



Colloquium

On the Nature of Causation in Cosmology: The Basis for our Existence.

George Ellis

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Host: Zoltan Haiman

Multiple scales in the Universe interact in a non-linear way, providing the basis for our existence. A key form of non-linearity is that both upwards and downwards causation occur at many different scales, from cosmology through to galaxies and down to particles. This is also key to biological function. We live in an Evolving Block Universe that provides a global Direction of Time, which is basis of all the local arrows of time – a key feature of astrophysics, physics, chemistry, and life - despite the time symmetry of the underlying physics. The future is not yet determined at small scales because of quantum uncertainty, which is magnified to cosmic scales by inflation and to human scales due to damage caused to DNA by cosmic rays, and at larger scales because chaotic dynamics occurs both at galactic scales and as regards weather on Earth. Living systems are open systems so Laplace's daemon cannot even in principle have the data it needs to predict unique outcomes from complete initial data of their physical state. Existence of a universal wave function would imply everything is uniquely determined by initial conditions, but no such wave function exists. Claims that "a universe can arise out of nothing" are incoherent, because "nothing" does not exist.

Wednesday, May 21, 2025 11:30am - 12:30pm

Raiffeisen Lecture Hall



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