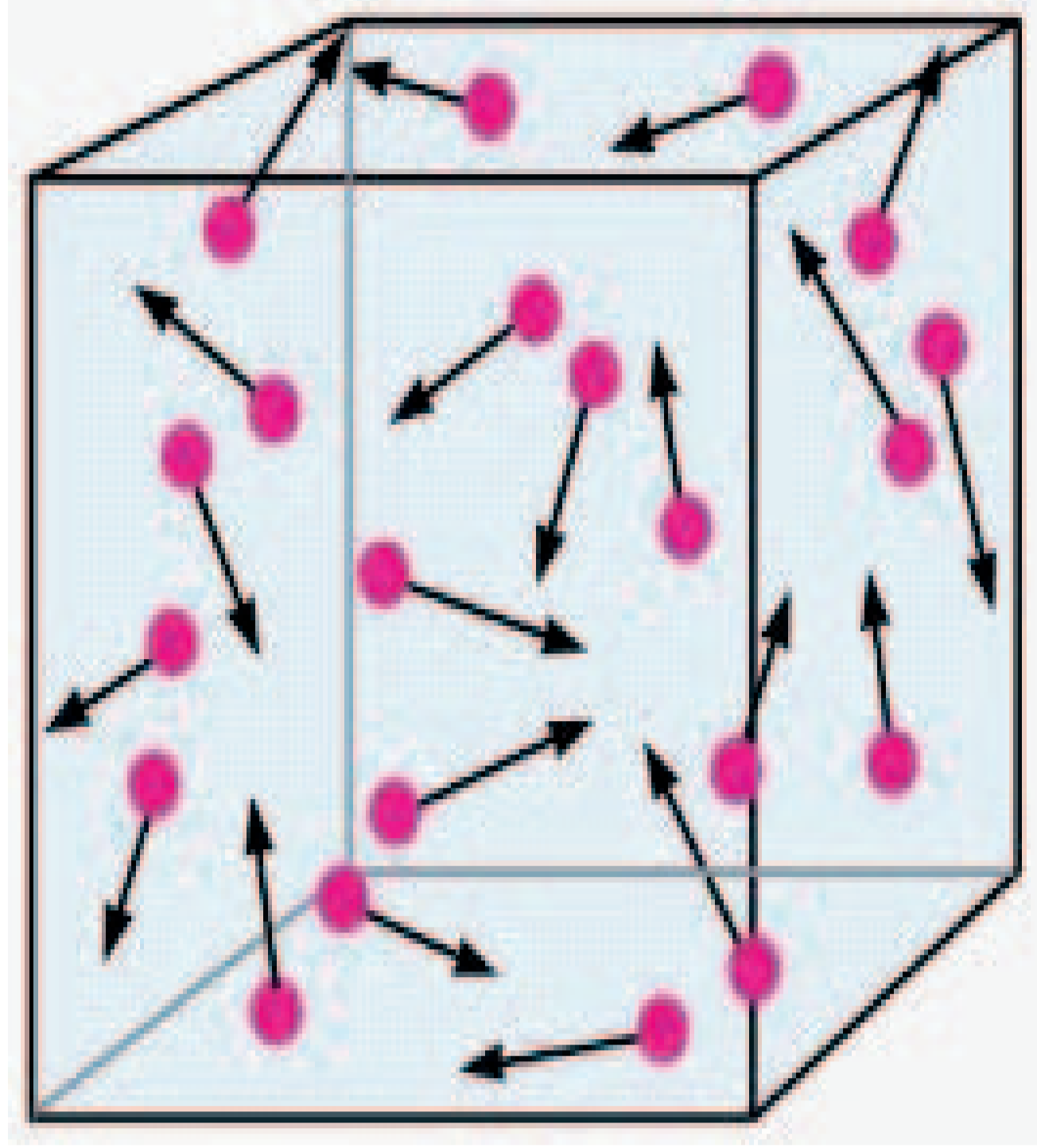


CAN PHYSICS HELP SOCIAL SCIENCES IN PREDICTION OF COMPLEX COLLECTIVE PHENOMENA?

