face receptor or ion channels. Although each protein has its unique amino acid sequence and conformational status depending upon it strongly, there appear common conformational features. Inside the membrane, proteins usually form alpha-helical domains, while random excursions of the protein strands are favored outside the membrane. In this study, protein molecules are assumed to be a homopolymer capable of forming hydrogen bonds with other segments, which enables it to build helical structures. Statistical weight of each domain of an integral protein is quantified and the most possible conformational status is determined via the grand canonical ensemble consideration. We discuss the effects of membrane hydrophobicity and temperature on the folding transition.

F-6(초)   생물학적인 신경계의 동적 특성. 한승기, 임태규, 이강구 (충북대학교 물리학과) 최근 뇌과학(neuroscience)의 발전과 함께 생물학적인 신경계에서 일어나는 여러 가지 거동이 갖는 중요성이 인식되면서 동력학적인 연구의 필요성이 대두되고 있다. 이 논문에서는 신경계를 어떻게 동력학적으로 다룰 수 있는지, 그리고 어떻게 분석할 수 있는지를 소개한다. 아울러, 동력학적인 연구의 몇 가지 예들을 소개함으로써 동력학적 연구가 신경계를 이해하는 데 어떤 도움들을 줄 수 있는지를 이야기한다. 이를 위하여, 생물학적인 신경세포의 전형적인 모형인 HH-신경모형에서 외부자극에 따른 활동전위 형성과 주기적 끌개 형성 등 거동의 변화를 이온 채널의 비선형 동적 특성으로 설명한다. 그리고 HH-신경모형을 간략히 한 2차원 ML-신경모형의 위상공간 분석을 통해 기하학적인 접근 방법이 이들의 거동에 대한 직관적인 이해를 줄 수 있음을 보인다. 아울러, 결합된 신경모형계가 보이는 동기화된 혹은 반동기화된 거동은 위상 모형의 효과장으로 분석할 수 있음을 보인다.

F-7   **Dynamical Transitions of Ion Channel in Membrane**   *Kwonmoo Lee and Wokyung Sung (Pohang University of Science and Technology, Pohang, 790-784, Korea) Gabriel Weinreb (Institute for Physics, Kiev, Ukrane)*   An ion channel is the macromolecular structure which provides passage for ion conduction through biomembrane. Ions pass through the channel in a random fashion, while the channel structure undergoes conformational changes in interaction with permeant ions. We calculate the effective free energy of channel conformation renormalized by fast permeant ions. It is shown that temperature, strong coupling, and nonequilibrium conditions arising from ionic imbalance and membrane potential can induce the bifucations of effective free energy, resulting in transitions in dynamical behavior of ion channel.

F-8   잡음으로 유도된 혼돈의 동기화 방법과 그 응용   김칠민(배재대학교)   동일한 두 혼돈계가 있을때 같은 잡음신호를 각 혼돈계의 대응 변수에 각각 더하여 두 혼돈계를 동기화 시켰다. 이때 두 혼돈계는 그 오차식이 무한대의 laminar길이를 가질때 동기화가 생겼는데, 이를 logistic 본뜨기를 이용하여그 얼개를 보였고, logistic본뜨기와 Lorenz식을 이용하여 그 특성을 보였다. 여기서는 일반적인 혼돈의 동기화 방법과 그 응용성을 설명하고, 이런 동기화 방법과 그 특성및 응용성을 기존의 방법과 비교 분석 한다.

