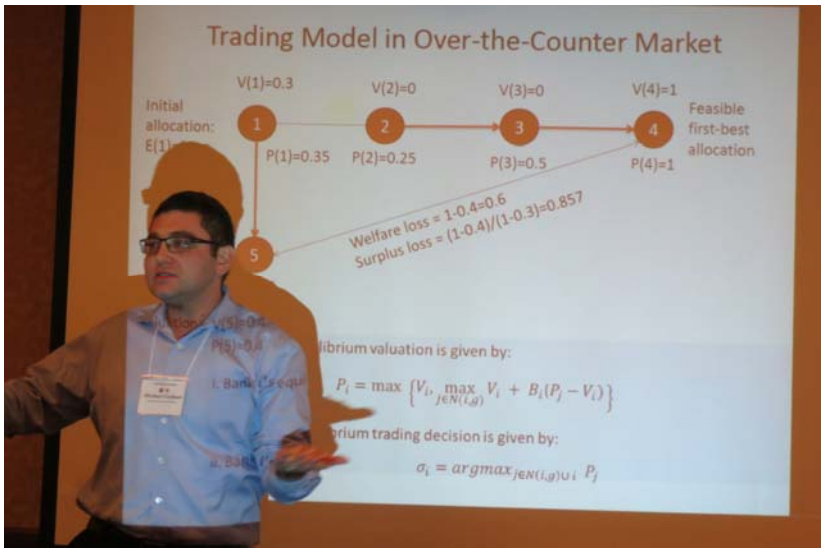
The conferees met for a long day of presentations and discussions arising from them.

The interdisciplinary nature of our institute's conferences was evident, with talks ranging from the systemic cascading risks inherent in our sophisticated system of interbank linkages, to the usually self-regulating cascades of nerve impulse propagation, to the very real chain blackouts that plague our power grid.

The researchers shared a common interest in applying the mathematics of stochastic networks for both modeling and control. For example, Andreea Minca (Cornell) provided a model that would be useful to the centralized derivatives clearinghouses envisioned within the landmark Dodd-Frank regulatory law. The model helps estimate the probability distribution of direct and (cascade-induced) indirect losses that the clearinghouses must survive, permitting their managers and regulators to design cost effective safeguards against their failure. Using the model, Minca can investigate the tradeoff between lowering the probability of failure and increased costly capital requirements. One could also envision ex-post assessment of fees to cover losses, a policy that her model does not favor. A related presentation developed the endogenous nature of the interbank loan linkages (i.e. the banks seek relationships which appear most profitable to them). Model developer Michael Gofman (Wisconsin) calibrated this model to data gathered from overnight interbank lending of Federal Funds.



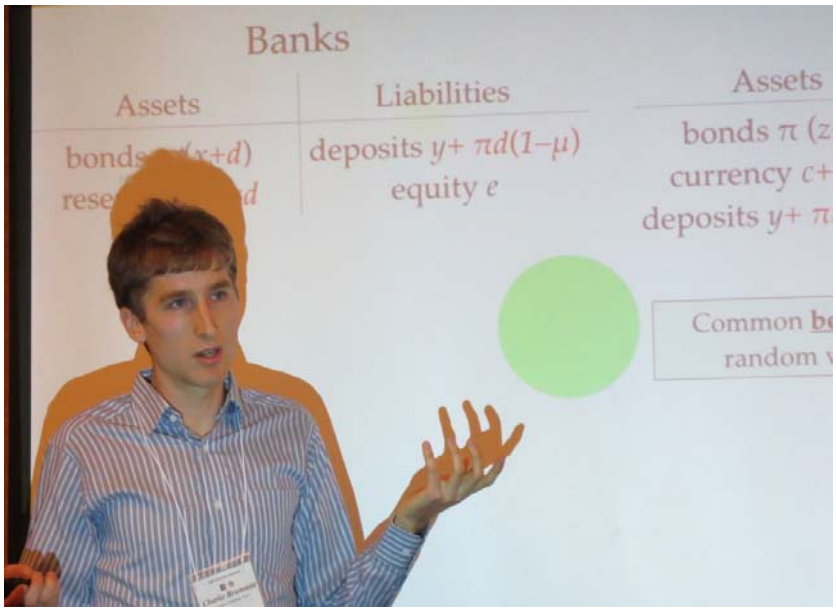
Prof. Gofman Predicting Who Links (i.e. Deals) With Whom

Longer term loan relationships were studied by Camelia Minoiu (IMF), who documented the web of interbank liabilities created by international loan syndications.

