**Source:**

# 1 | his intro / background

## 1.1 | used to be very into econ

## 1.2 | worked at world bank bc he thought it was a good place to meet people who were interested in math and econ and help the world

## 1.3 | was sent to a country (forgot) during communism->capitalism transition and saw that the forced capitalist policies were not working

## 1.4 | went into management because that allowed him to actually help

## 1.5 | sante fe institute

### 1.5.1 | centeripece for a global movement to involve complexity in sciences accross disciplines

### 1.5.2 | from los alamos national labs

### 1.5.3 | 'universal relationships'

### 1.5.4 | lots of nobel prizes

### 1.5.5 | applications of graph theory and network theory, and lots of econ

1. understanding when societies are going to have a revolution, finiance, energy grid

# 2 | other related areas

## 2.1 | do individuals matter in history

## 2.2 | impacts on marketing based on faith studies?

# 3 | Overview

## 3.1 | this intersession is "interdisciplinary fixing of economics"

# 4 | Warmup

## 4.1 | insectivora, macroscelidea avg mass vs avg BMR, guess avg bmr for pholidota given avg mass

### 4.1.1 | I just took the ratios and took a high and low

### 4.1.2 | a few strategies for solving the problem

1. look for a common ratio (assume 0 mass = 0 BMR)
2. fit a line
3. it's actually not a linear relation, and the answer is relatively unexpected (much lower ratio)

## 4.2 | the monkey business illusion (ball passing -> miss other stuff)

### 4.2.1 | when you get attached to a tool, you miss loads of other things

# 5 | universality

## 5.1 | examples

### 5.1.1 | common limit theorem

1. lots of common processes produce gauseian distributions
   (a) thus, there is a "universality" in the normal distribution

### 5.1.2 | other theorem? (something with gauss)

1. if things are often normal distributions, then statistics kind of works (because that's what it's all based on)

### 5.1.3 | all mamals average the same number of heartbeats

1. small animals have fast hearts and die sooner, vice versa

#### 5.1.4 | metabolic rate (first warm up problem)

1. log log linear → constant rate of savings? SUBLINEAR SCALING
2. constant increase in efficiency
3. roughly 3/4 or 2/3 exponent
4. exponent can be derived by networks (circulatory system)
   (a) where can this be applied?
      i. many city statistics
         A. 15% boost/saving for every size double for amount of gas stations, boost in gdp, # of patents, new AIDs cases, etc

# 6 | city

## 6.1 | superlinear scaling -> city should grow

## 6.2 | results

### 6.2.1 | finite time singularity? when the growth curve goes vertical.. what does that mean. maybe environmental collapse

### 6.2.2 | trying to increase GDP and decrease crime/AIDs by growing won't really work because both scale in the same way

# 7 | complexity

## 7.1 | core

### 7.1.1 | taking a general tool and applying it elsewhere

## 7.2 | methodology

### 7.2.1 | start with a data rich domain and find the generative mechinism, then apply to the data sparse

## 7.3 | definition of complexity

### 7.3.1 | difficult to come up with a concrete definition

### 7.3.2 | handwavey: systems of networked adaptive agents are complex

1. networked
   (a) networks have 'finite' sides (classifications of nodes)
   (b) complexity perspective: they provide an analyzable structure at the mezzo-level of granularity
      i. ways networks are analyzed

   A. degree of a node
   B. betweenness centrality
   C. eigenvector complexity?
   D. avg path length
   E. degree distribution
   F. clustering
   G. community structure

2. agents
   (a) assume that all companies or consumers are equal and if they differ, then they differ along one variable
   (b) agents are actually different though?

3. adpativity
   (a) such as evolutionarily inspired adaptation
      i. genetic algorithms / evolutionary algorithms
      ii. often used to come up with a pretty good answer for a hard (NP complete or more difficult) problem

# 8 | other structures

## 8.1 | many complex systems have network structures