

# SAIP 2011



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## **Top Down Causation and the Emergence of Complexity**

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### **Content :**

The emergence of true complexity (such as life and the human brain) on the basis of the underlying physics is enabled by top-down processes in the hierarchy of complexity. This talk will propose that there are five different types of top down causation that can all be shown by many examples to exist and be causally effective in the real world. There is room for them at the bottom both because of statistical and quantum randomness at lower levels, and because the nature of lower level elements is altered by top down effects. While the evidence for top-down effects is very strong in the life sciences, computers, and engineering systems, there may also be cases in physics where their influence is significant; examples are the arrow of time, the origin of inertia, and both state preparation and decoherence in quantum theory.

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