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# THE COMPLEXITY PERSPECTIVE AND *WHY DYNAMIC PATTERNS ARE IMPORTANT*

## ADVANCING CASE-BASED METHODS...

For more on my work: <http://www.art-sciencefactory.com/briancastellani.html>

For more on the COMPLEX-IT App we developed for employing computational modeling to do case-based methods: <http://www.art-sciencefactory.com/complexit.html>

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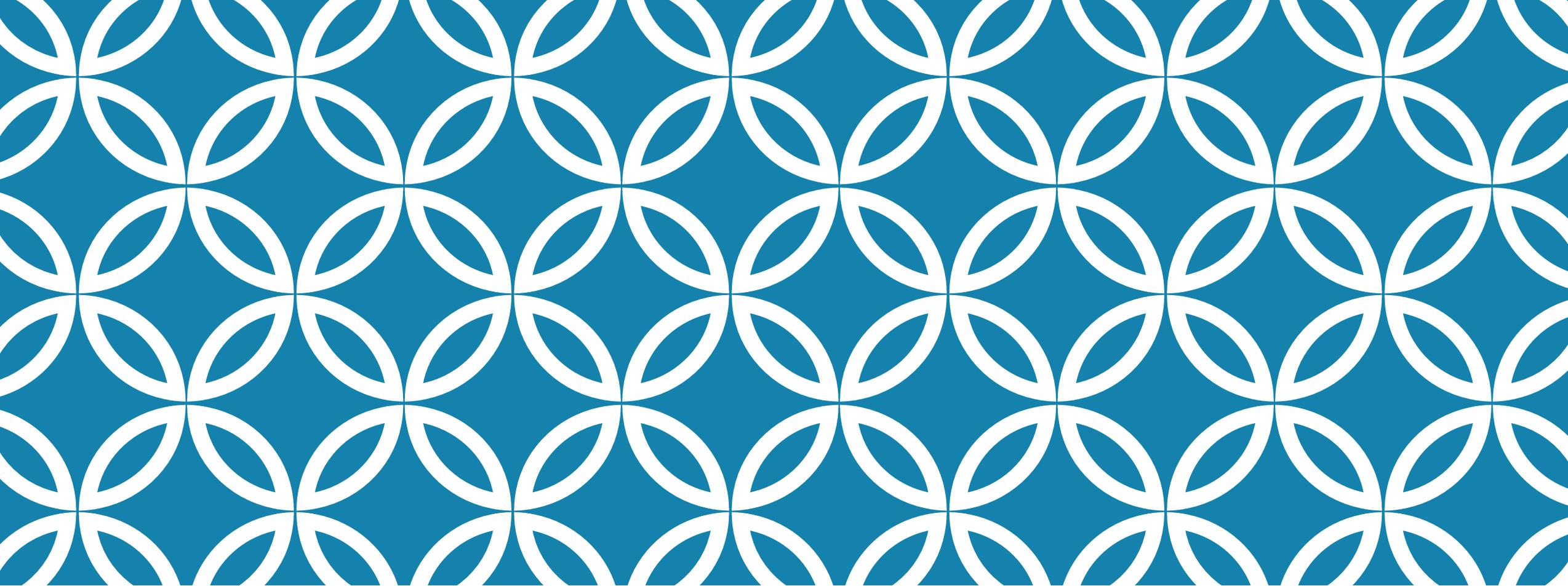


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*THANK YOU FOR THE OPPORTUNITY TO PRESENT!*

I want to begin by thanking the ESRC for their financial support to attend today's meeting; and to Phil Haynes for the opportunity to participate in this session.





# TENTATIVE ASSERTIONS



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# ASSERTION 1:

Conventional statistics are significantly limited in their capacity to study social dynamics, let alone complex global-temporal dynamics.

- Part of the problem is the static nature of these methods.
- The other is their focus on aggregates (bell shaped) distributions; rather than different and multiple trends.
- And their failure to study cases and their respective profile – which is the stuff of our globalized, digitally saturated, big data world.

