The Scientific Accomplishments of Hans G. Dehmelt

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Professor H. G. Dehmelt from the University of Washington, Seattle, Washington is, together with Bloch, Purcell, Zavoyskii, and Hahn one of the pioneers of magnetic resonance.

He has a long record of important and original contributions which opened new fields in the area of radiofrequency spectroscopy. His first major discovery came in 1950 in Germany when he was a Ph.D. student with Professor Krueger. There he made the first observation of nuclear electric quadrupole resonance. His discovery opened a field which is complementary to nuclear magnetic resonance and has become an important technique for the study of properties of solid materials in physics, chemistry and biology.

Later on Professor Dehmelt shifted his attention to precision radiofrequency measurements of individual atomic systems and free electrons which are well isolated from each other and only weakly perturbed by their environment. He made a number of important contributions to the field of optical pumping, optical orientation and optical state selection of atoms. His contributions enabled the development of the optically pumped rubidium magnetometer.

One of his great achievements was the development of electromagnetic ion traps which made it possible to confine atomic ions and electrons for long periods to increase the accuracy of radiofrequency measurements. Single electrons have been stored in isolation for periods of many hours.

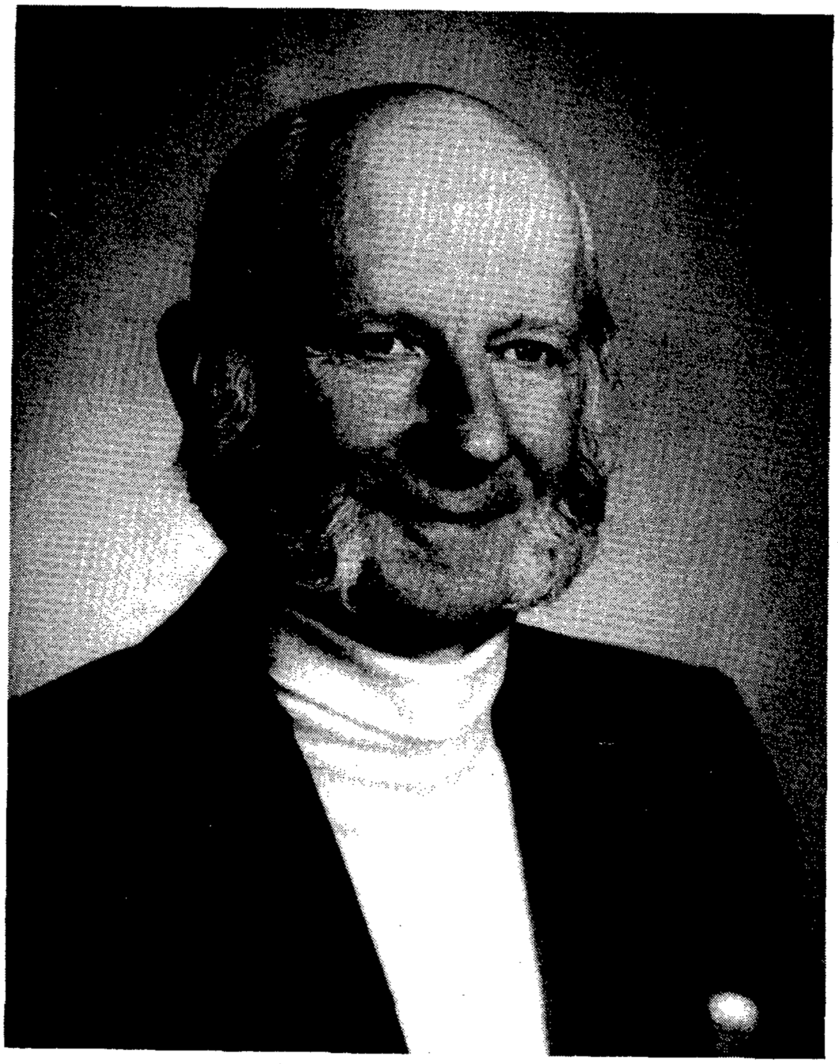
One of his most important contributions is his extremely precise measurement of the magnetic moment of a free electron.

By an extremely ingeneous experimental technique he was able to measure the g-2 anomaly directly as the ratio of two radiowave frequencies emitted by the electron. Thus a separate measurement of the magnetic field is avoided and the g-2 anomaly is determined directly.

The g-2 anomaly can be calculated with great precision by quantum electrodynamics. It is known to an accuracy of one part in 10^{12} and is the most accurately known pure number in physics both in terms of its experimental determination and its theoretical evaluation. Dehmelt's extraordinary experimental results represent the best test of quantum electrodynamics known so far.

Within the past years, Dehmelt and colleagues have still improved the accuracy of their measurements. They have as well isolated a single positron in the same way as they did with electrons. His measurements of the positron which is the electron's antiparticle, should offer a profound and basic test of the particle-antiparticle symmetry.

Professor Dehmelt has thus not only opened new fields in radio-frequency spectroscopy but also developed the techniques to unprecedented precision and pushed the frontiers of our knowledge to new horizons.



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