

## Book Review

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### DYNAMICAL SYSTEMS AND SINGULAR PHENOMENA

*In* World scientific advanced series in dynamical systems, G. Ikegami (ed.)  
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The contents consists of (mostly) short reports about papers from a meeting held at Kyoto from July 2 to July 5, 1986. My attention was first drawn to K. Hiraide's article. In it he outlines a proof which between the lines says that any expansive homeomorphism of a surface must be pseudo-Anosov, and thus by index theory any one on  $S^2$  would have to have a 'spike' singularity, which easily keeps it from being expansive. He kindly sent me a preprint entitled 'Expansive homeomorphisms of compact surfaces are pseudo-Anosov [84 pages, Tokyo Metropolitan Univ.]. There is no question about the importance of such a result: starting with point-set-theoretic hypotheses one must find measured foliations with finitely many singularities, (or a complex structure together with quadratic differentials.) And this structure is to behave correctly under the given homeomorphism. (I have just learned that Lewowicz has announced a similar pair of results.)

The editor, Giko Ikegami, says that the papers are classified as dynamical systems, ergodic theory, engineering sciences or theoretical physics; he seems to have omitted the key, and it is not always easy for the reader to supply. Roughly five of the first six articles are physics, the next and the second are engineering and the remaining eleven mathematics. Among the latter are discussions of many of the reviewer's favourite topics: knotted periodic orbits, one sided sofic systems, Markov partitions, Cantor sets (in dynamical systems), chain recurrence, quasi-Anosov diffeomorphisms, Hopf bifurcation, regularization. The lead article is 'Quantum chaos' which my friends tell me is an important topic. We conclude by joining the editor in his desire '... to contribute to the development of interdisciplinary research in dynamical systems'. [Table of contents: Quantum chaos, by M. Toda and S. Adachi, Digital control systems with chaotic rounding errors, by T. Ushio and C. S. Hsu; Phenomenology and characterization of spatiotemporal chaos – hitchhikers guide to coupled lattice world, by K. Kaneko; Studies on Toda map, T. Konishi; Spatio-temporal patterns of a plastic network system, T. Ikegami and M. Suzuki; Self excitation of square waves in two degrees of freedom oscillator with strong non-linearity, M. Kuramitsu and K. Yokata; Hopf bifurcation of a constrained circuit, R. Tokunaga; On regularization of circuits, G. Ikegami; Local characterization of characteristic surfaces for constrained systems, H. Oka; Regularization of vector

fields by Easton type surgery, E. Hayakawa; Normal forms of piecewise linear vector fields, M. Komuro; Knotted attracting periodic orbits in Silnikov bifurcations, Y. Togawa; Conjugacy from one-sided sofic systems, M. Fujiwara; Homeomorphisms with Markov partitions, M. Dateyama; There are no expansive homeomorphisms on  $S^2$ , K. Hiraide; Nullity of measures of Cantor sets, S. Matsumoto; Chain recurrence and P.O.T.P., T. Shimomura; Quasi-Anosov diffeomorphisms and pseudo-orbit tracing, K. Sakai.]

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