A few years later Thouless began working on the phase transitions of the two-dimensional "x–y model," a planar array of magnetic vectors free to rotate only in their plane. (This model represents such systems as thin superconducting films and liquid helium films.) He identified spin vortices as the objects whose interactions would very likely determine the phase transitions.

Thouless suspected that the x–y model might admit the same sort of renormalization-group techniques that Philip Anderson, Gideon Yuval and Donald Hamann had used recently in their work on Kondo alloys. The three had shown that a Kondo alloy was, for certain puposes, equivalent to a one-dimensional strip of "charges" whose interaction energy varies as the logarithm of their separation distance. Having found that a vortex pair in the x–y model also behaves logarithmically, Thouless wished to further explore the analogy between the two problems; for this project he enlisted the help of J. Michael Kosterlitz, a postdoctoral fellow in high-energy physics. The renormalization-group analysis yielded some of the first specific predictions about the phase transition in the x–y model—in particular, the prediction that the transition would be accompanied by a discrete drop in superfluid density (see PHYSICS TODAY, August 1978, page 19). Later, Kosterlitz applied a somewhat more sophisticated renormalization argument, which gave a number of more quantitative predictions. (V. L. Berezinskii of the Soviet Union had made considerable progress on the same problem roughly a year earlier.)

Much of Thouless's work in the 1970s was directed toward the problem of electron localization in disordered systems, a phenomenon that had been predicted much earlier by Anderson, Nevill Mott and Rolf Landauer but was still poorly understood. Today, Thouless's ideas on the topic underlie the whole field of mesoscopic systems. His work emphasized the key roles played by the conductance measured as a multiple of e^2/h and by the suppression of inelastic scattering at very low temperatures. One of the most dramatic predictions was that the resistance of a very thin wire would increase exponentially with its length at sufficiently low temperatures.

While working on spin glasses, Thouless, together with Jairo de Almeida, arrived at the conclusion that the mean-field-theory model of spin glasses would exhibit a phase transition at a certain curve in the magnetic field–temperature plane—the so-called Almeida–Thouless line. An earlier paper, by Thouless, Anderson and Richard Palmer, has also been the basis for some significant recent developments.

When he left Birmingham in 1978, Thouless became a professor of applied science at Yale. He left Yale in 1980 to become a physics professor at the University of Washington. Much of Thouless's work at Washington has centered on topological quantum numbers, particularly those found in the quantum Hall effect.

—MATT SIEGEL

AUSTON WINS AWARD FOR WORK IN ULTRAFAST OPTICS

David H. Auston of Columbia University has won this year's Quantum Electronics Award of the IEEE/Lasers and Electro-Optics Society. The award, presented on 21 May at a joint session of the Conference on Lasers and Electro-Optics and the International Quantum Electronics Conference, was made in recognition of Auston's "pioneering and fundamental contributions to the field of picosecond optoelectronics and ultrafast optical phenomena."

In 1975 Auston demonstrated that picosecond light pulses could be used to activate photoconductive switches and gates in electrical circuits; this work helped lay the foundations of the now-rich research area of picosecond optoelectronics. In 1984 he introduced pulses as short as a few femtoseconds into electro-optic materials to induce in the crystal a conical electromagnetic shock wave (electro-optic Čerenkov radiation), which Aus-

David H. Auston

ton used to probe the electronic structure of semiconductors (see PHYSICS TODAY, February, page 46). More recently Auston has been working on a different means of transforming optical pulses into electronic signals, namely, photoconducting antennas.

Auston received both his BASc (1962) and his MASc (1963) from the University of Toronto, and got his PhD (1969) in electrical engineering from the University of California at Berkeley. After graduate school, he joined the technical staff at AT&T Bell Laboratories, where he eventually became head of the high-speed materials and phenomena research department. Since 1987 Auston has been a professor of electrical engineering and of applied physics at Columbia.

IN BRIEF

Jack Crow, a condensed matter experimenter, has left his professorship at Temple University in Philadelphia to become a professor of physics and director of the Center for Materials Research and Technology at Florida State University in Tallahassee.

OBITUARIES

Stephen B. Fels

Stephen B. Fels, a senior research physicist at the National Oceanic and Atmospheric Administration's Geophysical Fluid Dynamics Laboratory, died on 22 October 1989 after a courageous struggle against cancer. As one of the world's pioneers in the mathematical modeling of atmospheric radiative-transfer processes, Fels had contributed to more accurate weather forecasting and better modeling of the impact of the greenhouse gases on Earth's climate. His published papers span particle physics, geophysics, planetary atmospheres, atmospheric dynamics and radiative transfer.

Fels completed both undergraduate and graduate work at Harvard University, earning his PhD in physics in 1967. After spending four years doing high-energy theory at the University of California, Los Angeles, Fels received a fellowship to switch to atmospheric physics. In 1971 he split his time between the department of geophysical sciences of the University of Chicago and the National Center for Atmospheric Research in Boulder, Colorado. In 1972, he became a visiting scientist in Princeton University's Geophysical Fluid Dynamics Program (now called the Program in