

**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 gaussian 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 mechanism, 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