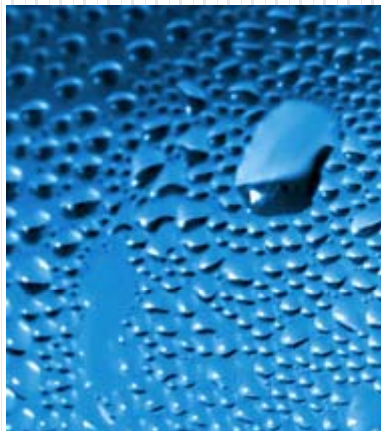


# The Phenomenon of Condensation of Wealth and Its Application on Networking Auction



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**Oct.29. 2009**

# MY GOALS

- **Make Everyone Understand What I am Talking about without Confusion!**



- **Collect your opinion!**



First monday of the month the corporate group gets together for a brainstorming session..

# Outline

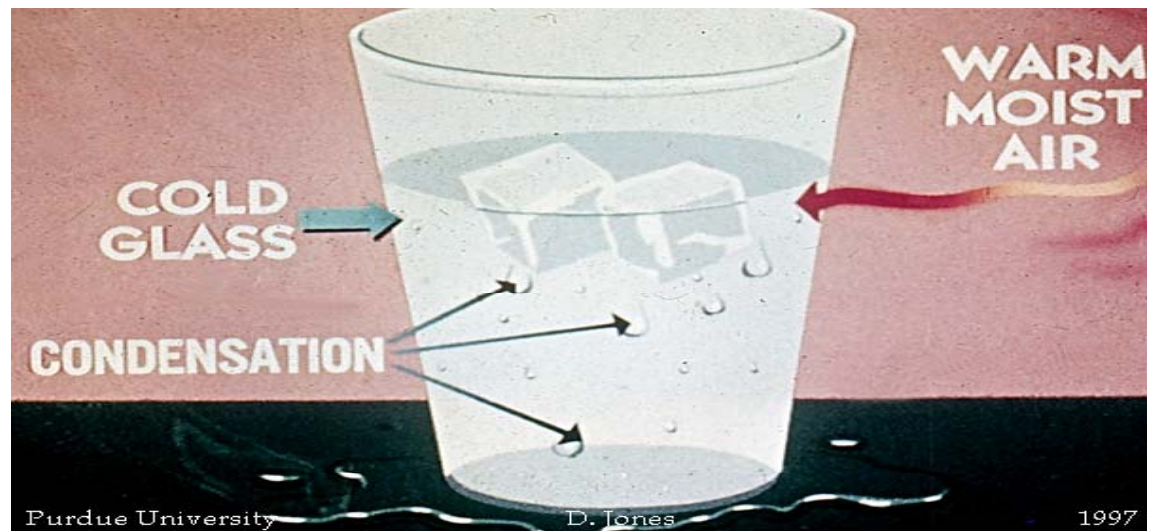
- **Introduction**
- **Modeling the Phenomenon**
- **Applying to Networking Auction**
- **Discussion of the on-going research**



# Introduction to the Condensation

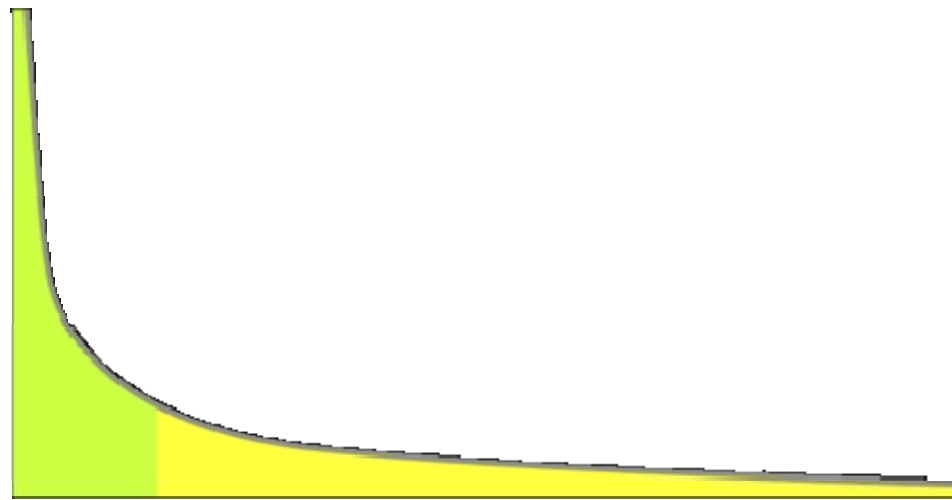
- **Physics**

- Change of the physical state of matter from **gaseous** phase into **liquid** phase and the reverse of evaporation.



