

This Week's Citation Classic®

CC/NUMBER 26
JUNE 27, 1988

Ando T, Fowler A B & Stern F. Electronic properties of two-dimensional systems. *Rev. Mod. Phys.* 54:437-672, 1982.

[Institute of Applied Physics, University of Tsukuba, Sakura, Ibaraki, Japan and IBM Thomas J. Watson Research Center, Yorktown Heights, NY]

This article reviewed the electronic properties of two-dimensional systems, especially electrons in silicon inversion layers, from the original suggestion of quantum effects by J.R. Schrieffer to the quantum Hall effect paper by K. von Klitzing, G. Dorda, and M. Pepper. [The SCJ® indicates that this paper has been cited in over 825 publications.]

Alan B. Fowler
and
Frank Stern
IBM Research Division
T.J. Watson Research Center
Yorktown Heights, NY 10598

May 3, 1988

After we had first explored the possibility of publishing a book or monograph on electrons in inversion layers, we agreed in 1977 to write a review for the *Reviews of Modern Physics* at the suggestion of R.W. Keyes. Although we had been working in that field for about 10 years, it was clear that a much better review would result if Tsuneya Ando, a leading theorist in the field, would join us. We felt that the large circulation of the journal would make the article widely accessible, and decided that we would try to summarize the physics rather than simply point to the literature.

Although the distance to Japan was not a barrier—Ando had learned our text formatting system during a stay in Yorktown Heights and sent us nearly flawless tapes of his sections of the manuscript—progress toward completing the review turned out to be sporadic. It eventually became clear that we would have to include two subjects that had not been in our original plan—weak localization in two dimensions and the rapidly expand-

ing work on heterostructures. That set us back almost a year, and the manuscript was not ready until the summer of 1981. It was published in 1982 after a critical reading by a conscientious reviewer and revision under the careful eye of Karie Friedman at the *Reviews of Modern Physics*.

The article has been widely referred to because it was—and perhaps remains—the most comprehensive single source in this field. The reprints offered for sale sold out quickly, and a second printing also sold out. Our article was translated into Russian and published in book form in the USSR in 1985; we have had inklings of a Chinese translation. Much has happened since 1982 and our article, while not obsolete, has been overtaken by events. Developments in the quantum Hall effect¹ and aspects of the physics of heterostructures² are well described in more recent works. The proceedings of the International Conferences on Electronic Properties of Two-Dimensional Systems provide a continuing record of the growth of the field.³

Writing comprehensive reviews is time-consuming and often tedious. Was it worth the effort? One of us, Frank Stern, feels that he lost two years in which he could have done other things and on balance he would have preferred working on new physics to recording things that had already been done, even though the article has been well received. None of the authors has shown any enthusiasm for revising or updating the manuscript—the bibliography alone would now probably have to be twice its original length.

All of the authors of the review article have received one or more prizes or awards, but these were presumably given for original work in this field rather than for the review article itself. [Ando is now at the Institute of Solid State Physics, University of Tokyo.]

1. Prange R E & Girvin S M, eds. *The quantum Hall effect*. New York: Springer-Verlag, 1987. 419 p.

2. Bastard G. *Wave mechanics applied to semiconductor heterostructures*. Les Ulis, France: Les Éditions de Physique, 1988. 358 p.

3. Ando T, ed. *Electronic properties of two-dimensional systems*. Proceedings of the Yamada Conference XIII on Electronic Properties of Two-Dimensional Systems (Sixth International Conference), Kyoto, Japan, 9-13 September 1985. (Whole issue.) *Surface Sci.* 170(1/2), 1986. 768 p.

1B-4