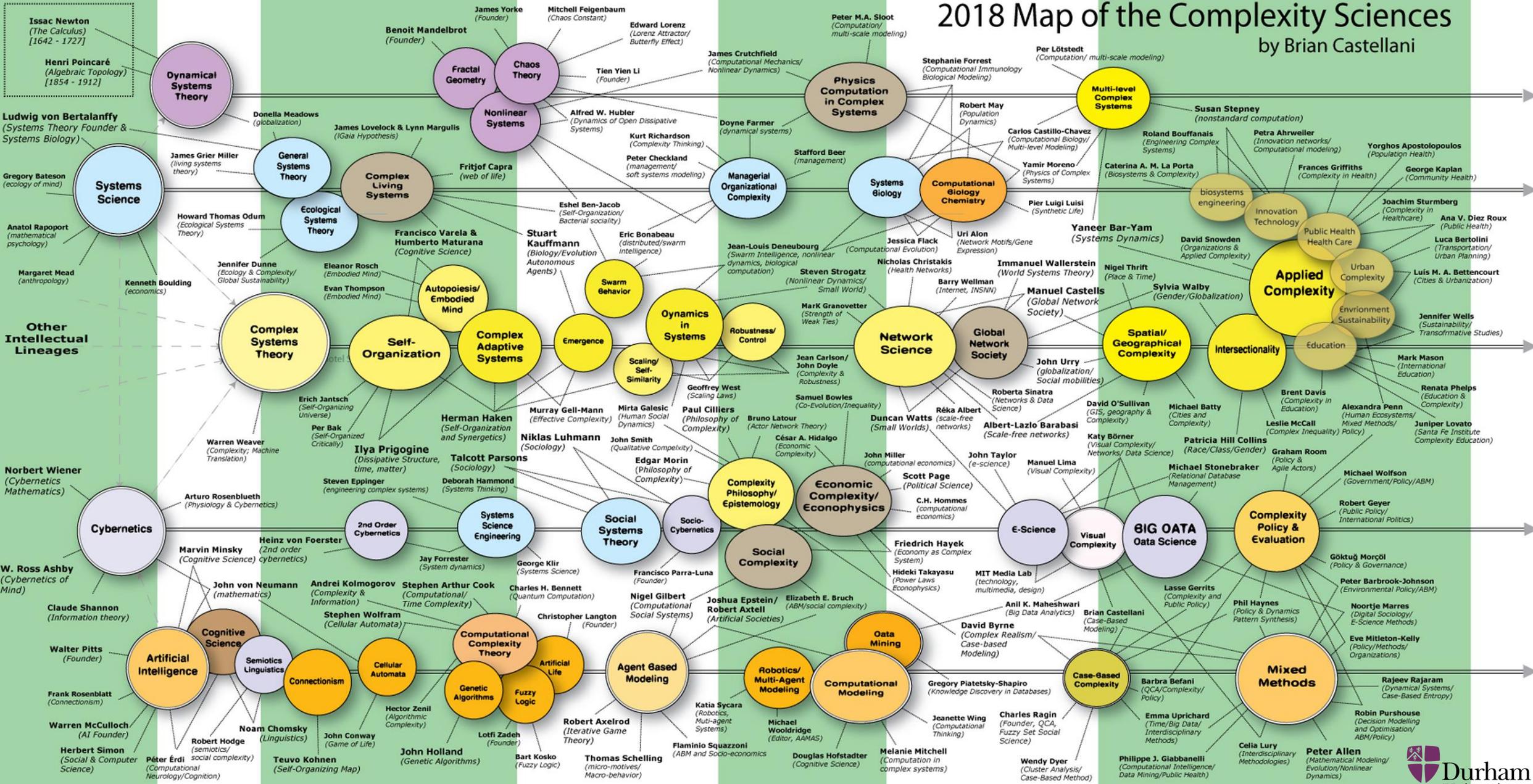
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## ASSERTION 2:

- The methods of computational modeling and complex system offer useful solutions to these problems.
- In particular, one of the most useful methods is case-based complexity, as linked with complex realism and Ragin's qualitative comparative analysis.
- Albeit only if one approaches them critically, as not all methods are equally useful for modeling and data mining social complexity -- which is one of the major points of Byrne and Callaghan 2013.