Czeslaw Mesjasz
Cracow University of Economics
Cracow, Poland
mesjaszc@uek.krakow.pl



COMMON ERRORS IN PREDICTION OF SOCIAL PHENOMENA

Physicalist approach

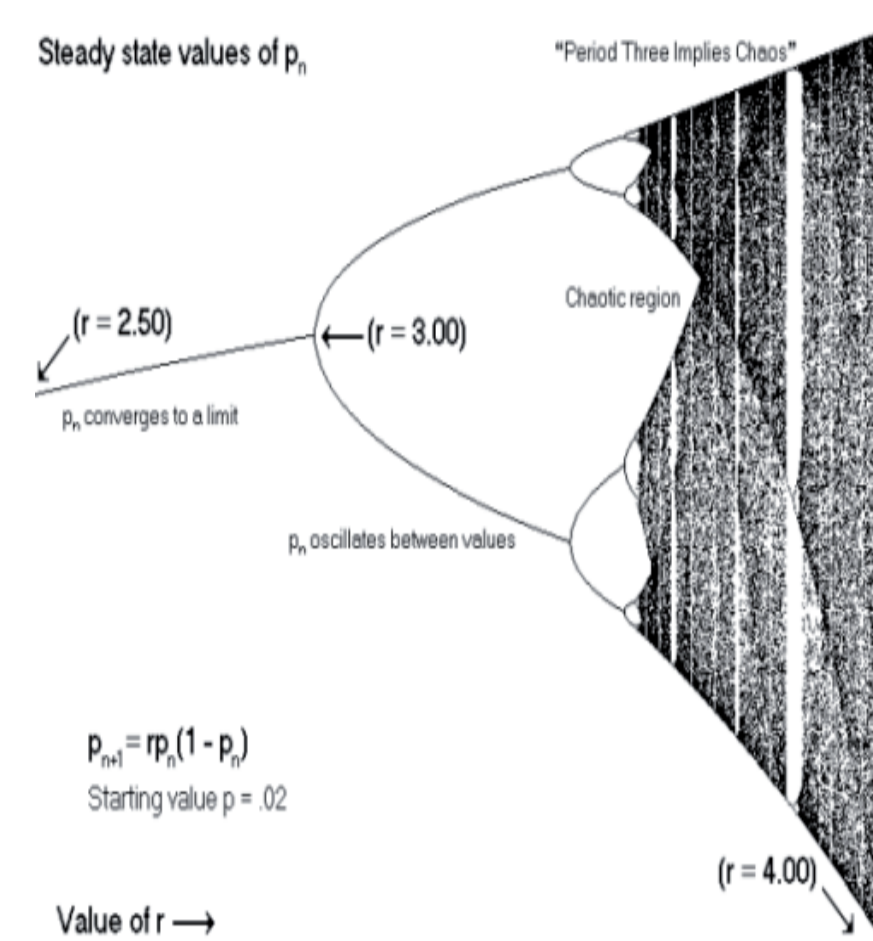
Social systems are but slightly more "complex" physical phenomena

Social science narratives

Social systems can be studied with analogies and metaphors supported with mathematical models



