

PHYSICS AND ASTRONOMY COLLOQUIUM (In Person Only)

Dr. Falk Herwig University of Victoria

"Transmutation and translocation: Common mechanisms of heavy element formation and protein synthesis"

Abstract

Despite frequent praise for interdisciplinary research, its tangible benefits often remain elusive to specialists in individual fields. This talk presents a case study through two seemingly unrelated research projects in nuclear astrophysics and biological physics. In stellar nucleosynthesis heavy-element transmutation by neutron capture creates elements from iron to lead through a chain of reactions along the nuclear valley of stability. Mathematical models constrain the conditions and mechanisms such as nuclear reaction rates and dynamic mixing processes through observed stellar abundance patterns. Remarkably similar mathematics describes protein synthesis in cells, where ribosomes translocate along mRNA chains. By measuring ribosome density patterns, we can identify processes affecting protein synthesis, such as mRNAdamage induced ribosomal traffic jams. This mathematical parallel between stellar nucleosynthesis and cellular biology demonstrates interdisciplinary synergy at work.

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