# 2018 Map of the Complexity Sciences

by Brian Castellani



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## ASSERTION 3:

- *However, there are several limitations to the case-based approach, as developed by Ragin and colleagues, that require address, as this methodology – which has multiple approaches -- has several important limitations.*
- **But, then again, all methods have limits. As such, my assertions from here forward are not criticisms at all! Instead, they are critical reflections on new aspects into which we can advance.**
- **As with Foucault, I have no interest in polemics!**

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## ASSERTION 4:

- To begin, my sense of things is that, other than the work Byrne and colleagues on integrating case-based methods with complexity (in particular, complex realism), the larger field of QCA and case-based methods remains rather resistant to or uninterested in complexity theory or the complexity sciences.
- Perhaps I am wrong on this, but there also seems to be a core group that – similar to the politics surrounding grounded theory methods – assumes there is a correct way to do case-based methods.

# ASSERTION 5:

- Other than the work of Haynes and Uprichard and a few others, it seems the majority of QCA and case-based methods have yet to develop specific tools for studying time.

**Crossing Levels: The Potential for Numerical Taxonomy and Fuzzy Set Approaches to Study Multi-Level Longitudinal Change**

Emma Uprichard

**Time-series QCA: Studying temporal change through Boolean analysis**

Airo Hino

- Also, many of the most sophisticated methods for studying global-temporal dynamics, as in the case of agent-based modeling and network analysis and differential equation modeling, remain ignored as potential mixed-methods strategies.

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## ASSERTION 5:

- Despite this lack of development, the importance of time has been part of the case-based methods tradition from the beginning.
- For example, in Ragin and Becker's famous "*What is a Case? Exploring the Foundations of Social Inquiry*," Andrew Abbott stated that, "when one thinks of cases doing things, one is studying agents."
- As such, there is significant precedent to pursue these ideas further.

# SACS TOOLKIT

The SACS Toolkit was created to integrate the latest developments in computational modeling and data mining techniques to engage in case-based methodological analysis of dynamics

The purpose of the SACS Toolkit is to model multiple trajectories (particularly across time/space) in the form of major and minor trends; which it then visually and statistically data mines for both key global-temporal dynamics and unique network-based relationships.

The SACS Toolkit also data mines its results to either (a) predict novel cases or trends or (b) simulate different case-based scenarios.

For an in-depth overview of the SACS Toolkit, including its mathematical foundation, go to <http://www.personal.kent.edu/~bcastel3/>

