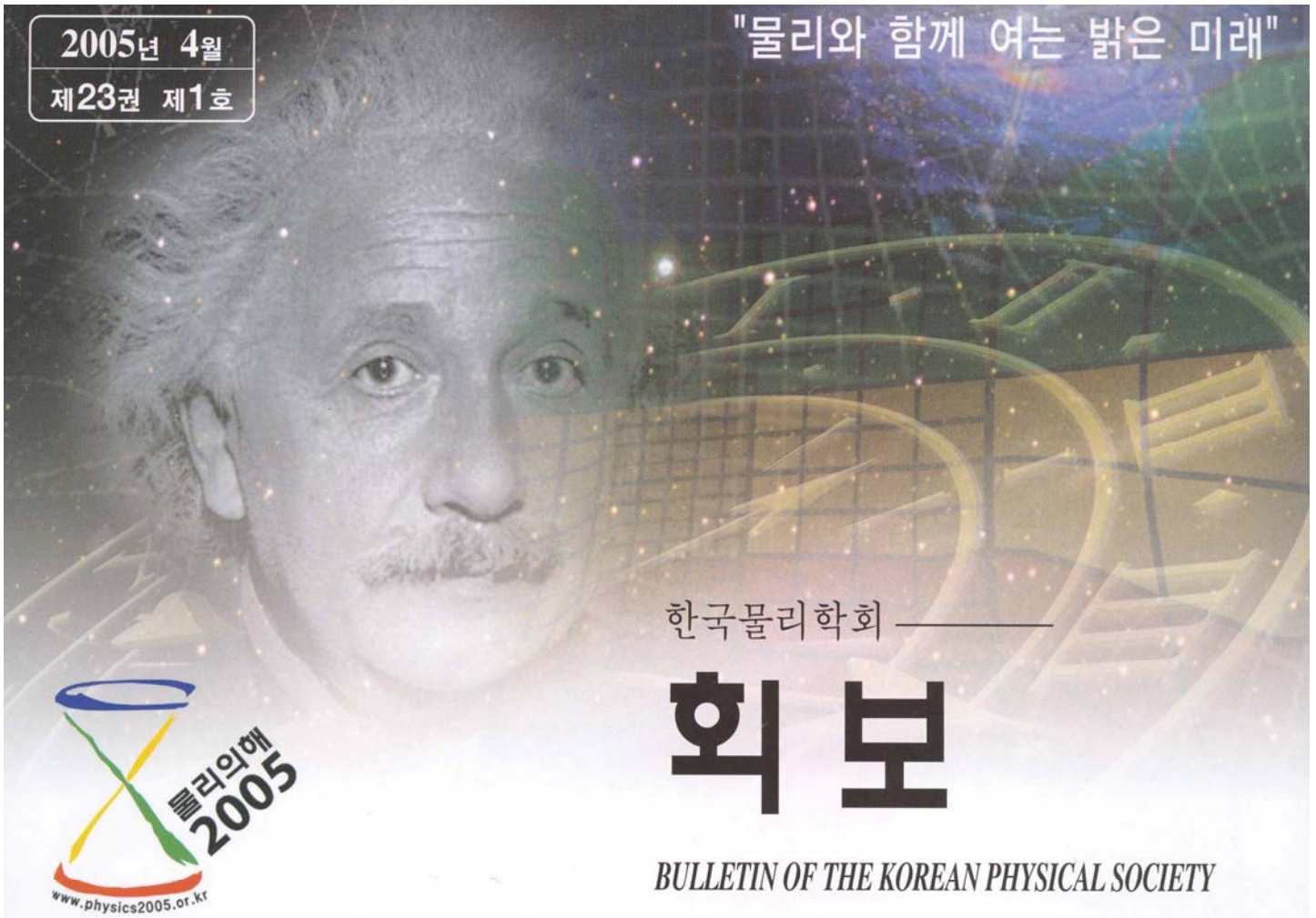
2005년 4월
제23권 제1호

"물리와 함께 여는 밝은 미래"



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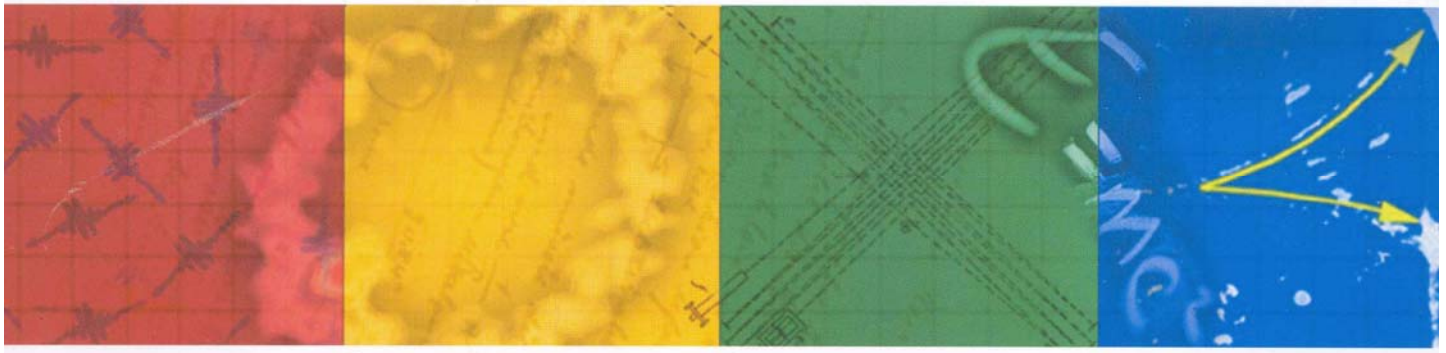
BULLETIN OF THE KOREAN PHYSICAL SOCIETY



