major efforts were directed to the rapid production of large amounts of atomic data, Doug developed theory and codes for computing electron-impact excitation of ions for transitions between magnetic sublevels. Such data could be compared with the results of, or applied to, electron-beam ion-trap experiments and plasma polarization spectroscopy. Further expanding the scope of the code suite, he developed a fully relativistic approach for calculating electron capture cross sections and auto-ionization rates and used this approach to obtain resonance contributions to excitation and ionization cross sections and to obtain dielectronic recombination rates. The whole code suite is now being used at Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and the Naval Research Laboratory.

In the course of his research, Doug welcomed discussions with students about his work. He was an active graduate and undergraduate teacher. Undergraduate students invariably commented on his accessibility, patience, and warmth. A lasting legacy of his work was the care he took in ensuring the accuracy of each step. He emphasized that even if one had the best theory, but made an error in computer coding or in producing a table, the resulting incorrect data were of no value.

Doug wrote *Radiative Contributions to Energy and Momentum Transport in a Gas* (Interscience) in 1965. At the time of his death, he had been working on summarizing his research in relativistic atomic theory in a manuscript for *Physics Reports*. After his retirement, he enjoyed routinely traveling with his wife, Carlyn, across country to spend time with their 4 children and 10 grandchildren.

Doug had an unobtrusive but keen sense of humor and a positive outlook. He remained physically active throughout his life. His colleagues remember him for his willingness to listen and to help and for his strong sense of pioneer values and humanity.

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Robert E. H. Clark

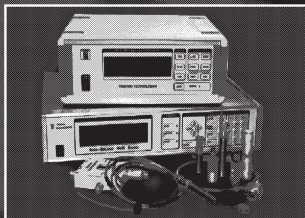
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