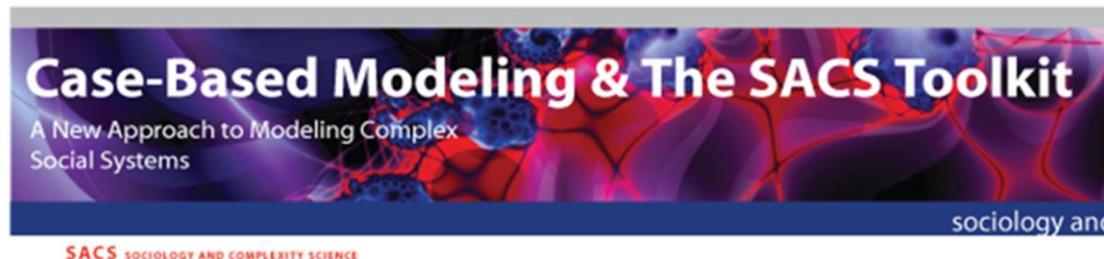
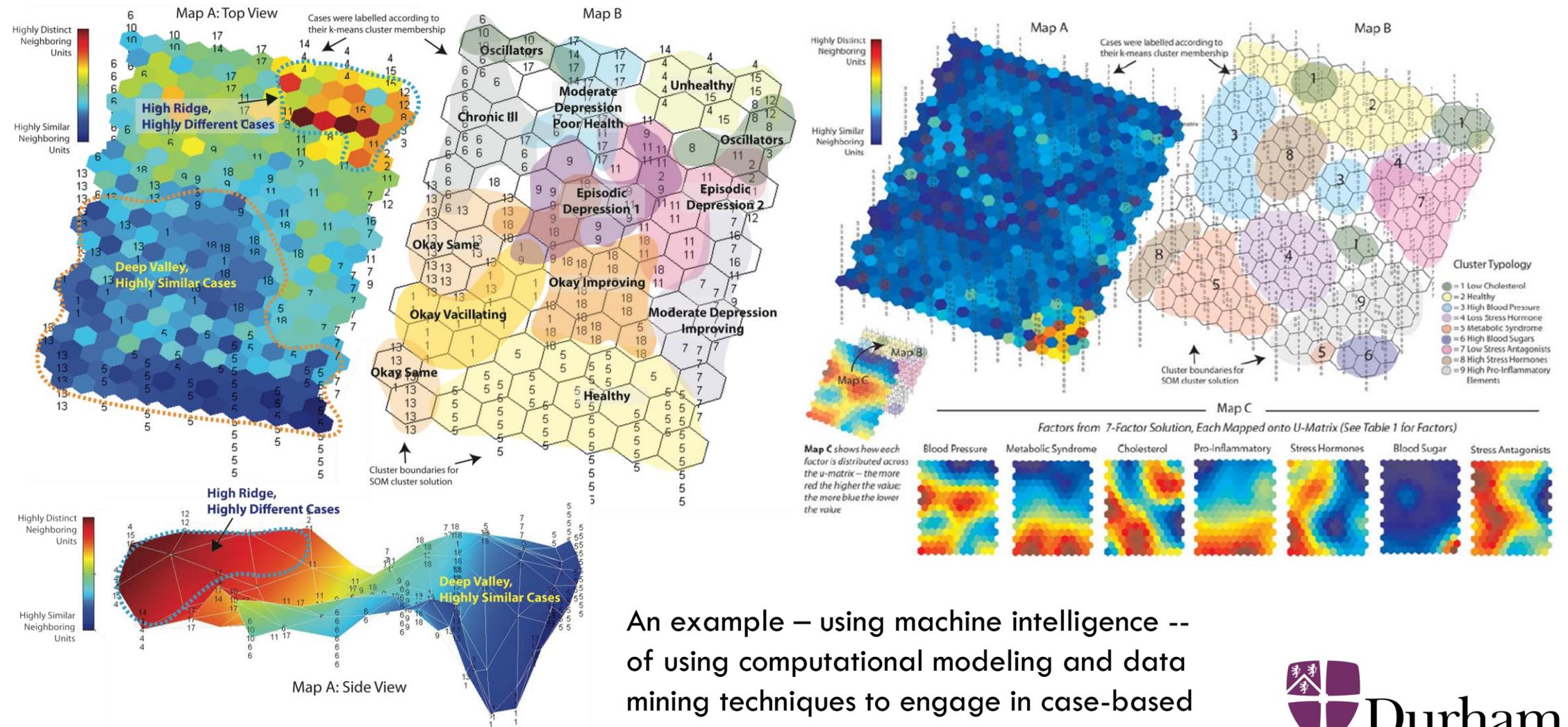
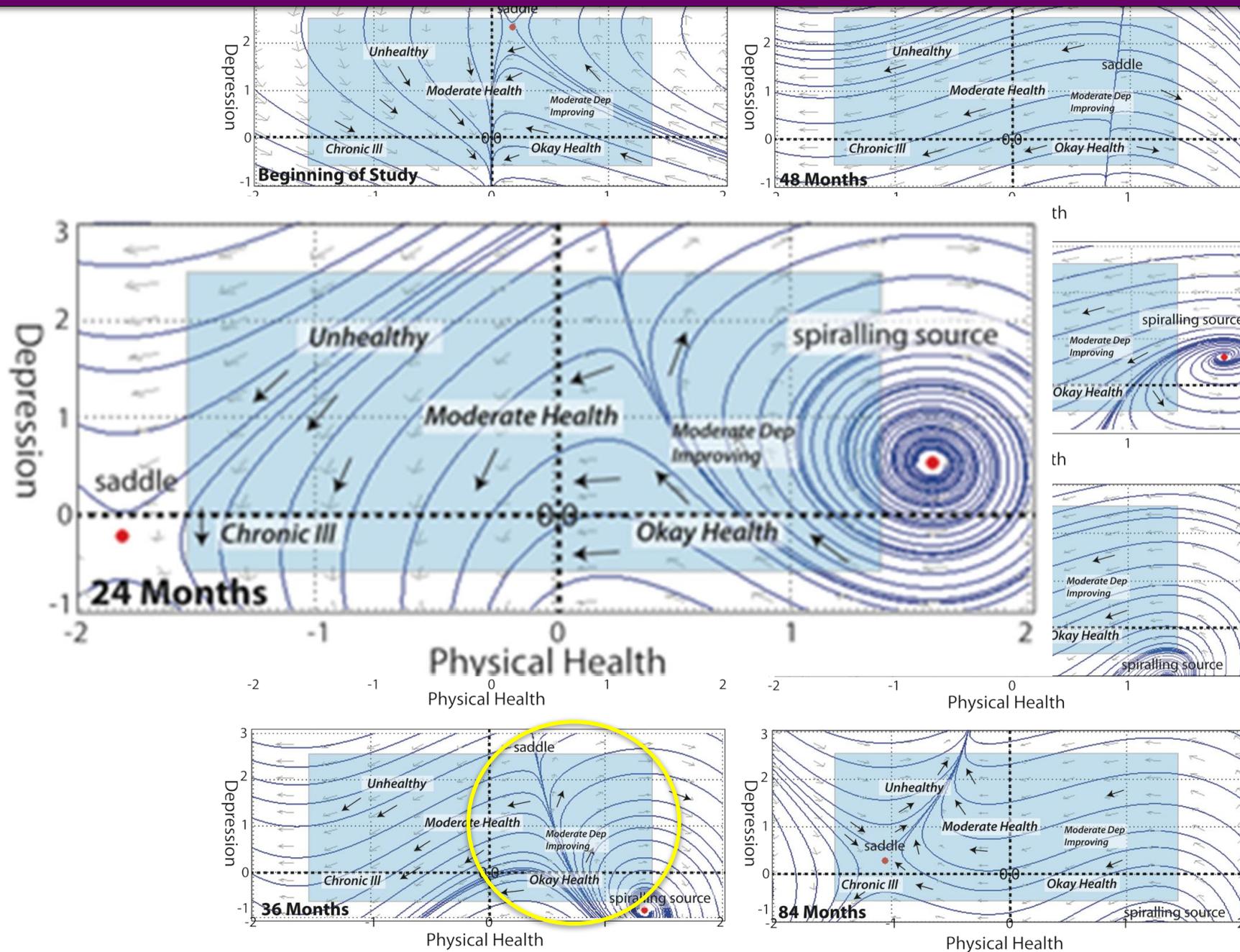


