

Complexity and the Real World

The Complexity Turn: a Pragmatic Perspective

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1. The importance of ontology; the development of the evolutionary complexity perspective
2. The ontology of evolutionary complexity theory
3. Differing methodological approaches to complexity
4. Complexity and issues of social research
5. Complexity and issues of management

1. The development of the complexity worldview



The importance of the ontological images we hold

Early ontological images

Upon those that step into the same rivers different and different waters flow...They scatter and ...gather...come together...and flow away...approach and depart
Heraclitus

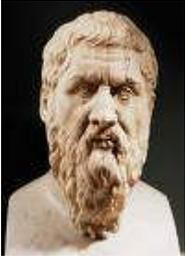
These rivers flow....they arise from the sea and flow into the sea....these rivers, while they are in the sea, do not know 'I am this river' or 'I am that river'.
Chandogya Upanishads

Dao de Jing

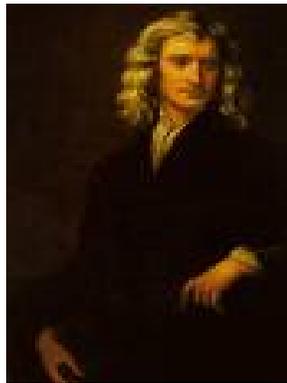
*Within the rhythms of life, the swinging gateway opens and novelty emerges spontaneously to revitalise the world
.....whatever is most enduring is ultimately overtaken
in the ceaseless transformation of things*

Flow, emergent patterning, contingency, windows for change

Then the mechanical worldview



Plato- ideal forms;
Creator;
messiness something
to overcome in the
strive for perfection

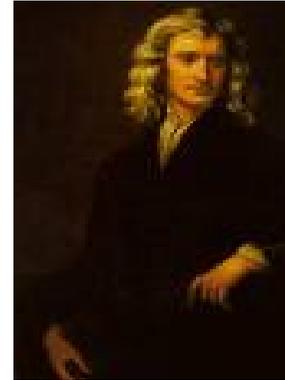


Newton



So, mechanical science paints a picture of a
rational, predictable, unchanging universe

Newton and Leibniz – the issue of contingency



N: 'There exists absolute space and time – a time zero and a centre of the universe; God set off the clockwork universe'.



L: 'Why would God choose a particular moment to start it off, rather than an hour later or earlier?'

N: 'Because he chooses to.'

L: 'What about the detailed structure of the universe? How do you explain that?'

Newton had no way of explaining the particularity of the structure of the universe

The uptake of Newton's mechanical universe as a worldview



Voltaire/Marquise de Chatelet
and the French Enlightenment
(*Elements of the philosophy of Newton*
1736)

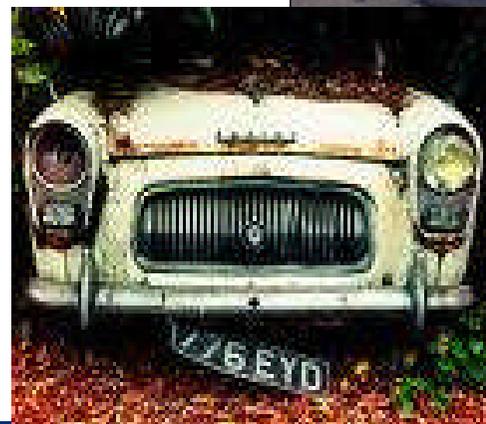
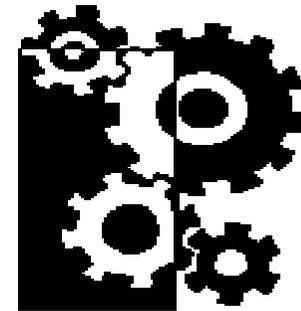


The mechanical worldview – of determinism, reductionism -
leads to the potential for design, control, prediction, measurement.
It has dominated ideas of what is professional, what is scientific.

It appeals to the dominant psychological preference for systematic process.

But traditional science indeed has two images;
which should we pick/are relevant for social or human systems?

