Dynamic model

John Guckenheimer

Nonlinearity. Honorary editors J.D. Gibbon and D.A. Rand. *Institute of Physics and London Mathematical Society. 4/yr. UK £178, North America $338. In the United States distributed by the American Institute of Physics.*

THE joint sponsorship of *Nonlinearity* (by the London Mathematical Society and the Institute of Physics) is unusual and it bespeaks the vitality of research on 'nonlinear' phenomena. The journal has already found itself a niche and it will undoubtedly persist as a publication of high quality. Its editorial board is strong and large enough to cover well the topics within its mandate — "nonlinear mathematics, mathematical and experimental physics and other areas in the sciences where nonlinear phenomena are of fundamental importance".

As the complement of all things linear, nonlinearity hardly seems a cohesive discipline. Nonetheless, there is a diverse group of scientists and mathematicians with overlapping interests in the phenomena concerned. This group of people forms the constituency of the new journal, as well as of several others that have slightly different emphases, and their work gives form to the subject. Among the topics of papers printed in the first few issues of *Nonlinearity* are chaos, fractals, nonlinear partial differential equations, dynamical systems, solitons, singularities and twistors.

The centre of gravity of *Nonlinearity* is distinctly different to that of such related journals as *Physica D*, *Ergodic Theory and Dynamical Systems*, *Communications of Mathematical Physics*, *Journal of Statistical Physics* and *Journal of Differential Equations*. *Physica D* is very similar in spirit to *Nonlinearity*, but its emphasis is decidedly more on physical aspects. On the other hand, *Ergodic Theory and Dynamical Systems* and *Journal of Differential Equations* are mathematics journals that frown on publishing papers that do not meet strict standards of mathematical rigour. In *Communications of Mathematical Physics* and the *Journal of Statistical Physics*, there is more emphasis upon models of statistical physics and field theories.

In *Nonlinearity* the stress is on dynamical systems theory. Over half of the papers published to date deal with the subject. There is a tremendous variation in the style of work in this area. At one end of the spectrum is pure mathematics with its insistence upon rigour, and at the other end is routine analysis of dynamical models that arise in many areas of science. The role of numerical studies and of theory that is founded upon careful numerical study rather than rigorous proof has been a source of tension within the field. Although *Nonlinearity* includes many papers that would fit comfortably in other mathematical journals, it also serves the community of workers who rely upon computers. The blend of rigour and computationally justified theory found in *Nonlinearity* is refreshing, and I hope that it represents a trend that will spread to more areas of mathematics. □

John Guckenheimer is in the Departments of Mathematics and Theoretical and Applied Mechanics, Cornell University, Ithaca, New York 14853, USA.

Chase for the holy grail

John Ruvalds

Physica C: Superconductivity. Editors M. B. Brodsky, G. W. Crabtree, B. D. Dunlap, R. P. Griessen, S. Maekawa, Yu. A. Osipyan, H. R. Ott and S. Tanaka. *North-Holland. 24/yr. Dfl.3,370.*

Journal of Superconductivity. Co-editors Donald U. Gubser and Stuart A. Wolf. *Plenum. 4/yr. North America $135, elsewhere $160 (institutional).*

International Journal of Modern Physics B. Edited by the editorial board. *World Scientific. 16/yr. $485 (institutional); $237 (personal).*

Modern Physics Letters B. Edited by the editorial board. *World Scientific. 22/yr. $475 (institutional); $234 (personal).*

Superconductor Science and Technology. Honorary editor J. E. Evetts. *Institute of Physics. 12/yr. £120, $228.*

EVER since the 1986 discovery of high-temperature superconductivity in an unlikely group of copper oxides, the race to find new materials with zero resistance to the flow of electrical current has generated immense excitement in the scientific community. The ultimate quest of a room-temperature superconductor has captivated thousands of chemists, physicists and a variety of other scientifically interested parties.

In addition to the intellectual challenge of understanding how the new superconductors function, the aura of a scientific 'breakthrough' and the promise of a new technology with imaginative commercial applications have attracted considerable interest among the general public, industrial representatives and even government officials. The dissemination of information in the field is thus beset by diverse demands.

The deluge of scientific data on the new superconductors has already surpassed 4,600 publications in a mere two years, and there is no sign of relief. Despite progress in the growth of single crystal samples and a vast array of confirmed experimental features, the origin of the superconducting properties at high temperatures remains a mystery. Surprisingly, there is not even agreement on the nature of the charge carriers in the copper oxides. Holes, electrons and more exotic species have been proposed as viable candidates, but the crucial ingredient remains elusive. Then there is the dilemma of the ideal number of carriers needed to achieve superconductivity at the highest possible temperature, and the embarrasing existence of analogous cuprate compounds which do not become superconducting at all.

On the optimistic side, there now appear to be no crippling theoretical obstacles to superconductivity at room temperature, even though this dream was regarded as a fantasy only a few years ago. Of course, the lack of a definite mechanism for the cuprates does not constrain the enthusiasm and imagination of many researchers in the field.

To cope with the spectacular growth in the literature, many established journals have revised their refereeing procedures, putting the emphasis on rapid publication of novel results. The need for new specialist journals may thus be limited to filling a gap in the established coverage.

The new journal *Physica C. Superconductivity* is derived from the highly regarded *Physica*, which has a long tradition of publishing first-rate articles in the physical sciences. The editorial board is composed of international experts who are actively engaged in basic research in the field. The early issues are notable for breadth in coverage and overall high calibre of the scientific content. Theoretical contributions range from the fundamental issue of casuality and the Josephson effect to a variety of computer calculations of electronic structures in specific materials. Several papers proposing innovative mechanisms for superconductivity have also appeared.

Experimental results published in *Physica C* include original findings on chemical substitutions which influence the transition temperature of the cuprate superconductors. Excellent articles on data for the heat capacity, transport properties, neutron scattering, nuclear spin resonance, critical magnetic fields, and microstructure characterization of samples attest to the high standard of this journal, which belongs in any library serving the basic research needs of scientists.

The *Journal of Superconductivity* aims to provide a new "forum for the publication of high-quality original articles on *all* aspects of the Science and Technology of Superconductivity". This ambitious goal has not been fully met in the first issues, but nevertheless there have been some interesting speciality features which may