

A World of Bits

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Communication Theory Workshop
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Communication Theory Cognoscenti

PITIFUL

PHYSICIST



$$E = h\nu$$

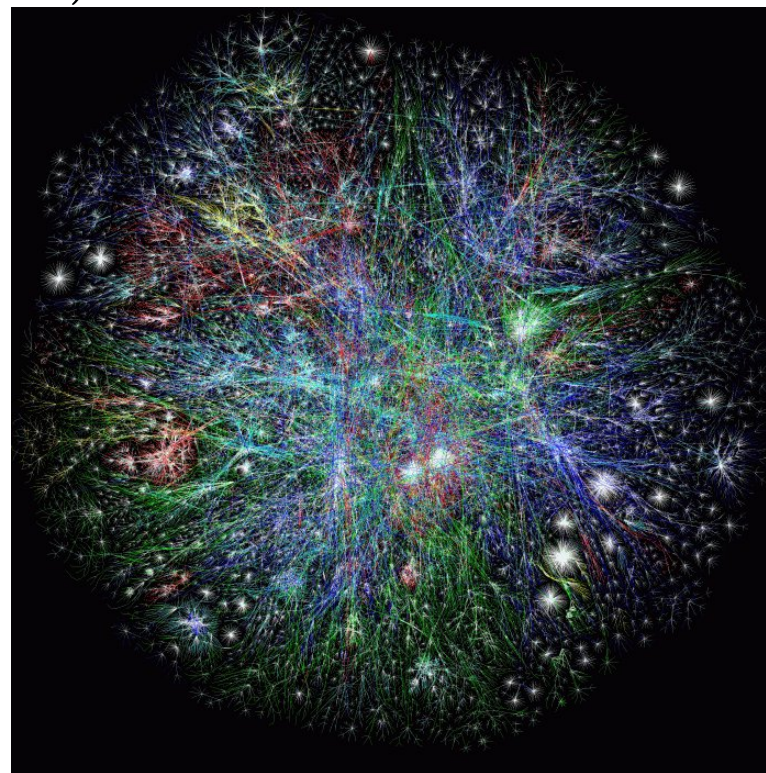
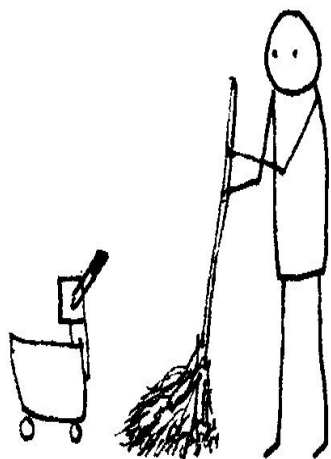


$$E = mc^2$$

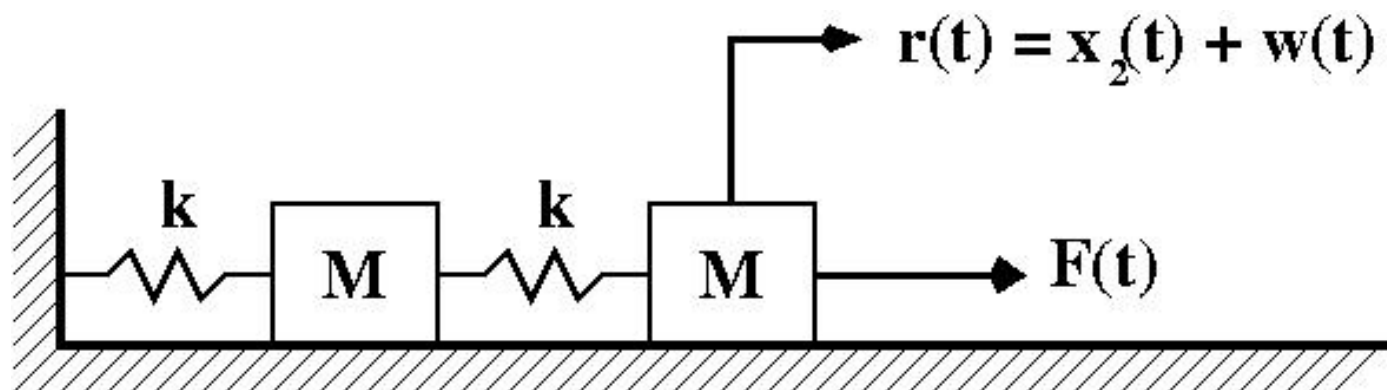


Communication Theorist

$$W \log \left(1 + \frac{P}{N_0 W} \right) \quad L = \lambda \tau$$



Conversations with a Slinky



A little color: $\mathbf{r} = \mathbf{Q}\mathbf{x}(0) + \mathbf{w}$

A little contention: $\mathbf{r} = \sum_{n=1}^N \mathbf{q}_n x_n(0) + \mathbf{w}$

energy constraints on system elements $\Leftrightarrow \mathbf{x}^\top \mathbf{Z} \mathbf{x} \leq \mathcal{E}$

Yo, Newton! Who Your Daddy?!

