

RICHARD G. BREWER

Boris Peter Stoicheff
1924-2010



Boris Peter Stoicheff, past President of the Canadian Association of Physicists (CAP), 1983-84 and the Optical Society of America (OSA), 1976- 77, died April 15, 2010 in Toronto, Canada from multiple myeloma at age 85. Boris was the leading laser physicist in Canada and an eminent world figure. He was a senior Fellow of Massey College at the University of Toronto and in 1977 was named "University Professor", the highest honor of the University.

He was beloved not only by his family but by his students, colleagues and friends. He had an endearing nature and a charismatic personality that attracted people towards him and because of his broad perspective and sound judgement; he frequently was in demand in an advisory role for CAP, OSA and the Canadian government.

Born in Bitol, Macedonia on June 1, 1924, the family immigrated to Toronto, Canada in 1931 because of political upheaval. In his formative years he acquired an interest in mathematics and critical thinking which resulted in a BAsC 1947 in Engineering Physics and a PhD, 1950 in experimental physics under the direction of Harry L. Welsh, University of Toronto. It was here that he and Arthur L. Schawlow met and became lifelong friends. Boris' thesis was on "Raman Spectroscopy of Gases at High Pressures". Many years later, he would travel to Bangalore, India to participate in a conference honoring Chandrasekhara V. Raman.

At the suggestion of Welsh, Boris moved to Ottawa to work in the laboratory of Gerhard Herzberg at the National Research Council and remained there for 14 years conducting high resolution Raman and Brillouin experiments on gases and solids. In the Raman effect, light incident on a molecule generates a scattered component shifted from it by the molecular vibrational frequency. In Brillouin scattering, the scattered light is shifted by the acoustic frequency. The light source in those pre-laser days was a high pressure mercury lamp.

The proposal of Schawlow and Charles H. Townes for an optical maser (1958) was soon realized by Theodore Maiman by his invention of the ruby laser (1960), and optical spectroscopy changed dramatically thereafter. Boris entered the scene by developing the first ruby laser in Canada (1963). At this time, Herzberg suggested that Boris spend a year at MIT working with Townes and his student Raymond Y. Chiao. They studied the generation of stimulated Brillouin scattering and intense coherent hypersonic waves produced in quartz and sapphire following excitation by a pulsed ruby laser. Because the laser beam is intense and coherent, stimulated Brillouin scattering is also, unlike the ordinary or spontaneous Brillouin scattering he studied earlier. In 1964, Boris participated in the Fermi Summer School in Varenna, Italy on Lake Como. He would comment later that the Italians considered anyone wearing glasses must be a professor and added that the idea went to his head because at that juncture he accepted a professorship at his alma mater, the University of Toronto.

At the Third International Laser Spectroscopy Conference in Jackson Lake Lodge, Wyoming (1977), Boris gave the keynote address, as he frequently did, and described the revolution taking place in laser spectroscopy. He was a colorful speaker with a commanding voice and a sense of humor. Once asked if he would like a microphone for his talk, he replied "No, I don't need it. I have a built-in microphone." Boris contributed to this revolution in several ways, but I will only mention three examples. One was a precision Brillouin scattering measurement of a single crystal of the rare gas krypton using an Ar⁺ laser. This work yielded elastic constants which

could be compared for the first time with neutron scattering experiments. The two results differed by about 10% because neutron scattering monitors high-frequency or zero-sound propagation (collisionless regime) and Brillouin scattering monitors first-sound (hydrodynamic regime).

In the past, the resolution of optical spectra in atomic or molecular gases was always limited by Doppler broadening, particularly for transitions to highly excited states with small level splitting. However, lasers provided the opportunity for developing new nonlinear techniques with Doppler-free spectra. Boris showed that highly excited states of the Rb atom were now accessible by a two-photon transition without Doppler broadening. The atoms were excited by two counterpropagating beams so that the Doppler frequency shifts cancelled. In this way, the excited state D doublet spacing of the Rb atom could be resolved for the first time up to principal quantum number $n=32$.

In another area, he measured the ground state dissociation energy of the simplest of all molecules, the hydrogen molecule. For this purpose, Boris et al. used a fluorescence technique employing a nonlinear multi-laser scheme for generating tunable extreme ultraviolet radiation (XUV) around 84.5nm. The experimental result was $36118.11 \pm 0.08 \text{cm}^{-1}$ compared to a theoretical value of $36118.09 \pm 0.10 \text{cm}^{-1}$ based on a 249-term wave function that included relativistic, radiative and nonadiabatic corrections.

Herzberg and Boris had a deep mutual respect and admiration for one another. While Boris was writing his mentor's biography, *Gerhard Herzberg, An Illustrious Life in Science*, he made numerous trips from Toronto to Ottawa for interviews when Herzberg's health was failing. He pursued his task with great vigor and meticulousness visiting the University of Chicago, the Yerkes Observatory, and all the places in Germany where Herzberg lived and taught including archives and libraries.

Boris received numerous awards, fellowships and honorary doctorates. These included an appointment as Officer of the Order of Canada, and Fellowships in the Royal Society of London, the Royal Society of Canada, Australian Academy of Science, American Academy of Arts and Sciences, and others. He was awarded the Centennial Medal of Canada, the Gold Medal of CAP, the Henry Marshall Tory Medal of the Royal Society of Canada, the William F. Meggers Award and the Fredric Irves Medal of OSA. We will miss this kind gentleman who had a special talent for making people feel better by just being in his company.

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