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 / interdisciplinary

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 | random questions

8.1 | other structures?

8.1.1 | many complex systems have network structures

8.1.2 | celular automata

8.1.3 | almost everything is a network, but they mean network like everyone knows everyone else

1. it's a nice assumption if you want to use calculus, but sometimes its a poor model
2. somewhere along the way, textbooks inverted it
3. try to find the underlying mechinism and build models that reflect it

8.2 | does economics stop new things from cropping up?

8.2.1 | not cooridantedly, but if you edit a journal you will prefer to publish papers that exapand existing techniques instead of brand new ones

8.3 | evolutionary 'economics'

8.3.1 | multiple equilibriums will be bounced between bc there is always variation that comes from new mutations

8.3.2 | economics tries to pin systems to a 'perfect' equilibrium but with this complexity stuff you actually bounce between them

9 | classic economic curtain view

9.1 | pull a curtain on the state of the economy between equilibriums and just figure out where the next one is

9.2 | however, the actual policy that we care about is heavily affected by the transitions, thus we actually care

9.3 | case study: russian economic contraction

9.3.1 | the 2008 recession was 5% and came back in 4 years. In russia, there was a 40% contraction and society really started to break down

9.3.2 | jeffery somebody wanted mass privatization

1. government should value each company and make shares and give them out
2. doesn't account for dynamic something processes and didn't account for heterogenety
3. what happened? villagers sold their shares which kept getting resold
4. this is the problem with the curtain view: the transitions are the difficult parts that policy needs to hold up through
5. dengxiaopeng economic experiments were more effective than the mass shock transition
   (a) nomaclotora system? easier to get promoted if you run an experiment and it works
   (b) similar to how social credit experiments are being rolled out
   (c) it's like an evolutionary algorithm to search a complex landscape

10 | how does this change the way we think about policy

10.1 | for privitization, keep in mind how agents change and make decisions?

10.1.1 | the only systems where game theory works is when everyone making the decision is a game theorist

10.2 | for science education, how do we influence the agents to make more risk adverse or better decisions?

10.2.1 | teaching people about economics makes them behave more game theory rationally

11 | not perfect knowledge, so what?

11.1 | agents are different in many ways (not just one very controlled variable)

11.2 | agents don't have perfect information

11.3 | so, complex systems behave differently

11.3.1 | cities are complex

11.3.2 | firms are complex

11.3.3 | industries

11.3.4 | markets

11.3.5 | individuals (brains)

11.4 | emergent properties

11.4.1 | difficult to predict in a reductionist mindset

11.4.2 | however, we organize knowledge from a reductionist mindset. This is already a mistake

11.4.3 | phase transitions

1. nature of a system changes rapidly
2. it's difficult to undo the change
3. such as bear vs bull market in economics

12 | modern research

12.1 | collective intelligence

12.1.1 | overview

1. used to have a very reductionist model (either group is one individual or boundedly rational; or everyone in it is universally networked and can make good collective decisions)
2. based on how individuals learn / communicate, you can get good or bad decisions
3. monkeys often organized themselves near critical points where it's easy to provoke internal war

   (a) makes sense if you believe in group level selection