Instytut Fizyki
Wydział Nauk Ścisłych i Przyrodniczych
Uniwersytet Pedagogiczny im. Komisji Edukacji Narodowej w Krakowie

Serdecznie zapraszamy na

SEMINARIUM IF-UP

referat pt.

"How chance processes and randomness can make nuclear power safer – reactor diagnostics and nuclear safeguards with neutron noise analysis"

Zapraszamy!

Wygłosi

Prof. Imre Pázsit

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Zapraszamy!

Seminarium odbędzie się w piątek, **11 października 2019, o godz. 10:00**
w sali 514, główny budynek UP, ul. Podchorążych 2, 30-084 Kraków.

Streszczenie:

Most physical quantities of a non-trivial system, either biological or physical, are inherently random. In stationary physical systems, the randomness is manifested by small fluctuations around the mean value. Such small fluctuations, also called "noise", are most often considered as unwanted, and hence suppressed. However, if one understands the physical reasons how these fluctuations (which often have very fascinating and unexpected features) arise, such that they can be formulated in mathematical terms of random processes, they become a true "gold mine", i.e. they contain a wealth of information about the state and the dynamic properties of system, which one can obtain by a non-intrusive way (i.e. without perturbing the system).

In this talk, first some illustrations of random processes in life sciences will be given, together with the historic example of the extinction of family trees, which represents the beginnings of the study of random effects in branching processes. Then, the various reasons for the fluctuations of the neutron population in a multiplying system (a nuclear reactor or a piece of fissile material) are discussed. Finally, it is shown how the neutron noise can be used for monitoring the "health status" of nuclear reactors and to indicate incipient failures in an early phase ("reactor noise diagnostics"), as well as to detect, identify and quantify hidden nuclear materials ("nuclear safeguards"). Examples of applications in Swedish and Hungarian power plants will be given, including the case when the development of a thin layer of corrosion deposit on the surface of the fuel rods was detected "on-line", i.e. during operation, by neutron noise measurements.