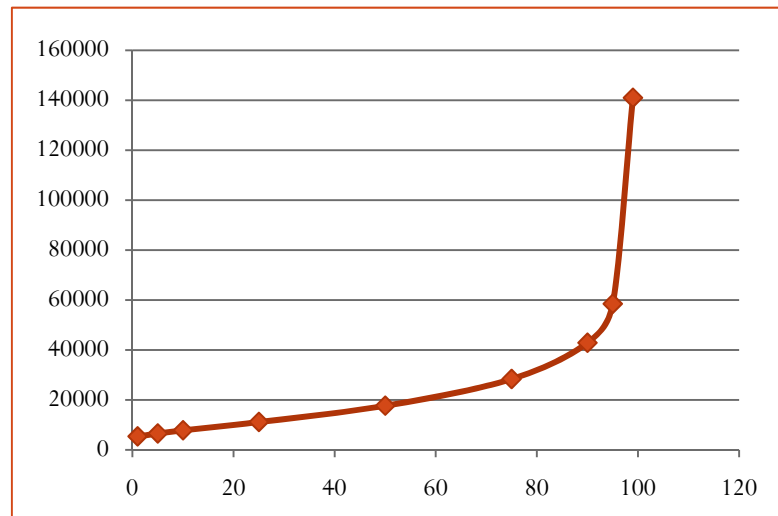
# Introduction to the Condensation

- **Economics**
  - **Wealth condensation** is a theoretical process by which, in certain conditions, wealth tends to become concentrated in the possession of already-wealthy individuals or entities, a form of preferential attachment.

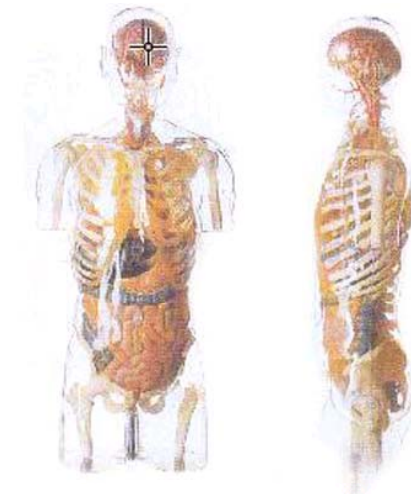
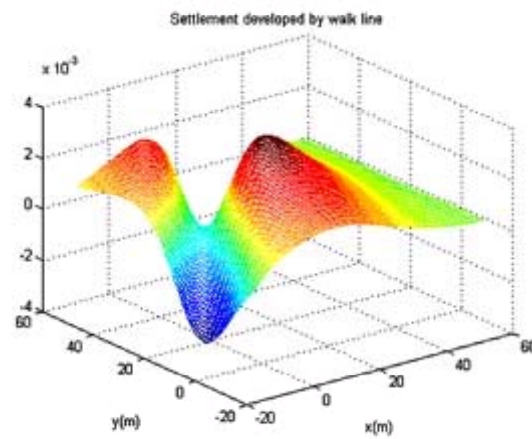


# Introduction to the Condensation

- **The Existence of Wealth Condensation**
- **Data from the British Government**



