2008 Russell Varian Prize to Alex Pines

In 1971 Alexander Pines, then a graduate student at MIT, came up with a scheme for performing high-resolution nuclear magnetic resonance (NMR) on solids. Until that time, conventional NMR dealt mostly with liquids, because spin-polarized nuclei, upon which NMR depends, diffuse in liquid and certain interactions that interfere with the high resolution of spectral lines are averaged out. In solids, nuclei don't diffuse, and the lines of the NMR spectrum are broadened.

In 1972 Pines, with fellow graduate student Michael Gibby and their professor, John Waugh, published a note in the Journal of Chemical Physics promising "a method of high-resolution NMR of dilute spins in solids," which has come to be known as cross-polarization. This brief note, and a longer article in the same journal the following year explaining the technique in detail, were to prove founding documents for the field of solid-state NMR, which expanded rapidly after their publication.

For his leading role in this work, Pines, now a senior scientist in Berkeley Lab's Materials Sciences Division and the Glenn T. Seaborg Professor of Chemistry at UC Berkeley, was awarded the Russell Varian Prize at the EUROMAR conference held July 6 to 11 in St. Petersburg, Russia, and sponsored by the European magnetic resonance community.

The Russell Varian Prize was first awarded in 2002 and honors the cofounder of Varian Associates, who pioneered commercial NMR

spectrometers. The prize is awarded for a single innovative contribution — a paper, patent, lecture, or piece of hardware — which has proven of "high and broad impact on state-of-the-art NMR technology." It is sponsored by Varian Inc. and carries a monetary award of 15,000 Euros. Major names in the field who have received the award include Erwin Hahn of UC Berkeley and John Waugh, Pines's former professor.

The 2008 Varian Prize contained the following "laudatio" (which has been slightly edited) outlining the winning technology:

The proposal for which Alexander Pines is honored was a method for sensitive, high-resolution observation of rare spins in solids, for example, those of carbon 13, about one percent in natural abundance, while in the presence of abundant spins such as protons (hydrogen nuclei). Relaxation is first used to polarize the abundant spins. Part of this polarization is then transferred to the rare spins by cross-polarization "in the rotating frame," and the free induction response of the rare spins is finally observed under continuous-wave irradiation of the abundant spins. This simple method, often just called "cross polarization," helped launch the modern era of solid-state NMR in chemistry, materials, and biology and inspired a wealth of useful variations, many of which are still among the popular tools of practical solid-state NMR.

Pines could not attend the St. Petersburg conference but addressed the EUROMAR attendees in a 23-minute video recalling the circumstances of the discovery, available online here.