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BULLETIN

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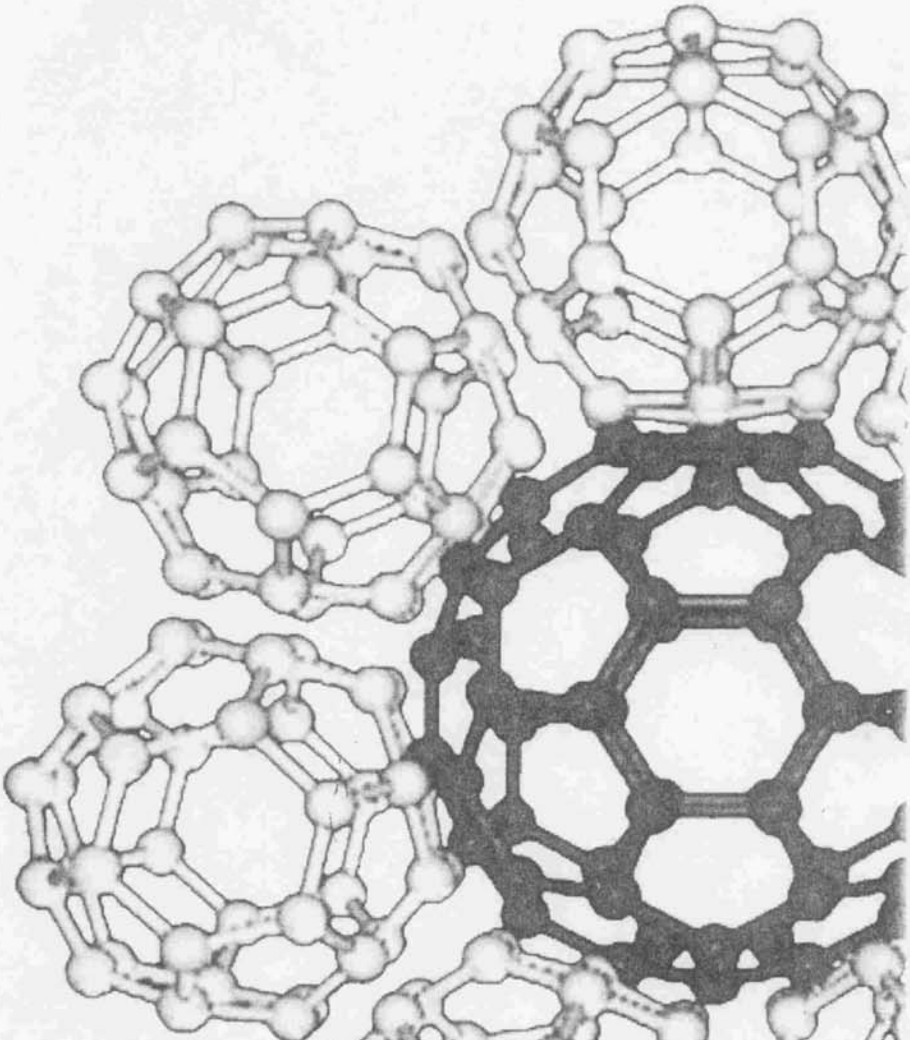

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PART I

Includes sessions for Monday, March 12 and Tuesday, March 13

15:06

E5 2 Synchronization of Arbitrarily Coupled Oscillators: The Master Stability Function and Small World Problem.

LOUIS PECORA, *Naval Research Laboratory*

We show here that it is possible to solve, once and for all, the stability problem of synchronizing any array of identical oscillators, whether chaotic or limit cycle. The scheme gives a master stability function. We apply this to a system of 8 coupled Rossler-like circuits. We further show that this approach allows an experimental probe of the stability of any array of any number of identical oscillators using only three oscillators. Finally, the synchronization of oscillators in smallworld systems is understandable using a master stability approach.

Contributed Papers

15:42

E5 3 Loss of Synchronization of Periodic Orbits in Unidirectionally Coupled Systems YOUNGTAE KIM,* *Department of Molecular Science and Technology, Ajou University, Korea* SANG-YOON KIM, *Department of Physics, Kangwon University, Korea* We have investigated the mechanism of desynchronization of periodic orbits in unidirectionally coupled system using detailed analysis of coupled logistic maps. Synchronous periodic orbits become transversely unstable through a transverse period doubling or transcritical bifurcation, depending on the system parameter and coupling constant. Then asynchronous periodic orbits appear and they exhibit an infinite sequence of period doubling bifurcations, leading to chaos. The chaotic attractor disappears through a boundary crisis. Experimental results using unidirectionally coupled electronic circuits will also be presented for comparison.