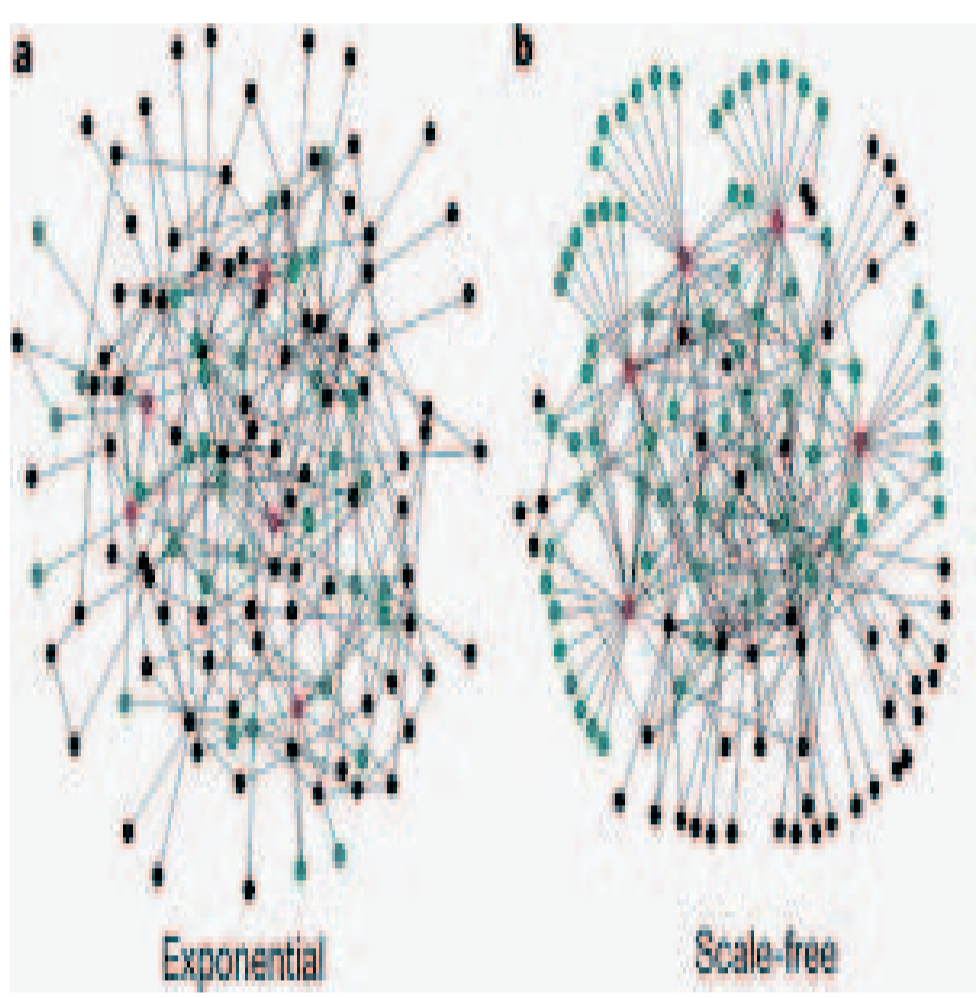
AN EXAMPLE - CHAOS



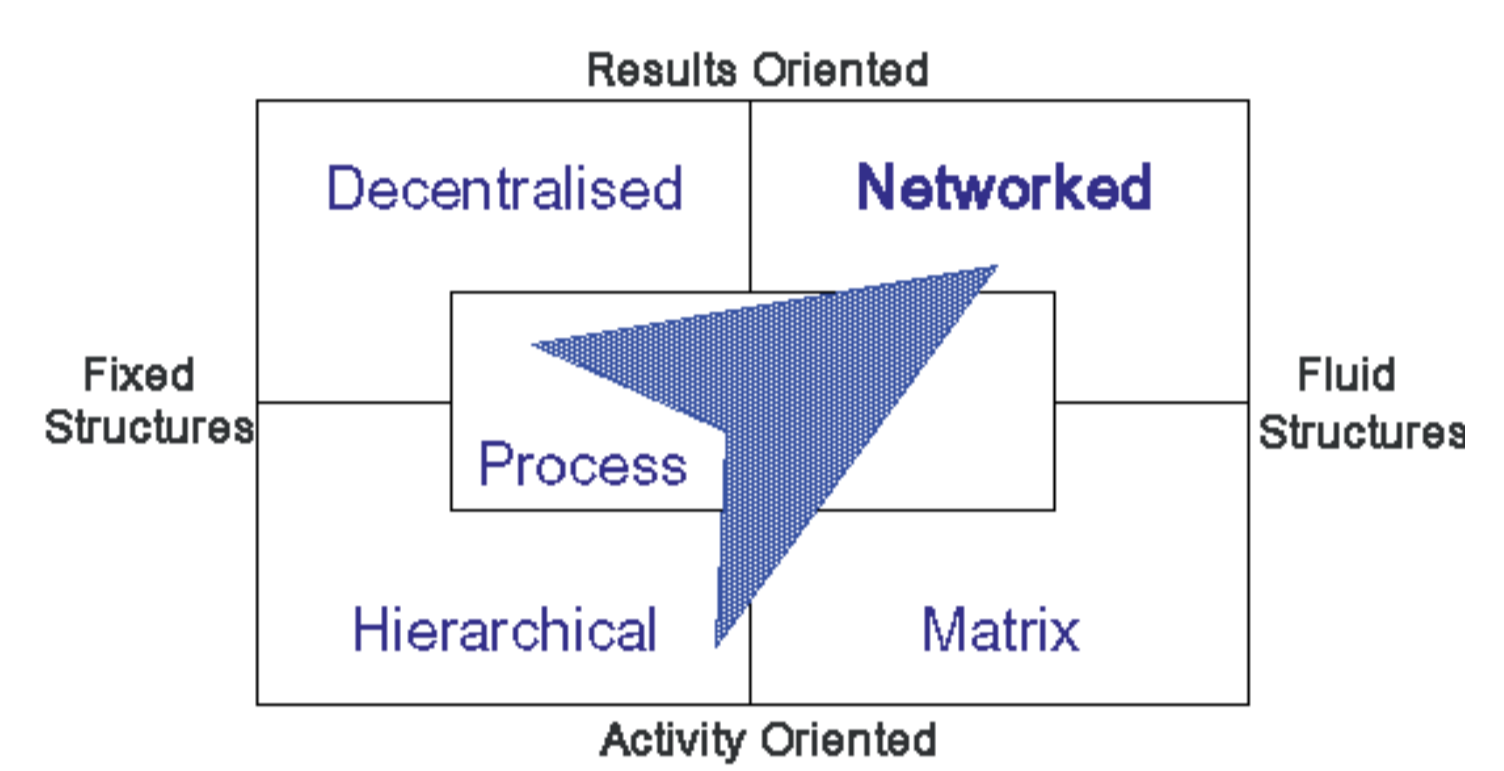
Source: <http://pwnage.tv/articles.php?id=159>

