



Reduction and Emergence in Physics and Cosmology: A Workshop with George Ellis (University of Cape Town/CAS Visiting Fellow) CAS LMU, 16 May 2025

This workshop investigates the nature of emergence in contemporary physics and cosmology, with a special focus on its implications for reduction, explanation, and metaphysical interpretation. Recent developments in quantum gravity, cosmology, and the foundations of quantum mechanics challenge traditional reductionist frameworks and raise the possibility that key features of our world—such as spacetime structure, cosmological dynamics, or informational architectures—may be emergent rather than fundamental. Questions about the explanatory autonomy of higher-level theories, the legitimacy of metaphysics at non-fundamental levels, and the role of abstract and purposive causation in physical and technological systems form the core of the workshop's agenda. With George Ellis as special guest, we will explore how such issues bear on the status of effective laws, the structure of scientific theories, and the broader philosophical understanding of our universe.

Schedule

9.00-10.00	Geoge Ellis Reduction and Emergence in Physics, Cosmology, and Technology
Coffee break	
10.30-11.15	Christian List Levels of Description and Levels of Reality: A General Framework
11.15-12.00	Stephan Hartmann Analogy-Based Reduction: Lessons from the NJL Model
Lunch break	
13.00-13.45	Daniele Oriti Emergent (Relational) Cosmology from Quantum Gravity
13.45-14.30	Laurie Letertre Laws without Spacetime: the Strategy from Global Constraints
Coffee break	
15.00-15.45	Alyssa Ney The Causal Argument for Physicalism
15.45-16.30	Mario Hubert How to Reduce the Quantum Formalism? The Quantum Reconstruction Program vs. The Ontological Model Framework
16.30-17.15	Sébastien Rivat What is Effective Metaphysics?