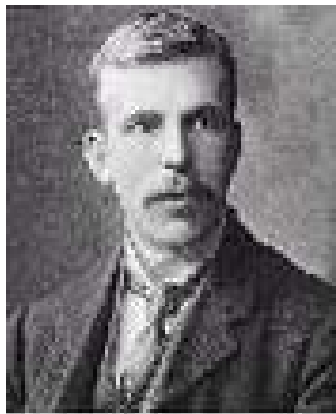
# Modeling



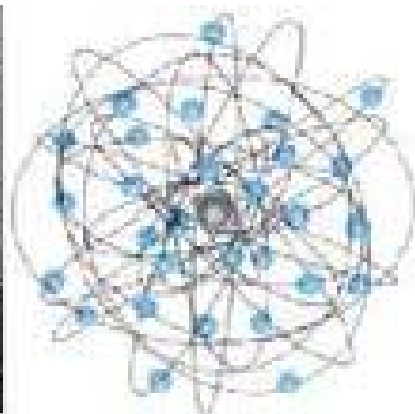


# Motivation: Why We Study This?

- All things in the universe are connected, which leads us researchers to explore.
- A phenomenon, a structure, a law of nature could exist in different areas



**E. Rutherford and his model of Atom**



**L. de Broglie**

$$\lambda = \frac{h}{p} \quad \lambda = \frac{h}{\gamma m v} = \frac{h}{m v} \sqrt{1 - \frac{v^2}{c^2}}$$



# Motivation: Direct Reason

- Budget Based Auction and Evolution of Network
  - How we capture the flows of transactions?
  - How budgets distribute?
- Mechanism Design
  - Can we avoid the condensation happening?
  - (if not) How to control the condensation?

# Study the Models

- How other researchers view this phenomenon
  - [“other” means Economists and Physicists]

# In Common

- Wealth Distribution, Power Law:

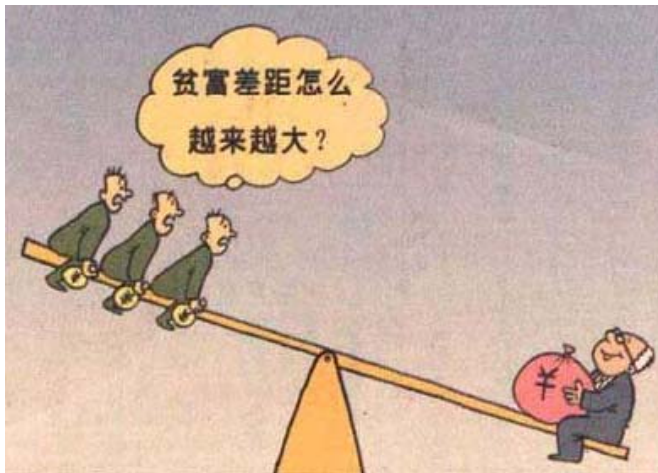
$$p(w) \sim w^{-1-a}$$

$$p(k*w)/p(w) \approx 1/k^{1+a} \quad (0 < k < 1)$$

# Intuition: Matthew Effect

- For whosoever hath, to him shall be given, and he shall have more abundance; but whosoever hath not, from him shall be taken away even that he hath.

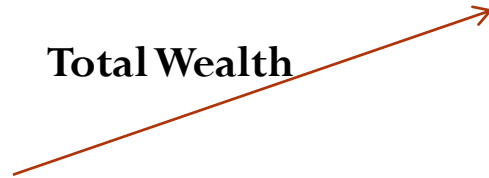
——Matthew 13:12, Bible



# Various Models

- **Open Economy**

Total Wealth



- **Closed Economy**

Total Wealth



# General Model of Open Economy

$$\frac{dW_i}{dt} = \eta_i(t)W_i + \sum_{j(\neq i)} J_{ij}W_j - \sum_{j(\neq i)} J_{ji}W_i$$

**Investment**

$$\frac{dW_i}{dt} = \eta_i(t)W_i + J(\bar{W} - W_i)$$

**Trading**

$$(J / N = J_{ij} = J_{ji}, \bar{W} = \frac{\sum_i W_i}{N})$$

**Result:  $p(W) \sim$  Power Law Distribution**

# General Model of Closed Economy

$$W_i(t+1) = W_i(t) + \sum_{j=1(\neq i)}^N w_{ij}(t)$$

$$p(w_{ij}) = \frac{1}{\sigma\sqrt{2\pi}} e^{\left[ -\frac{(w_{ij} - \overline{w_{ji}})^2}{2\sigma^2} \right]}$$