Figure 2: Self-Organizing Topographical Map of Eleven Major and Minor Trends



An example – using machine intelligence -- of using computational modeling and data mining techniques to engage in case-based methodological analysis of dynamics

Figure 3: Microscopic Model of Global-Temporal Dynamics



An example – using genetic algorithms and differential equations -- of using computational modeling and data mining techniques to engage in case-based methodological analysis of dynamics

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# ASSERTION 7:

- In the QCA and case-based methods literature, there is also very little to no study of how cases interact.
- Or, more important, how cases inter-(re)act to one another.
- As such, there is much that can be learned (again) from the fields of social networks and agent-based modeling, which explore cases in inter-action with one another and how their reactions to one another result in differences and change.

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## ASSERTION 8:

- As a result of the previous set of assertions, there is little if anything in the case-based methods or QCA literature devoted to the studying of complex global-temporal dynamics across time, beyond the analysis of individual trajectories.
- And, as a result, little if anything devoted to the processes of self-organization or emergent behavior.
- The purpose of our session is to explore some of these methods; and to have a panel discussion about how social science method can move forward in the study of complex time/space trends and global-temporal dynamics.

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# ASSERTION 9:

- To reiterate, these limitations can, however, be addressed.
- As such, the purpose of our session is to explore some of the methodological advances being made in this area.
- Then we will have a panel-based discussion about how social science method can move forward in the study of complex time/space trends and global-temporal dynamics.