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Nonstandard methods in stochastic analysis and mathematical physics, by Sergio Albeverio, Raphael Høegh-Krohn, Jens Erik Fenstad, and Tom Lindstrøm, Academic Press, Orlando, xi + 514 pp., $59.50 cloth, $39.50 paperback. ISBN 0-12-048860-4

Nonstandard or infinitesimal analysis was invented by the late Abraham Robinson in 1960. Since that time there has been continued interest in the subject and a number of impressive results have been established using nonstandard methods. These results testify to the vision of the man of whom Gödel wrote, "(He was) the one mathematical logician who accomplished incomparably more than anybody else in making this science fruitful for mathematics. I am sure his name will be remembered by mathematicians for centuries." The book under review is a welcome addition to a growing list devoted to the subject.

Nonstandard analysis has had a controversial history. It had its roots in the use of infinitesimals by Leibniz and Newton in the development of calculus. Infinitesimals are "numbers" which are smaller in absolute value than any real number. Leibniz regarded them as entities in some "ideal" structure which also contained the infinitely large numbers and the reals. He also implicitly made the important but somewhat vague hypothesis that this structure satisfied the same rules as the ordinary real number system. The challenge facing Robinson was thus to

(a) demonstrate the existence of a set $^*R$, now called the hyperreal numbers, which carried analogues of all the structures on the reals R (for example, the ring and the set theoretic structures);

(b) ensure that statements true in the real number system are mirrored in a natural way by statements true in the structures on $^*R$.