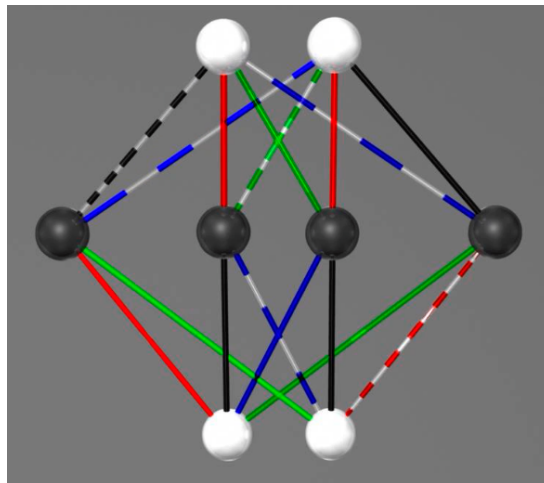
(From E. Verlinde, *On the Origin of Gravity and the Laws of Newton* arXiv:1001.0785v1 1/6/2010)

- **Extreme Conditions (Beckenstein):**
 - Dropping matter into singularities adds information
 - Number of bits in a black hole \propto surface area
- **Non-relativistic argument (Verlinde):**
 - $(displacement) \propto (information) \Rightarrow F = ma$
 - Same basic dance $\Rightarrow F = m \frac{MG}{R^2}$

Physical Laws *emerge* using an information perspective

Life, The Universe and Everything (SUSY)

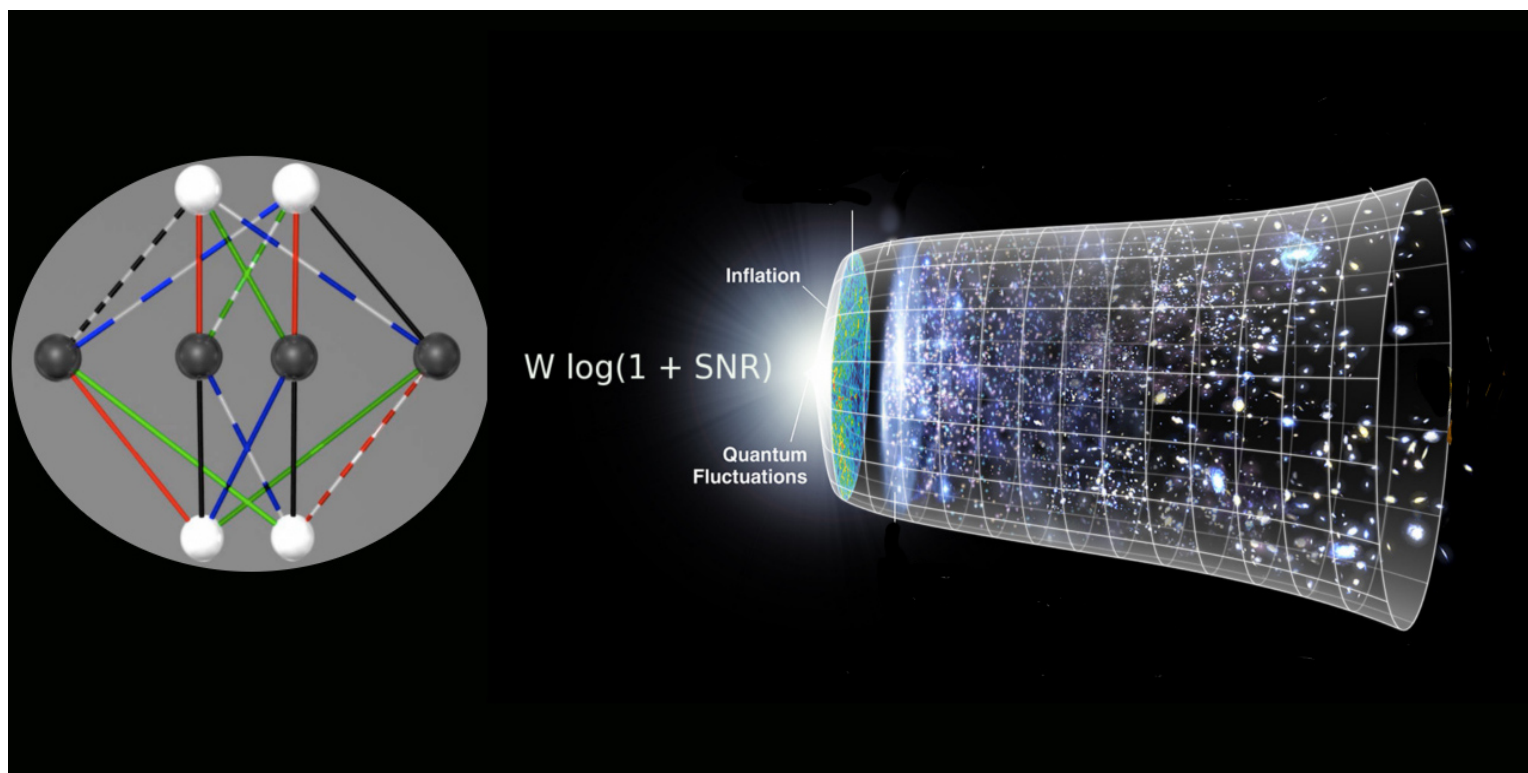
(courtesy of S.J. Gates, John S. Toll Professor of Physics, UMD)



“Adinkra”

- Fundamental particles (nodes) \Leftrightarrow eigenfunctions
- Particle relationships (edges) \Leftrightarrow linear operators
- Not all graphs are Adinkras
- BECs are embedded in Adinkra relationships!

From “god’s” Lips to Our Ears?



Communication Theory IS Everything