Camelia Minoiu Relates Crisis Failure Risk to Bank ROA

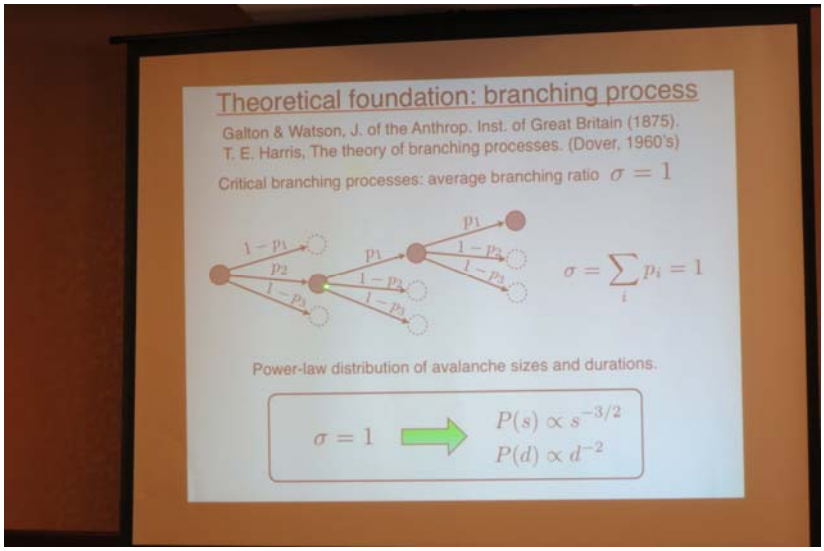
She found that bank performance is indeed related to the relative exposures those banks have to other banks operating in crisis-prone markets, but that indirect exposures to third-party banks was (fortunately!) not a very large threat to their bottom lines.

The possibility of catastrophic switching between stable and catastrophic equilibria was raised by Charlie Brummitt (UC Davis), via an elegantly simple mechanism dependent on bank deposit creation induced by our fractional reserve system.



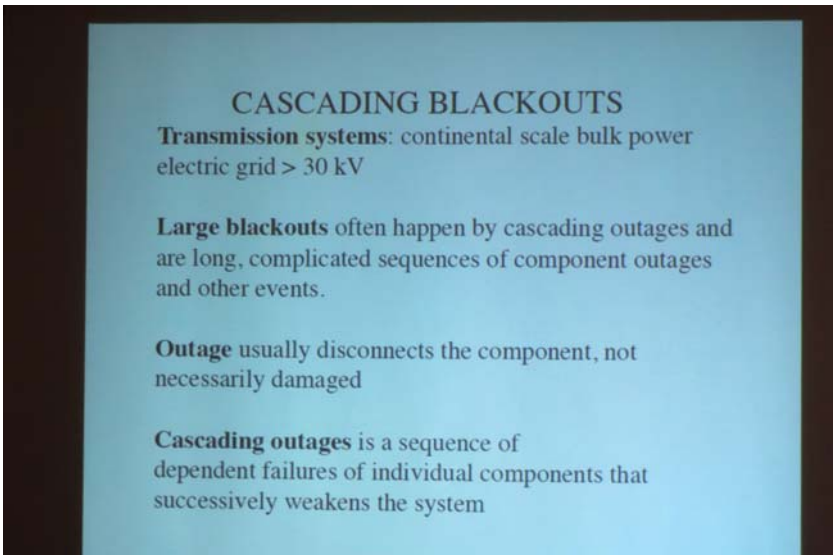
Brummitt Banking On Instability

Biological and engineering applications occupied the conference's afternoon sessions, with dual objectives of both advancing those scientific endeavors, while exposing the financial regulatory researchers to analytic and simulation methods that will prove useful in advancing their own work