제81회 정기총회 프로그램, 논문초록집

이화여자대학교

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to chaos in each subsystem may bereplaced by a quasiperiodic transition to chaos. This replacementis done when a symmetric antiphase orbit with time shift of half aperiod loses its stability via a Hopf bifurcation, instead of aperiod-doubling bifurcation. We investigate this type of Hopfbifurcations in two symmetrically coupled logistic maps. Adaughter orbit born via a Hopf bifurcation may be characterized interms of its rotation number ν (i.e., the average rotationrate around a mother orbit point per period of the motherantiphase orbit). For irrational ν, a symmetric quasiperiodicattractor, surrounding the unstable antiphase orbit, emerges. Onthe other hand, for rational ν (=r/s, s and r: coprimes)anomalous Hopf bifurcations occur as follows. For even r, the Hopf bifurcation creates one symmetry-conserved pair of symmetricperiodic attractor and saddle, while for odd r it creates twosymmetry-broken pairs of asymmetric periodic attractors andsaddles. These symmetric and asymmetric periodic attractors existin the mode-locked Arnold tongues emanating from the Hopfbifurcation line in the parameter space. Furthermore, bifurcationsinside these Arnold tongues are discussed. Similar results arealso obtained in symmetrically coupled multidimensionalperiod-doubling systems such as the coupled Henon maps, coupledpendula, and coupled Rossler oscillators.

Fp-011 **Interior-Crisis Route to Strange Nonchaotic Attractors in Quasiperiodically Forced Systems** LIM Woochang, KIM Sang-Yoon(*강원대 물리학과.*) As a representative model for quasiperiodically forcedperiod-doubling systems, we consider the quasiperiodically forcedlogistic map, and investigate the dynamical mechanism for the interior-crisis route to intermittent strange nonchaotic attractors. Using the rational approximation to the quasiperiodic forcing, it is shown that a new type of interior crisis occurs for a three-band smooth torus via a phase-dependent saddle-node bifurcation when it collides with a ring-shaped unstable set which has no counterpart in the unforced case. This interior crisis results in the birth of a single-band strange nonchaotic attractor, exhibiting intermittency. Characterization of such intermittent strange nonchaotic attractors is made in terms of the avergae time between bursts and the local Lyapunov exponents.

Fp-012 **경락에서의 생체신호에 대한 비선형 분석** 유 승훈, 김 연진[1], 김 장일[2], 윤 옥자, 남 성우[3], 노 유헌[4], 배 기홍, 한 상준(*중앙대학교, 물리학과. [1]Nanjing University of TCM, Dep. Acupuncture. [2]연세대학교, 물리학과. [3]연세대학교, 생명공학과. [4]중앙대학교, 의과대학 해부학교실.*) 인체에 대한 침구치료에서의 자극과 반응에 대한 연구는 주로 f-MRI를 이용한 영상진단법과 해부학적 연구방법등에 의해서 그동안 연구되어 왔다. 본 연구에서는 특정 경혈에 침구자극을 주고 동일 경락 내에서 얻은 생체신호와 다른 경락에서 얻는 생체신호를 비선형 분석하여 그 특성을 정량화 하였으며, 이를 통하여 동일 경락 내에 있는 생체신호의 동력학적 특성의 유사성을 조사하여 경락의 실체를 밝히고자 하였다.

Fp-013 **Morphological Properties and Cytosolic Calcium Oscillations in {\it In Vitro} Cortical Neural Networks** JEONG Byeongha, KO Tae-Wook, KIM Gi-Ho, LEE Kyoung-Jin(*고려대학교 물리학과 신경망동력학연구센터.*) We have quantified the changes in the structures (e.g., cell density, neurite density and morphology, connection motifs) of cortical neural networks {\it in vitro} over several days as they grow and become mature in a dish. At the same time, we have characterized the cytosolic calcium oscillations of the neuronal cell populations and their synchronization based on a confocal imaging. Our analysis indicates that calcium spikes and the degree of their synchronization increase rather dramatically while the morphology of the cellular network changes only gradually. Based on the results of our pharmacological investigations and computer model studies, we believe that long-range electrical connectivities are the key component conferring an almost instantaneous synchronization.

Fp-014 **Instability of defensive alliances in the six-species predator-preymodel on complex networks** LIU Jianbin, 김 범준(*아주대학교*) A simple model of a food web composed of six species is studied in the viewpoint of the spatial interaction structure. Each species has two predators and two preys, and it was previously known that the defensive alliances of three cyclically predating species self-organize in the two-dimensional regular structure and protect each other from the invasion of other species. The alliance becomes unstable either as the high mutation rate is allowed or as the rewiring probability is increased in the Watts-Strogatz network constructed in two dimensions. An order parameter to detect the inter-alliance symmetry breaking is suggested and used to