COLLOQUIUM BY STEPHEN TEITSWORTH

THE SURPRISING ROLE OF NOISE IN COMPLEX SYSTEMS: FROM NANOSCALE ELECTRONICS TO GLOBAL CLIMATE DYNAMICS

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The surprising role of noise in complex systems: from nanoscale electronics to global climate dynamics

Speaker: Dr. Stephen Teitsworth, Associate Professor of Physics, Duke University

ABSTRACT:

Noise refers to the rapid and unpredictable fluctuations that are present in almost all complex systems. For example, in nanoscale electronic devices, noise arises from the random and highly unpredictable flow of individual electrons as they move through the structures. Historically, noise has been viewed as a nuisance that tends to degrade performance of systems by making them less predictable. Recently, however, scientists have discovered surprising ways in which noise can actually enhance the performance of a complex system. A striking example of the beneficial effects of noise include the superlattice high-speed random number generator in which the noise greatly enhances chaotic electrical current flow and first demonstrated in 2013 at the SINANO Institute in Suzhou, China. Another important example is provided by climate models that can more accurately predict weather patterns such as the famous El Niño by treating the forcing of the atmosphere on surface sea temperatures as an effective noise.

BIO:

Stephen W. Teitsworth is Associate Professor in the Department of Physics at Duke University. His research centers on experimental, computational, and theoretical studies of the interplay between deterministic nonlinearity and noise, with a particular focus on the transport of electrical charge in nanoscale structures such as semiconductor superlattices and tunnel diodes. In teaching, he has recently developed a course for non-scientists at Duke on the physics of current and emerging sustainable energy technologies.

Dr. Teitsworth received a B.S. in Physics from Stanford University and got his Ph.D. in Physics at Harvard University.