

Prospects for a “social physics”

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What's “different” about social science?

- Physics: makes predictions, has laws, accurate theories, etc. So too with chemistry, biology, ...
- Social science: makes few predictions, has conflicting theories, no infallible laws, etc.

Social theorists themselves voice grave concerns:

“...much sociological theory has evolved into a form of meta-theorizing without any specific empirical referents, ... much of empirical sociological research has developed into a rather shallow form of variable analysis with limited explanatory power.”

Hedstrom, *Dissecting the Social* (2005)

Other problems:

- Lack of clarity: Pierre Bourdieu defines “*Habitus*”:

“...systems of durable, transposable dispositions, structured structures predisposed to function as structuring structures, that is, as principles which generate and organize practices and representations that can be objectively adapted to their outcomes without presupposing a conscious aiming at ends or an express mastery of the operations necessary in order to attain them...”

- Excessive fascination with past figures:

Submissions to *Sociological Theory* are too often...

“...summaries of what dead people said (with no indication of why living ones should care, or how the revered ancestor's work would advance contemporary analytic projects)”

and

“criticisms of what other people have said that dead people said (with no more indication of why we should care than that those criticized are famous.”

Craig Calhoun

Why the difference?

Common view: the “hard” and “soft” sciences differ because the methods of physics don't apply to the social world

(Lieberson & Lynn, 2002)

Key issues:

1. No possibility of controlled experiments
2. Perverse influence of historical accident (Cleopatra's Nose problem)

BUT...

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BUT... similar problems affect other historical sciences, evolutionary biology, geology, meteorology, etc., and they do all right ...

so what's the real difference?

Maybe, people are “special”?

- We're just too complex and unpredictable; hence human science has to be different from the rest of science.
- We're rational, thinking organisms, hence any understanding has to be based on a deep theory of mental processes; human science stands a world apart from the rest of science, and there's a rift in nature.

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Is this correct? McIntyre in *Dark Ages* suggests that this conviction rests more on emotional need than on evidence:

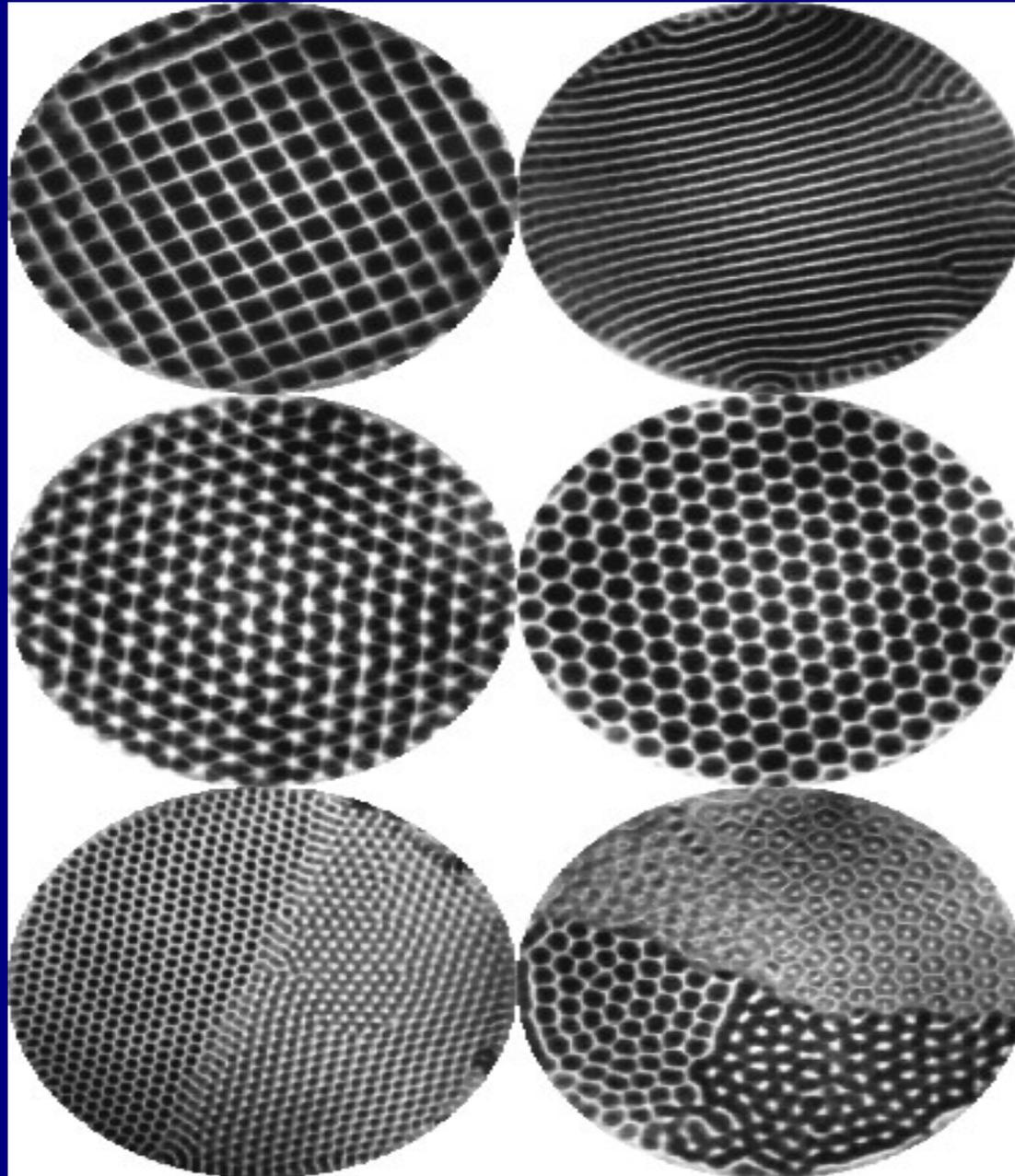
“The threat it seems is one to human freedom and autonomy – the notion that we're special in the universe. It is taken to be an insult to human dignity that one can study our behavior with the same methodology one uses to study all the other matter in the universe.”

