

SEMINAR SERIES

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FRACTAL PHYSIOLOGY: APPLICATION IN SLEEP AND CIRCADIAN RESEARCH

Featuring Dr. Kun Hu

Assistant Professor, Associate Physiologist

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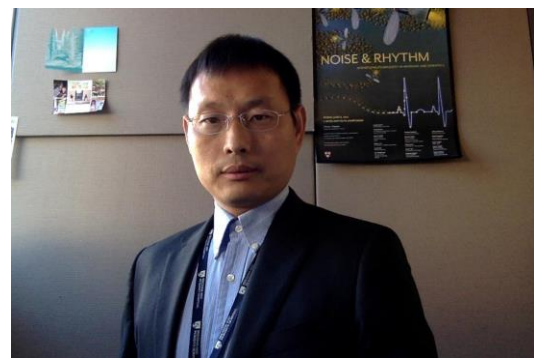
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ABSTRACT

One of the most puzzling phenomena in biology is the fractal pattern in the spontaneous fluctuations of many physiological outputs such as motor activity and heartbeat fluctuations, i.e., the patterns of fluctuations are very similar at different time scales. These fractal patterns are robust in healthy physiological systems but are significantly altered or reduced in perturbed systems associated with aging and pathological conditions, indicating important underlying fractal controls that provide system integrity and adaptability. Understanding these fractal controls is a major challenge in biomedical research, and is believed to be one of the top five great ideas in biology of the 20th century, as Sir Paul Nurse, winner of the 2001 Nobel Prize in Physiology or Medicine, stated in his lecture at Harvard Medical School. In this talk, I will sketch the emerging picture of the developing interdisciplinary field of fractal physiology by reviewing our recent studies in which we applied the concept to sleep medicine. Specifically, I will discuss the role of the circadian control system in generating fractal patterns in motor activity and heart rate as well as the effects of aging and aging-related pathological conditions such as dementia and Alzheimer's disease. I will also discuss briefly the network view/concept of fractal physiological control and the possibility to build a bridge between the fields of circadian biology and fractal physiology.

ABOUT DR. HU

Kun Hu, Ph.D., is an assistant professor of Medicine, at Harvard Medical School and an associate physiologist, Division of Sleep and Circadian Disorders, Departments of Medicine and Neurology, at Brigham and Women's Hospital. He is also the Director of the Medical Biodynamics Program at Brigham and Women's Hospital. Dr. Hu is an *Ad Hoc* Reviewer for over 20 academic journals and is on 5 editorial boards.



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