*Corresponding author.

15:54

E5 4 Characteristics of period-doubling cascades in a piecewise smooth area-preserving map* JIAN WANG, XIAO-LING DING, XU-MING WANG, DA-REN HE, *Dept. Phys., Yangzhou Univ., 225002, China* JIAN-SHAN MAO, *Inst. Plasma Phys., Hefei, China* We report a study carried out in a system concatenated by two area-preserving maps. The system can be viewed as a model of an electronic relaxation oscillator with overvoltage protection. We found that a border-collision = bifurcation may interrupt a period doubling bifurcation cascade, and that some special features, such as "quasi-coexisting periodic orbits crossing border" as well as the transition between "quasi-transience" and chaotic orbits, accompany the process. These features are belonging to so-called "quasi-dissipative" properties. These new concepts will be explained in a long paper and may be interesting for many scientists.

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16:06

E5 5 Evidence of multiple devil's staircase* XU-MING WANG, SHI-XIAN QU, DA-REN HE, *Dept. Phys., Yangzhou Univ., 225002, China* JIAN-SHAN MAO, *Inst. Plasma Phys., Hefei, China* We report an observation of multiple Devil's staircase in an electronic relaxation oscillator. The system can be described by a circle map, which becomes both discontinuous and non-invertible beyond two critical lines in parameter space. The staircase, different from conventional ones, loses monotonicity and self-similarity. Each phase-locked plateau in the staircase is confined by conditions created by the collision between a periodic orbit and either of the end points of the discontinuous region of the system. We have constructed a simplified model to show that the nonlinear variation of the mapping function slope is responsible for this phenomenon, and believe that this mechanism can be observed in other practical systems.

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16:18

E5 6 A multiple devil's staircase in a two-dimensional map* WEN-XIU WANG, XU-MING WANG, DA-REN HE, *Dept. Phys., Yangzhou Univ., 225002, China* JIAN-SHAN MAO, *Inst. Plasma Phys., Hefei, China* We found a multiple devil's staircase in a two-dimensional discontinuous map that can be viewed as a simplified model of an impact oscillator. The staircase loses monotonicity and self-similarity and shows a very complicated structure. In some parts of the staircase one can see tower-like structures. Each tower is consisted of two branches. They are conventional devil's staircases. Each phase-locked plateau in the staircase is confined by conditions created by the collision between a periodic orbit and a point located on the discontinuous boundary of the system. The collision points of the phase-locked plateau in a conventional devil's staircase moves linearly along the boundary when the winding number changes. While the collision points of the plateau in different branches do not obey this rule. This observation may suggest that multiple devil's staircase can be found widely in higher-dimensional discontinuous maps.

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16:30

E5 7 Most elementary chaotic flows S. J. LINZ, *Theoretische Physik I, Universitat Augsburg, D-86135 Augsburg, Germany* J. C. SPROTT, *Department of Physics, University of Wisconsin, Madison WI 53706* Searching for elementary chaotic flows and a classification scheme based on their functional complexity, autonomous scalar third-order differential equations (jerky dynamics) seem to be an appropriate point of departure. By combining extensive numerical searches for chaotic behavior in such systems [1,2] and analytical no-chaos criteria [1,3], we are able [4] to (i) identify minimal chaotic flows with quasi-linear and other types of nonlinearities, (ii) obtain insights in the interplay between the functional form of the entering nonlinearity and the potential chaotic behavior of such models, and (iii) generalize a previously suggested classification scheme for chaotic jerky dynamics with quadratic nonlinearities [5] to arbitrary nonlinearities. [1] Linz, Sprott, Phys. Lett. A 259, 240 (1999); [2] Sprott, Phys. Lett. A 266, 19 (2000); [3] Linz, Phys. Lett. A 275, 204 (2000); [4] Linz, Sprott, in preparation; [5] Eichhorn, Linz, Hanggi, Phys. Rev. E 58, 7151 (1998).