The Industrial Age and Thermodynamics; the Information Age and… *What?*

Tempe Arizona, Sept 30, 2015, 8:30 am – 5:00 pm

The room comes with a laptop computer, projector, screen, microphone, and speaker. Presentations are 20min + 5 min for individual Q&A. The final interactive roundtable consists of joint reflections among all participants (3-5 min each + open discussion).

7:00-8:30am   **Breakfast organized by CCS'15**

8:35am   **Welcome and why we are here**
Jim Crutchfield: Welcome to the new millennium of information
Martin Hilbert: The information age and its conceptual challenges

9:20am   **Prediction and dynamic processes**
Sarah Marzen: New tools for dimensionality reduction in prediction
Cina Aghamohammadi: Beyond the typical set: fluctuations in intrinsic comput.

10:10am   **Networking & Coffee Break organized by CCS'15**

10:40am   **Populations Dynamics, Games & Information Theory**
Carl Bergstrom: Information transmission as the fundamental concept in biology
Marc Harper: Understanding finite population dynamics with information theory
David Wolpert: The marginal value of information in noncooperative games

12:00pm   **Networking & Lunch organized by CCS'15**

1:00pm   **Demons & the physics of life**
Dibyendu Mandal: Mawell's demon: Carnot's cycle for information engines?
Alec Boyd: Information engines: history and future prospects
Sara Walker: The information architecture of the cell

2:15pm   **Networking & Coffee Break organized by CCS'15**

2:40pm   **New Horizons**
Pierre-Andre Noel: Mind the information flow: …on cycle-rich random graphs
Ryan James: New horizons in information theory

3:30pm   **Interactive Roundtable with all contributors: *the Information Age and… What?***
Aghamohammadi, Bergstrom, Boyd, Harper, James, Mandal, Marzen, Noel, Walker, Wolpert. Moderated by Crutchfield and Hilbert.

Satellite Session Conference on Complex Systems '15 [ccs2015.org](ccs2015.org)

5:15 - 6:30pm Buses will be transporting guests to the dinner venues

Background:

Social change is intricately linked to technological progress, which is intricately linked to scientific understanding, which again influences how we interpret the world around us. The first steam locomotives were up and running two decades before Carnot published his thermodynamic "Reflections". After thermodynamics became a formal theory, its basic principles started to become a standard paradigm for interpretation. For example, the co-formulator of the theory of evolution, A.R. Wallace, proposed natural selection as a kind of feedback mechanism which "is exactly like that of the centrifugal governor of the steam engine". Concepts like equilibrium, transformation of work, flow of energies and resources, and a vast array of related mathematical concepts were used as guiding metaphors and formal building blocks in the creation of biological and social science theories. Currently, information and communication technologies transform our lives in a similar way. Once again, the underlying theories were discovered in parallel with the creation of those technologies, including innovations in telecommunication networks, cryptographic coding machines, computers and formal algorithms. And once again, the emerging theories have an important influence on the way we interpret the world around us. It is not surprising to hear laypeople and scientists alike suggesting that "evolution computes", "the economy processes information", "code is law", "ecosystems are communication networks", and "culture executes algorithms". Sometimes these analogies work better than other times. In order to obtain a deeper understanding, we have to go beyond mere metaphors.

This Session explores formal advancements in the application of information sciences to social and biological systems. If we live in an "information age", the related formal scientific theories must have something concrete to say about how to think about this. We called for papers that explore the explicit application of theories, concepts, and mathematical tools developed in fields like **information theory** and **computer science**. We welcome papers that explore the application of such concepts to all branches of **ecological** and **social systems**, including evolutionary ecology, economics, sociology, communication, political science, anthropology, and social psychology.

Visit our Website at: http://csc.ucdavis.edu/InfoAge_CCS_2015.html