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David Dennison, the specific heat of hydrogen, and the discovery of nuclear spin CLAYTON GEARHART, St. John's University (Minnesota) — The specific heat of hydrogen gas at low temperatures, first measured by Arnold Eucken in 1912, decreases sharply as the two rotational degrees of freedom freeze out. The "old quantum theory" could never explain this behavior satisfactorily, despite persistent efforts. Then in 1926, Heisenberg showed that in the new quantum mechanics, identical particles must have either symmetric or antisymmetric wave functions, and were the key to the spectrum of helium. Friedrich Hund first applied this concept to the rotational specific heat of hydrogen, with limited success. An experimental breakthrough came in 1926, when for the first time, spectral lines involving the ground state of molecular hydrogen were found in the far ultraviolet. Further measurements by the Japanese spectroscopist Takeo Hori led to a moment of inertia for molecular hydrogen more than double earlier estimates. Using this result, the American physicist David Dennison devised the modern theory in 1927, and in the process, found persuasive evidence for proton spin. Most of these actors were at Bohr's institute in Copenhagen in 1926–27; their interaction plays a central role in this story.

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