- **Newtonian**, mechanical science – everything moves in a predictable fashion, carries along its allotted path
- Equilibrium thermodynamics, **entropy**, - in the end everything dies and turns to dust



The equilibrium worldview

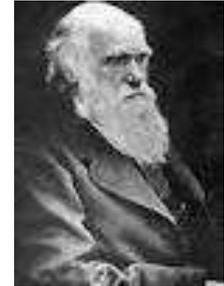
- Most situations are near equilibrium
- Near equilibrium we can predict what will happen next as things tend to move back to equilibrium
- Harmony and balance are part of 'natural law'

This pure theory of economics is a science which resembles the
physico-mathematical sciences in every respect
Walras 1874

What matters to Walras is not the methodological fit but rather the method itself..
Instead of being led by ontological inquiry he defines a priori the ontology to fit the method.
Fullbrook 2008

It does not make it science just because scientific methods and theories are adopted

And then there was the theory of evolution



Darwin 1859

variation followed by selection;
emergence of new form within an ecological/systemic context
the future emerges, cannot be known in advance

Note: this seems to be the first time that 'messiness'/variety has been viewed as generative

Prigogine posed the question:
'Why, if physics, in the form of the second law of thermodynamics proposes that matter and form degrade into structure-less dust, does life
'mount the incline that matter descends''
(Bergson 1907)



Prigogine gave an answer to Bergson's question in 1947.
He pointed out that for open systems, entropy
can decrease and order/patterns emerge

Evolutionary theory inspired physicists to see how to connect entropy, dynamics and emergence of order.

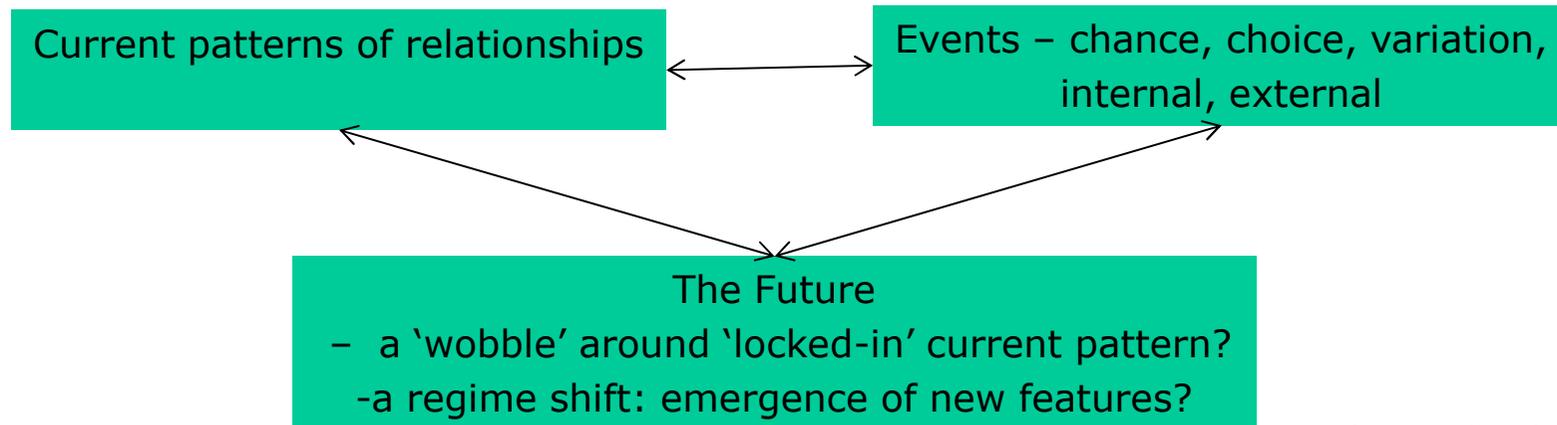
The key was the recognition that most situations of interest are **open** to their surroundings.

This was the start of the **science of complexity**

2. The ontology of evolutionary complexity theory

'[Complexity] begins to throw light on the basic difference thought to exist between 'science' and 'history'. In the former, explanation was believed to be traceable to the working of eternal, natural laws, while the latter provided explanation on the basis of 'events'. In this perspective of self-organising systems we see that both aspects are present and that such systems are not described adequately by either 'laws' (their internal dynamics) or events (fluctuations) but by their interplay.'

