

and family. One reads with foreboding of his early years in Darmstadt and Göttingen and of the anti-Semitism in the universities, all with the foreknowledge that the Nazi peril would envelop Herzberg and his wife Luise. During his postdoctoral year in Göttingen, Herzberg played a role in developing molecular-orbital theory and in teaching atomic structure and atomic spectroscopy. After a second postdoctoral year in Bristol, England, Herzberg returned to Germany in 1930 as a *privatdozent* at the Technische Hochschule Darmstadt. A few years later, he found that, because his wife was Jewish, he would have to leave his position. By 1935, he had established himself as a leader in the high-resolution spectroscopy of molecules. At that frightening and soon to turn deadly time, Herzberg accepted a position at the University of Saskatchewan in Saskatoon. The cultural change was large, but he adapted fully. From then on, he was Canadian.

During his 10 years in Saskatoon, Herzberg was instrumental in developing an effective spectroscopic research program. Interestingly, the program depended almost entirely on photographic plates for recording spectra. With his student and later colleague Alex Douglas, he generated the laboratory optical spectrum of CH^+ and showed it to be the carrier of several of the unidentified interstellar lines observed by Theodore Dunham and Walter Adams. The identification is important because CH^+ is the most generally observed species in diffuse interstellar clouds.

Stoicheff makes clear that Herzberg was a superb lecturer and textbook author. His primer, *Atomic Spectra and Atomic Structure* (Prentice Hall, 1937), closely followed by *Spectra of Diatomic Molecules* (Van Nostrand, 1939), became standard texts for theory and experiment. J. W. T. Spinks, who had helped Herzberg to escape from Germany, translated both works from German. In his next text, *Infrared and Raman Spectra of Polyatomic Molecules* (Van Nostrand, 1945), Herzberg developed infrared and Raman spectroscopy with a style similar to that of his diatomic-molecule text: a summary of existing theory followed by experimental data to illustrate the theory. Both the diatomic and polyatomic books educated most molecular spectroscopists of the time.

In 1945, Herzberg moved to the Yerkes Observatory at the University of Chicago, which had an excellent intellectual environment. However, after three years he returned to the NRC's division of physics because the

NRC offered him the opportunity to set up what would become the premier spectroscopy laboratory in Canada.

Herzberg had many triumphs in Ottawa. He gathered a powerful research group with good technical support and did his most spectacular research on the electronic spectra of polyatomic molecules—especially free radicals. He perfected the technique of flash photolysis for the efficient production of cold free radicals. Herzberg obtained the high-resolution spectrum of CH_3 and the spectra of the singlet and triplet electronic states of CH_2 . Those fundamental free radicals had been postulated as important transient reactive intermediates in many reactions. They now had a spectral identity. Herzberg's pioneering spectroscopy of free radicals led to his receiving the 1971 Nobel Prize in Chemistry.

Herzberg then focused on the spectra of polyatomic ions. His life was full. He became an outspoken proponent for government support of basic research in Canada. The spectroscopy laboratory of the NRC, which he was so instrumental in making a world beacon, needed constant defense as science funding became increasingly centered on programs rather than on laboratories. Success in ion spectroscopy, however, was in his control. Species such as NH_4^+ were identified. In the case of NH_4^+ , the higher Rydberg states were essentially an ammonium ion core and an outer planetary electron. Rydberg states of the unstable species H_3^+ were also studied. However, the ion H_3^+ , long sought by Herzberg, was characterized by Takeshi Oka, a colleague at NRC, using infrared vibrational spectroscopy.

Gerhard Herzberg was a great scientist and a great human being. He generously guided and advised numerous successful spectroscopists. Boris Stoicheff has given us a wonderful biography of a unique man.

William Klemperer

*Harvard University
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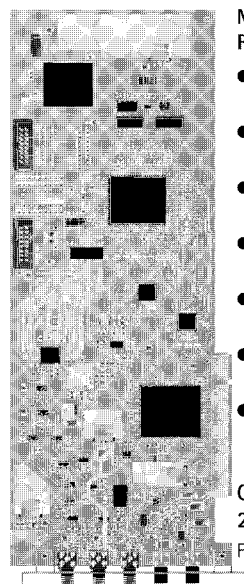
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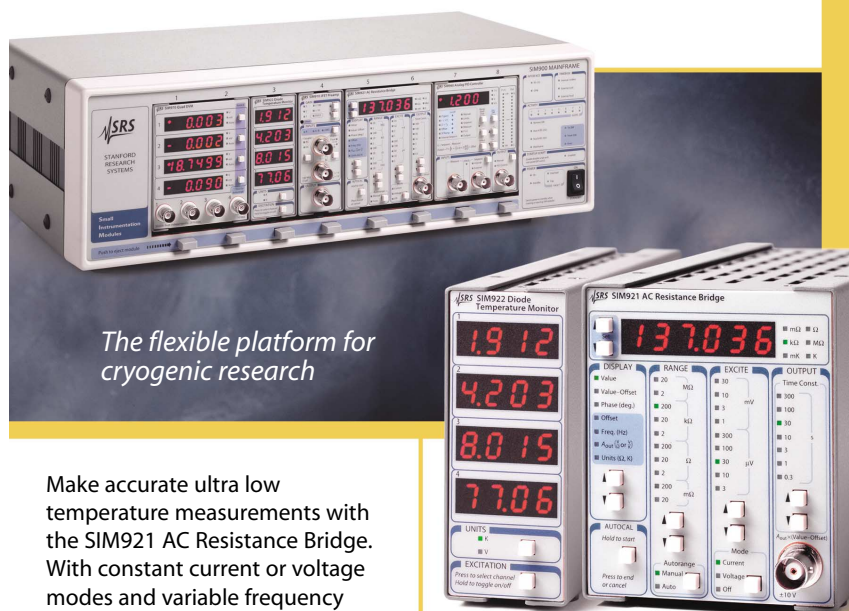
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