# Key Parameters Analysis

$$W_i(t+1) = W_i(t) + \sum_{j=1(\neq i)}^N w_{ij}(t) \quad p(w_{ij}) \sim N(\overline{w_{ij}}, \sigma)$$

$$\sigma = \boxed{h} \cdot W_{ij} \quad \text{Poverty Index}$$

$$W_{ij} = W_{ji} = \min(W_i, W_j)$$

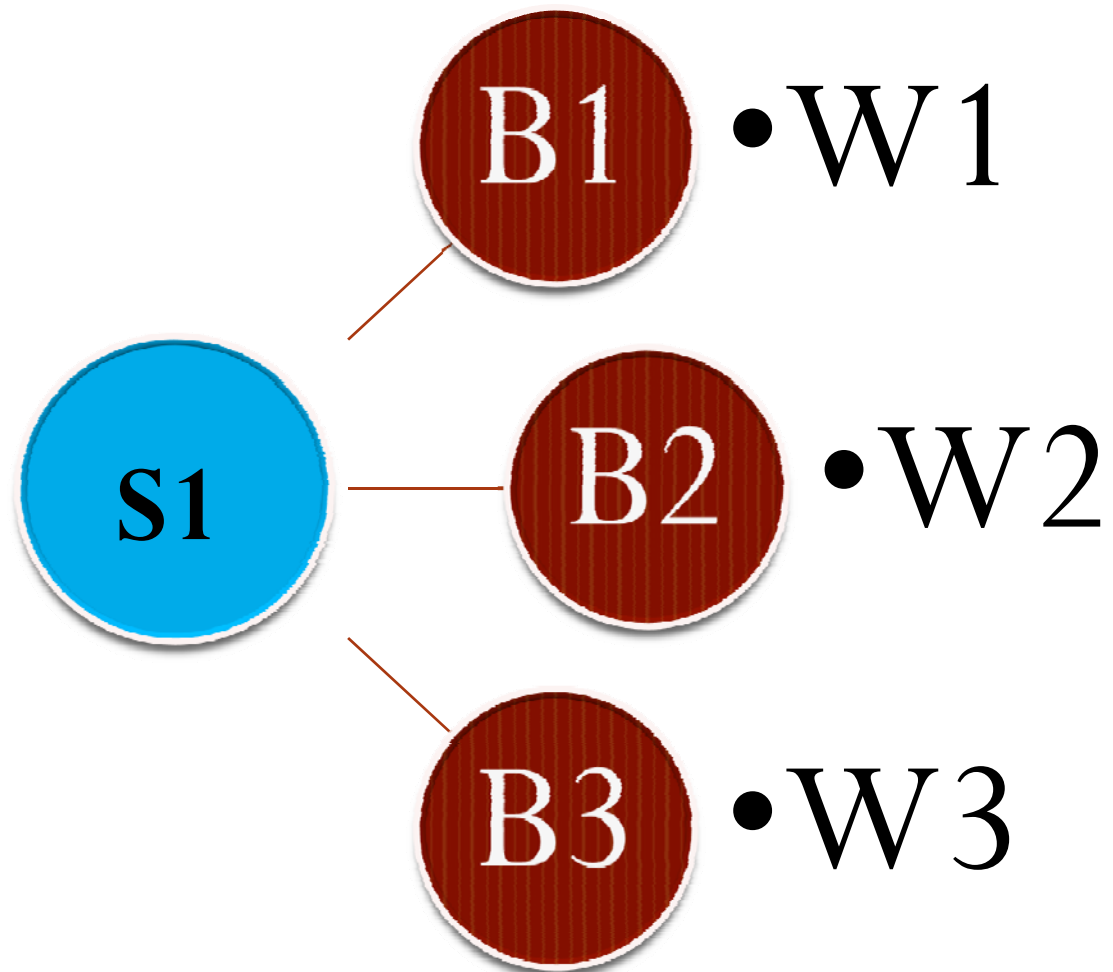
$$\overline{w_{ij}} = \alpha_{ij} \cdot h \cdot W_{ij}$$

$$\alpha_{ij} = \boxed{f} \cdot \frac{W_j - W_i}{W_j + W_i} \quad \text{Social Index}$$

# Applying to Auction

- **Revision**

## Applying to Auction Game



# Topics

- **#define Wealth Amount\_of\_Budgets**
- **#define Transaction Auction\_Result**
- **Wealth and Bandwidth?**
- **Motivations?**

# Discussion