F-9   Experimental Study of Bifurcations in A Parametrically Forced Magnetic Pendulum   *Sang-Yoon Kim, Seung-Ho Shin, Jaichul Yi, and Chi-Woong Jang (Kangwon Nat'l Univ.)*   An experimental study of bifurcations associated with stability of stationary points (SP's) in a parametrically forced magnetic pendulum and a comparison of its results with numerical results are presented. The critical values for which the SP's lose or gain their stability are experimentally measured by varying the two parameters Ω (the normalized natural frequency) and A (the normalized driving amplitude). It is observed that, when the amplitude A exceeds a critical value, the normal SP with $\theta = 0$ (θ is the angle between the permanent magnet and the magnetic field) becomes unstable either by a period-doubling bifurcation or by a symmetry-breaking pitchfork bifurcation, depending on the values of Ω. However, in contrast with the normal SP the inverted SP

with $\theta = \pi$ is observed to become stable as A is increased above a critical value by a pitchfork bifurcation, but it also destabilizes for a higher critical value of A by a period-doubling bifurcation. All of these experimental results agree well with numerical results obtained using the Floquet theory.

F-10 **Markov Chain analysis of random walks on a percolation cluster in four dimensions.** *Sang Bub Lee (Kyungpook National University)* We study by Markov chain analysis the random walks on a critical percolation cluster embedded in four-dimensional hypercubic lattice. We calculate a number of dominant eigenvalues of the transition probability matrix and calculate the fractal and spectral dimensions d_w and d_s of random walks from the eigenvalues and their distribution. Naive estimates of d_s and d_w for a given size S of the underlying percolation cluster were found to be dependent upon the size S and, after extrapolating the results to $S \to \infty$ limit, results were close to the known values obtained by other methods. We also calculate d_w from the Monte Carlo data of rms end-to-end distances and obtained the result consistent with that of the Markov chain analysis but with large corrections to scaling.

F-P001 **Single and dual-mode quantum nondemolition measurements of photon number via optical Kerr effect** *C. I. Um, S. K. Hong, I. H. Kim (Korea University), K. H. Yeon, D. H. Kim, S. Zhang (Chungbuk National University)* A quantum nondemolition(QND) measurement has attracted considerable attention because an observable is measured without perturbing its free motion. In this presentation, we analyzes the QND measurement properties of the photon number of one and two modes light in the balanced homodyning detector of nonlinear Mach-Zehnder interferometer. In the schemes, the sum of photon numbers is measured via Kerr-type photon number QND measurements device which was proposed by Imoto et al.. We examine the characteristics of the interference fringe visibility and its phase shift of the schemes, where both the self and cross-phase modulation effect of Kerr media are considered.

F-P002 **The Appearance of Superfluid Vortices in a Narrow Annulus in He II** *엄정인, 장기호(고려대학교)* Using the rebuilt potential for the superfluid vortices and the generalized relation for the onset of vortices, we have derived the general critical angular velocities, including the deviation of symmetrically-placed vortices from the midway of a gap, for three types of experiments in a narrow annulus. Through the temperature-dependent core radius and the detailed calculation of the deviation, we have obtained the slightly better result than that predicted by Swanson and Donnelly quite near T_λ and below $1.8K$, repectively, and the conclusion that their prediction is reasonable within 7.3% in an ideal narrow annulus.

F-P003 **Ground-State Properties of Two-Dimensional Binary Boson ^{3}He-^{4}He Mixtures** *엄정인, 강재록 (고려대학교)* Using a variational Jastrow wavefunction extended to include a three-body correlation function and a hypernetted chain scheme with contribution of elementary diagrams, we analize binding energies and structural properties of two-dimensional binary boson ^{3}He-^{4}He system. It is shown that the mixture system is in equilibrium at lower density compared to pure ^{4}He system because of the large zero-point energy of ^{3}He atoms. We have evaluated the lowering of binding energies as a function of impurity concentration and total density of mixtures.

F-P004 **Stochastic Resonance in Multistable SQUID Potential** *김희경, 홍종배 (서울대 물리교육과)* Bistable SQUIDs model의 경우에 대해 stochastic resonance 가 나타남을 실험과 이론을 통해 보인 기존의 결과[1]의 확장된 경우로 우리는 overdamped 된 SQUID model의 multistable한 포텐셜의 경우에 대해 stochastic resonance가 나타남을 컴퓨터 시늉 실험을 이용하여

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