

# 21世紀COE「物質階層融合科学」セミナー 「中間子原子核の拓く新しい物理学」

Paul Kienle先生と山崎敏光先生をお迎えして連続セミナーを行います。

## Pions in Nuclei -- Probes of Chiral Restoration

講師: **Paul Kienle**

(Technische Universität München, Germany and  
Stefan Meyer Institute for Subatomic Physics Wien, Austria)

日時: 4月28日(木) 15:00-16:15

場所: 大学院講義室1 [理学総合棟745号室]

概要:

Spontaneous chiral symmetry breaking, as proposed by Nambu and Jona-Lasinio is presented as mechanism which creates the large mass gap between the QCD groundstate and the hadrons with the pion decay constant,  $f_\pi$  as order parameter of this phase transition. It is expected that  $f_\pi^2$ , which determines the isovector strength of pion-nucleon and  $\pi$ -nucleus s-wave interaction, decreases linearly with the density of a nuclear medium and brings about a partial restoration of chiral symmetry.

Recent experiments are presented to study with high precision the s-wave pion-nucleon and pion-nucleus interaction in comparison, using X-ray spectroscopy of pionic hydrogen on one hand and pion transfer reactions to study deeply bound s-states of pions in heavy nuclei on the other hand. From the ratio of the thus determined isovector scattering lengths, we find that the squared pion decay constants, which are inversely proportional to their respective isovector scattering lengths, are modified by a nuclear medium. Our results indicate that the order parameter of symmetry breaking  $f_\pi(\rho_0)^2$  is reduced by a factor of  $\sim 0.64$  in a nucleus with density  $\rho_0 = 0.17 \text{ fm}^{-3}$ , in good agreement with theoretical expectations. Thus we have found evidence for partial restoration of spontaneously broken chiral symmetry by a nuclear medium, by studying chiral dynamics.

\*このあと引き続き 山崎 敏光先生のセミナーを行います。

世話役 田村 裕和 (原子物理研究室・内6454)