Another point of view:

It is an unsupported leap to conclude that human science is difficult because it involves complicated human beings. This unthinkingly attributes complex collective outcomes to the complexity of individual parts. Yet the causation may lie elsewhere.

Even if people were simple, social science might still be very hard.

What about... patterns in sand?



But what about... stone circles?



Perhaps **individual** complexity
is not the problem!

Social physics recognizes that:

- Social complexity often stems from patterns, not people
- We often incorrectly attribute social complexity to individual psychological complexity
- The real problem in social science is to understand collective complexity (even though people are indeed often complicated)

The goal: to understand the parts, at least crudely, and to probe the key collective patterns (recognizing the two-way flow of causation).

This naturally moves towards *mechanism based* explanations (Hedstrom).

What
about
wobbling
bridges?



Some success stories

- Persistence of segregation (Schelling 1971)
Races may separate for benign reasons,
even without racism
- Financial markets/minority game (Johnson et al., 2006)
Explains market fluctuations in natural, endogenous terms
- Firm Growth (Axtell 2005)
Explains firm size distribution and lifetime patterns
- Fashion/imitation (Michard & Bouchaud 2005)
Explains discontinuities in social change and
“fragility” of social outcomes

All make assumptions that are simple, but not too simple,
and preserve the core logic of the phenomenon

Is this really “physics”?

- Physics (condensed matter) can be viewed as a fundamental study of order and its origins.
- The Ising model is the “first” and simplest agent-based model; common physics models inhabit the simpler end of a rich world of more complex models yet to be explored.
- Important point – universality (in critical phenomena and elsewhere) gives reason to think that crude models can be valuable; we can at least have hope that simple models might work

Models should be as simple as possible, but not simpler

So is there a social physics?

- Yes, clearly, though a little disorganized and lacking foundations (which is okay for now)
- But the term “social physics” may be counter-productive

What's next?

1. Learn more about what people are like
(experimental economics, social psych, etc).
2. Exploit new ways to collect data (sensors, WWW, etc.)
3. Begin to understand human universals: ethnicity, diversity, social norms, trust, language, government, etc.

Moving beyond “naïve” greed

Numerous experiments show that:

- Many people across cultures act altruistically (Fehr et al.)
- Nowhere do they fit the model of pure self-regard (except in academic economics)
- Culture and history matter and create variation; socialization has lasting influence (Henrich 2007)

Moving beyond naïve rationality

Suppose a bat and ball together cost \$1.10, and the bat costs \$1 more than the ball.

How much is the ball?

Right answer: 5 cents

Roughly 50% of university students at Michigan and Princeton gave the wrong answer (Frederick).

- Experiments show that:

Many of our actions are more or less automatic or mechanical (Kahneman). We seem to have two mental systems:

1. Instinctual, fast and effortless, but prone to error
2. Based on reason, but slow and requiring effort (mostly acts as a censor of the first system)

- Experiments also show that we rationalize as much as we reason (Bargh, Dijsterhuis, Pentland)

Where is social science going?

Answer: from *Homo economicus* to *Homo sapiens* (Thaler 2002)

Agents in future economic and sociological models will:

- Lose IQ
- Become adaptive learners
- Reflect heterogeneous reality
- Reflect more realistic biology/psychology; they'll act on emotions as well as thoughts

“Homo economicus will evolve into Homo sapiens”

New ways to get data

- ● Compact electronic sensors can gather data passively from the individuals making up an organization (Pentland 2006)
- The data shows strong regularities (eigenvectors) in collective behaviour
- With new technology, we can begin studying people more objectively, much as biologists do other species.

Key future aim: explaining human universals

- ● Humans globally exhibit many strong collective universals, such as ethnicity, ethnocentrism and social norms (Brown)

Many of these may be emergent patterns, driven by natural social instabilities; can social physics explain these? The conditions under which they arise? Their stability? Function?

- Can it explain reduced trust in high diversity communities? (Putnam 2007)
- Can it explain political polarization? (Sunstein 2007)

Conclusions

- The modeling approach of physics turns out to be not only about physics; agent based modeling is the continuation of this exploration.
- It's most important contribution is to probe how collective complexity contributes to social life in many ways we currently do not see
- It will make prediction possible, though possibly not the kinds of predictions people seek most
- Perhaps the biggest key is to defeat the prejudice that sets us apart from nature, i.e. to complete the Copernican Revolution