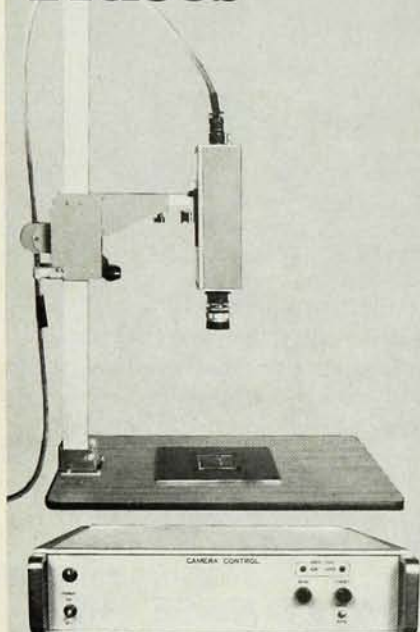


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letters

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area. The faculty participants in the program have resisted the temptation to develop separate applied-physics courses, requiring the students to take existing graduate courses in engineering and physics as well as preliminary examinations split between the two schools. In addition, there has been created a graduate co-op program at the Master's level, which further increases the employability of the Masters of Engineering students.

ROBERT E. JOHNSON

University of Virginia

Charlottesville, Virginia

11/27/78

Stock-market fluctuations

Rolf Landauer's comments (November, page 23) on the influence of noise on "open systems" are well illustrated by recent fluctuations of historic proportions in the stock market. The market may be considered an open system in which an adequate flow of money will effect a transition from disorder (random walk) to order (cooperative or crowd behavior). Near the critical threshold it is highly susceptible to noise (random economic or political news).

In mid-October of this year the Federal Reserve Board announced that the discount rate of interest charged to member banks would be raised to an unprecedented 8.5%. This bad news came at a time when the market was near the transition threshold (undamped). It resulted in the largest single-week decline in history (59.08 points on the Dow Jones Industrial Average) and a staggering two-week loss in the market value of all stocks on the order of 100 billion (10^{11}) dollars!

The concept of the second-order phase transition in equity markets is new. It implies that the market is not always efficient, that is, the impact of random economic and political news is not always discounted (damped) quickly. In particular, a virtual lack of damping near transition implies a highly inefficient market, characterized by large, long-lasting fluctuations.

Noise (chance developments) always has a strong influence on the stock market, and it represents an ever-present element of risk to investors. By understanding that the market is of necessity more susceptible to noise during the undamped transitional period, investors can be aware that even small changes in economic or political fundamentals at these times can have a big impact on the market.

TONIS VAGA

Cream Ridge, New Jersey

11/15/78

THE AUTHOR COMMENTS: Tonis Vaga points out that the coupling of the opin-

ions of people leads to situations that share some of the characteristics found when many physical degrees of freedom are coupled to each other. This point has been brought out on a number of occasions.¹

I would like to supplement Vaga's example with one that may be equally important for the readers of PHYSICS TODAY.

The evaluation of scientific work has become much like the stock market; the influence of the opinions of others provides a coupling leading to positive feedback, and to a strong dominance by fads and fashions. Just as the investor can no longer ask: "Which company will do well?" but must ask, "Which company will *others* think will do well?" the scientist who asks, "What are the important problems?" instead of, "What will *others* think are the important problems?" takes a serious risk with contract-granting agencies and with his chances for invited papers. You need competitors to be grouped into a reasonable APS meeting session.

Some clustering into communities of interest is, of course, essential to the healthy development of science. I believe, however, that we have let the coupling, leading to positive feedback, get out of hand.

Reference

1. W. V. Smith, *Science* **167**, 957 (1970); E. Callen, D. Shapero, *PHYSICS TODAY*, July 1974, page 23. For other citations see refs. 1 and 21 of my *PHYSICS TODAY* paper.

ROLF LANDAUER

IBM

11/29/78

Yorktown Heights, N.Y.

Too many physicists

I feel that the letters of Robert Yaes (February, page 83), G. Adomian (June, page 48) and others (November, page 15) have put too much emphasis on tenure and missed the important point.

The careers of physicists are far longer than the careers of professional football players. For example, out of the 45 players on the 1972 Washington Redskins team, only seven are still present in 1978. On the other hand, many physics departments hire as many postdoctorals every year as the draft choices of Los Angeles Rams or New York Giants. With or without tenure, there will be few positions for young physicists. Take another example; there is no tenure system in the national laboratories or industrial laboratories, but the turnover rate is not much higher than the universities with the tenure system.

We must recognize that the physics community is now approaching the steady state rather than the expanding state. The number of physicists has grown fifteenfold since 1926, when the dawn of