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mechanism for the appearance of intermittent SNA is the same as that found in a simple system of the quasiperiodically forced noninvertible logistic map. Hence, the intermittent route to SNA seems to be "universal," in the sense that it occurs through the same mechanism in typical quasiperiodically forced systems of different nature.

F-P007

Effect of Parameter Mismatch on

Weak Chaotic Synchronization in Coupled Invertible

Systems **임우창, 김상운(강원대.)** We investigate the parameter-mismatching effect on weak chaotic synchronization in high-dimensional invertible systems such as coupled Henon maps and coupled pendula. Due to the existence of positive local transverse Lyapunov exponents, a weakly stable synchronous chaotic attractor (SCA) becomes sensitive with respect to the variation of the mismatching parameter. To quantitatively characterize such sensitivity, we generalize the method proposed in coupled noninvertible one-dimensional maps to high-dimensional invertible systems. Thus, a quantifier, called the parameter sensitivity exponent (PSE), is introduced to measure the "degree" of the parameter sensitivity. In terms of the PSE, we characterize the effect of the parameter mismatch on the bubbling and riddling of the weakly stable SCA. The scaling exponent for the average characteristic time spent near the synchronization plane for both the bubbling and riddling cases is found to be given by the reciprocal of the PSE.

F-P008

신경발화패턴 및 뇌파의 위상 분석: 알

파 리듬의 위상 조정 **김원섭, 김정애¹, 조선영², 한승기¹(충북대학교 의용생체공학과, ¹충북대학교 물리학과, ²충북대학교 기초과학연구소)** 다중 채널로부터 측정한 신경세포의 발화 패턴과 뇌파 신호에 wavelet과 band-pass filter를 적용하여 여러 가지의 리듬성분을 추출하고, 각 성분에 대한 위상 변화에 대해 조사했다. 또한 반복된 자극에 따른 발화 신호와 뇌파에 대해, 자극 이전의 신경계 리듬이 자극에 의해 어떻게 조정되는지를 분석하였다. 반복된 자극에 의한 신경세포의 발화 신호와 뇌파 신호를 자극 제시 시점

을 기준으로 정렬하여, 반복된 뇌파의 평균치, Event-Related-Potential(ERP),를 측정하였을 때, 자극 제시 이전에는 ERP가 매우 작으나, 자극 제시 이후에는 ERP가 급격히 증가는 것을 볼 수 있었다. 이것은 자극이 전에는 알파리듬의 위상이 고르게 분포되었으나, 자극 제시 후 알파리듬의 위상분포에 변화가 생긴 것으로 볼 수 있다. 자극제시 시점의 알파리듬 위상에 따른 위상 속도 변화 분포도와 자극시 위상에 따른 위상속도의 비선형성으로부터 이러한 현상을 설명하고자 한다.

F-P009

Bifurcation Analysis of Cell Cycle

Regulation in the Budding Yeast

NGUYEN Cuong,

윤장로, 한승기(충북대학교 물리학과) Bifurcation analysis of cell cycle regulation in the budding yeast is performed based on the mathematical model by Chen et al.(MBC, 11, 369). On the bifurcation diagram, location of the stable and the unstable solutions of the nonlinear differential equations is presented taking mass of the cell as a control parameter. Based on the bifurcation diagram, dynamic mechanism underlying the 'start' transition, initiation of a new round of a cell cycle, and the 'finish' transition, completion of a cell cycle and returning back to the initial state, is discussed: the 'start' transition is a transition from a stable fixed solution for a small mass and to an oscillatory state for a large mass, and the 'finish' transition is a switching back to the stable fixed solution from the oscillatory state. To understand the role of the genes during the cell cycle regulation, bifurcation diagrams for the mutants are compared with that of the wild type.

F-P010

Punctuated Equilibrium and Criticality

on Network Structures

LEE Sungmin, KIM Yup(경희대학교 물리학과) We study a simple model for punctuated equilibrium and criticality on several network structures, where the neighbor of each node is distributed heterogeneously, given as its own degree. Each node has a fitness value $\$$. On evolution a node who has the smallest value of fitness and its linked neighbors are updated to new random value of fitness. After a while the system goes to the critical state, where the