# History of a Quantum Phase Transition Turns on a Paradigm

In their November 1998 PHYSICS TODAY article (page 39), Allen Goldman and Nina Marković describe some experiments that they interpret as a superconductor–insulator transition.

It is worth pointing out, I think, that my theory concerning the superconductor–insulator transition in a disordered Bose condensate in three dimensions was published as long ago as 1983.[1] Therefore, it is appropriate to claim that this quantum phase transition was predicted by theory. (Individuals unfamiliar with European scientific journals could have read my second paper, published in 1986, in which I discussed the dielectric properties near the superconductor–insulator transition.[2]) The first interpretation of experimental results relating to a superconductor–insulator transition—in a 1989 paper by David Haviland and colleagues[3]—was published six years after my theoretical prediction. I find it misleading that Goldman and Marković (and others) have ignored my early contributions.

Publication of my results on the superconductor–insulator transition in two dimensions[4] did not occur until after the paper by Haviland and company appeared—essentially because, before that time, there was no way to convince a referee; even the existence of a metallic phase in two dimensions was contested (today, of course, nobody contests that).

I suggest to your readers that the above facts are important not only for the history of physics, but also because they show how a paradigm in physics can change.

## References


1. A. Gold, Z. Phys. B **52**, 1 (1983).
2. A. Gold, Phys. Rev. A **33**, 652 (1986).
3. D. B. Haviland, Y. Liu, A. M. Goldman, Phys. Rev. Lett. **62**, 2180 (1989).
4. A. Gold, Z. Phys. B **81**, 155 (1990); Z. Phys. B **83**, 429 (1991).



**ALFRED GOLD**
*(gold@cemes.fr)*
*Centre d'Elaboration de Matériaux et d'Etudes Structurales (CEMES)*
*Toulouse, France*


GOLDMAN REPLIES: Alfred Gold indeed carried out the first calculations of a superconductor–insulator transition based on boson physics for three-dimensional systems in his 1983 and 1986 papers, and extended those results to two dimensions in his 1990 paper. He later argued very strongly in a fairly extensive article[1] that the limiting resistance for the two-dimensional transition was not universal, and that its value depended on the nature of the disorder, a viewpoint that will probably be borne out by experiment.

References to Gold's work, as well as to that of several other important contributors in this very active field, were omitted from our article because of constraints on length and format. Nevertheless, because his work predates that of other theorists who were cited in our article, it should have been included. In fairness to the ones we mentioned, though, they did focus the question on whether the superconductor–insulator transition was a quantum critical point, and provided an approach to answering that question.

## Reference


1. A. Gold, Z. Phys. B **87**, 169 (1992).



**ALLEN M. GOLDMAN**
*(goldman@physics.spa.umn.edu)*
*University of Minnesota*
*Minneapolis, Minnesota*


# SUNY Stony Brook Is Charged with Having Verified Quasiparticle

As a follow-up to your December 1998 story on the 1998 Nobel Prize in Physics (page 17), which states that "Just last year, the reality of the charge ⅓ $e$ quasiparticle was vividly demonstrated in two experiments that measured Hall-current shot noise," we would like to note that the charge of the quasiparticle was first measured at the State University of New York at Stony Brook in 1995.[1] To quote from the background material released by the Nobel committee, "Direct verification of the existence of fractionally charged quasiparticles have so far been obtained by three groups using two different methods; by Vladimir Goldman and B. Su of the State University of New York at Stony Brook in 1995 and in 1997 by groups . . . in Israel and . . . in France."[2]

## References


1. V. J. Goldman, B. Su, Science **267**, 1010 (1995).
2. On the Web, see http://www.nobel.se/announcement-98/phyback98.pdf.



**ALFRED S. GOLDHABER**
*(goldhab@insti.physics.sunysb.edu)*
*State University of New York at Stony Brook*
**JAINENDRA K. JAIN**
*(jain@phys.psu.edu)*
*Pennsylvania State University*
*University Park, Pennsylvania*