Allen (1997)



(Second order effects
Attractor basins)

The nature of a complex world; a focus on ontology

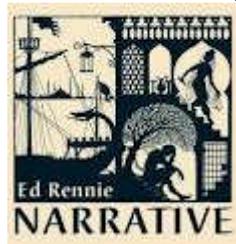
- Systemic, multi-level
- Synergistic
- Contingent, path dependent
- Particular – every situation is different
- Emergent – there is more than one future
- The future does not in general unfold smoothly, but is episodic. Sometimes 'locked-in' (whatever you do nothing much changes; things are fairly predictable, features don't change much); sometimes wobbles; sometimes unstable (change is radical, new features emerge, there is a 'tip' into a new regime)
- At least to some degree, what is happening and what is significant is a matter of opinion¹
 1. An emperor wishes to have a perfectly accurate map of the empire made. The project lead the country to ruin – the entire population devotes all its energy to cartography
(Lyotard 1979:55)

Research methodology



'reality'

Various approximations, simplifications and omissions



Knowledge
Processes
Patterns



Modelling



Thinking

3. Differing methodological approaches to complexity

- Realist; the world can be understood as 'things' connected by 'forces'
 - At the positivist end of realism: non-linear deterministic equations – either systems dynamics (what will most probably happen) or through finding stationary solutions.
 - At the contingent end of realism: Master equation, agent-based modelling

- Complexity as metaphor

Some (worrying) examples:

'It would work to establish a vectored field of emergent values and convergent objectives within which synergistic emergence of autopoiesis would be constrained.'

'It would catalyse the rapid viral spread of replicating multi-scalar cellular networks with maximum connectivity and optimum interactivity.'

'Leadership and organisations are fractal'

'Organisations are more creative at the edge of chaos'

'Sensitivity to initial conditions'

'Self-organised teams are 'good' as the 'right' things will emerge'

- Towards a post-modern complexity science? (Cilliers, Byrne, Shrayne et al)
 - When is it better to consider fewer situations richly; when is a more generalised 'statistically significant' view appropriate?
 - Pluralist
 - Narrative real-time methods
 - Systemic, contextual, follow over time
 - Macro and micro
 - Qualitative and quantitative
 - Symbols, the imagination, beliefs, emotions

4. Complexity and social research

Case-based narratives

View things over time

Context, historical

Macro and micro

Systemic

Qualitative and quantitative

Multiple questions and hypotheses

Allow for emergence of new qualities not considered at outcome

Be alert to shifting regimes

It is non-trivial to draw all this together in a thought-through and replicable fashion.

Complexity and social research; an example

- Tracing the war against poverty in Ethiopia (Bevan and Dom 2011)
- Focus on village communities; stories
- Regional factors – considered systemically; climate, terrain, cooperation between villages; local government officials
- Followed situations over time – path dependent features, emergent features
- History, culture, government policy
- Multiple hypotheses

5. Approaches to management/policy framed by a complexity worldview

The Intention Phase

Wide range of stakeholders

Think systemically

Fore-sighting/scenario planning

Scan internally; build on what works

Make judgements re stable/unstable/fluctuating context

Create shared intentions

The Action Phase

Wide-ranging steering group that can regulate/make decisions

Pilot (more than one option), build out from there

View strategy as 'live'; don't put all your eggs into one basket

Plan details short-term; plan more loosely, build in contingency longer-term

Allow local variation within overall intentions

Share learning

Expect there to be unintended consequences

MBWA

Review regularly with steering group and modify approach if necessary; tackle the blockages

The Review Phase

Look for unexpected successes not just achievement of intentions

Recognise issues of timing – lags, complex causation

Capture information as things unfold not just at the end

Conclusions

- An evolutionary complexity ontology makes central the issue of contingency, the interplay between current patterns of relationships and the way 'events' may 'invade' such patterns
- Our ontological stance is a key factor in shaping behaviour and thus surfacing and exploring worldviews is an important approach to facilitating change
- All methodologies reduce the amount of information in order to contain the problem; being aware of the nature and consequences of these simplifications is critical when non-linearities and 'events' mean small things can assume a dominant role in shaping the future