



KAAPI WITH KURIOSITY

150 years of entropy

Over time, the threads of our clothes unravel, and once unraveled they do not spontaneously weave back together again. This tendency for things to decay and disorder is universal. In the mid-nineteenth century, it was realized that this tendency places fundamental limits on the things we can build: there are no perpetual motion machines, and running a refrigerator takes power. Fifty years later, it was realized the tendency toward unraveling has its roots in the behaviour of atoms and molecules. One hundred years later, disorder was reinterpreted as missing information, and the possibility of measuring information flow provided the foundations for our modern technological world. It is astonishing that there is one mathematical idea – entropy – that unifies all these different problems. Entropy determines how much heat we need to boil water, and whether we can watch movies on our phones. There are even connections to black holes. I will try to explain all this, and to convey some of our wonder at the power of mathematics to describe the world.

WILLIAM BIALEK

is the John Archibald Wheeler/Battelle Professor in Physics, and a member of the Lewis-Sigler Institute for Integrative Genomics, at Princeton University, and Visiting Presidential Professor of Physics at The Graduate Center of the City University of New York. A theoretical physicist broadly interested in the phenomena of life, Bialek is best known for contributions to our understanding of coding and computation in the brain. Bialek has made significant contributions to understanding optimal strategies in brain function, the early events of embryonic development and the collective states of biological systems — the activity in a network of neurons, or the flight directions in a flock of birds — using ideas from statistical physics. His work has been recognized by election to the US National Academy of Sciences, by the Swartz Prize for Theoretical and Computational Neuroscience, and by the Max Delbrück Prize for Biological Physics, among other honors. As passionate about teaching as about research, he has received the President's Award for Distinguished Teaching at Princeton, and is the author of a textbook, *Biophysics: Searching for Principles* (2012).

4 pm, Saturday, 21st December 2019*

Jawaharlal Nehru Planetarium, Bengaluru

***PLEASE NOTE THAT THE TALK IS ON SATURDAY, NOT SUNDAY AS IS USUALLY.**

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