WHAT ABOUT THE "CENTRAL METAPHOR" – PHENOMENOLOGY

Firstly mathematical concepts, then search for real phenomenon
Metaphor as a foundation for building mathematical models
 Ludwig von Mises – praxeology – human action:
validity of mathematization vs. validity of verbal description



Change to Organisational Structure



Physical tangible collectivities can be reduced to interacting particles creating various types of networks

(Dyadic interactions, multiple interactions and systemic properties)

"Hard complexity"

PREDICTION IN PHYSICS

- System identification** (parameters, control parameters, measurement, limited negotiation of meaning)
- Data collection** (measurement, interpretation, precision, disturbances)
- Model dynamics** (linearity, non-linearity)

Physicalisation of objects of study in the process of **negotiation of meaning** (limited discrepancy of interpretations)

Entropy, energy, rare events, chaos, edge of chaos, self-organized criticality, power law

BARRIERS OF PREDICTION

Epistemological limits:

- Limits deriving from systems complexity and non-linearity
- Constructivism, post-modernism and prediction
- Fundamental limits of mathematical models, which in some cases, e.g. non-linearity and indeterminism, computational complexity, computational (algorithmic intractability) can be treated as an ontological limit, i.e. it's not only limited cognition but existence of such entities, subjectivity of definitions of risk/threat/hazard, etc.
- Subjectivity of definitions of risk/threat/hazard, etc.
- Process of identification and communication of uncertainty and risk
- Inherent cognitive limits of observer – limited physiological capability to identify and process variables (information) depicting phenomenon (phenomena) under scrutiny; they are also causes of "bounded rationality" (Simon, 1997) and framing, and prospect theory (Kahneman & Tversky 1979)
- Consequences of reflexivity, self-reflexivity, multiple recursions

Socio-political limits:

- Socio-political consequences of complexity of social systems
- Socio-political influence (external pressure, conformism, political correctness)
- Socio-cultural factors – culturally-determined interpretations of risk, cultural bias in prediction and anticipation
- Inherent limits of subjectivity and intersubjectivity exposed in post-modernist and constructivist approaches, e.g. definitions of meaning, deficiencies in transfer (negotiation) of meaning
- Uneven access to information (asymmetry of information)

PREDICTION OF CONTEMPORARY SOCIAL PHENOMENA

Most of prediction barriers of social phenomena are already well-known

What is new in modern society?

Detachment of social activities from physical base – knowledge based economy, intangible assets, intellectual capital

New metaphors ("buzzwords") – complexity, "risk society", radical uncertainty

Increased role of multiple reflexivity, self-reflexivity and recursions, e.g. financial derivatives

A new role of physics in prediction of social phenomena

- Demand for sophisticated modeling with better quality data – a "traditional claim"
- A new demand – better understanding of self-reflexive society with multi-level recursions and self-reflexivity
- Deepened understanding of non-metaphorical ("metaphorless") utterances – information, knowledge, intellectual capital, derivative instruments.
- Deepened understanding of individual cognition and its role in emergence social phenomena at physical level and at collective cognitive levels