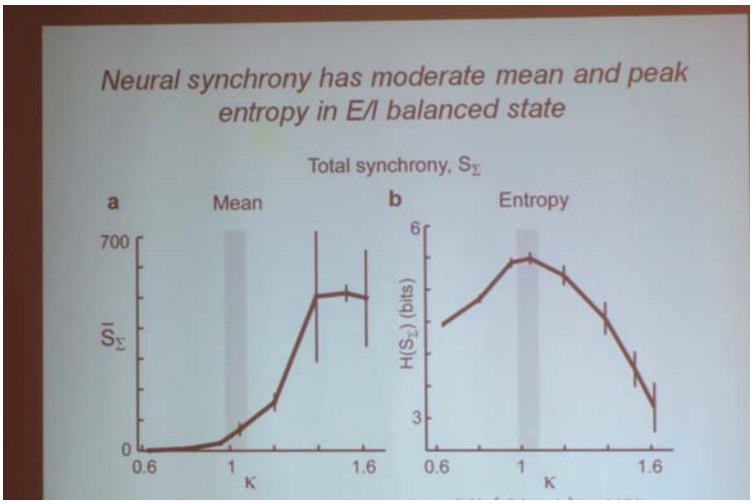
Branching Processes Generate Networks With Power Law Cascades

Perhaps the most transparent results were provided by Prof. Ian Dobson (Iowa State), who devised a parsimoniously parametrized model to estimate the probabilities that a power grid will suffer cascading failures of various lengths. The estimation only required a relatively small amount of (proprietary) historical failure data gathered by power companies for their own use.



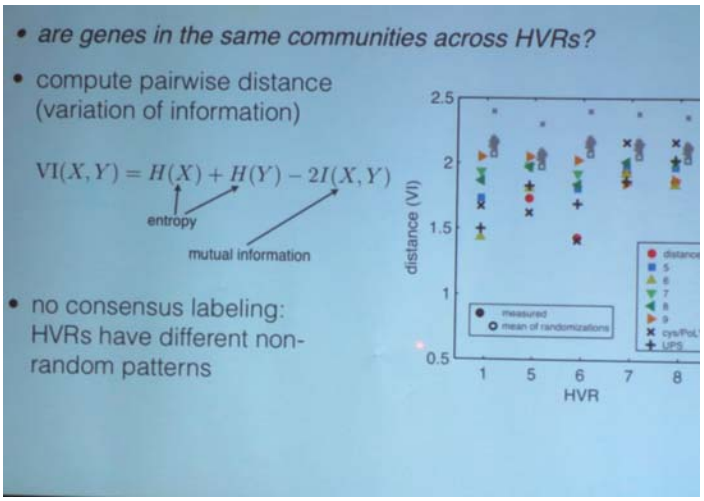
Rolling Blackouts Are More Complex Than Rolling Thunder

A hallmark of Info-Metrics conferences is the application of information theoretic statistical methods, so it is not surprising that Hongdian Yang (Johns Hopkins Medical School) was invited. He wrote a dissertation chronicling novel information-theoretic interpretations of the propagation of neuronal activity measured both in cell cultures and live animals. Apparently self-induced, transient "bursts" of neuronal activity occur, which can be either elevated or attenuated by the release of chemical stimulators or inhibitors.



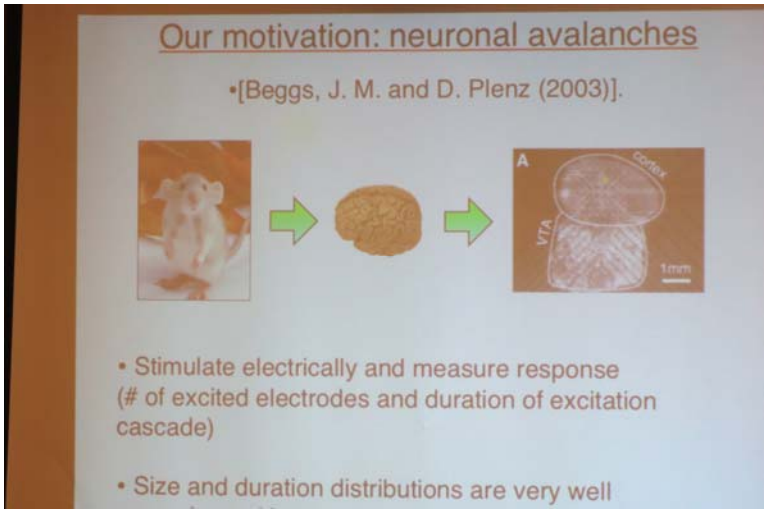
Entropy is Maximized When Stimulation/Inhibition is Balanced

Yang defined a coarse-grained entropy measure to characterize the distributions arising from his experiments, and discovered that the entropy was maximal when excitation was roughly equal to inhibition. The finding was robust across experimental models and variations in the protocols.



Prof. Clauset computes Joint Entropy - Mutual Info.

The complex interactions among genes within living organisms is well-suited to statistical models and measurements derived from information-theoretic measures. The above slide, which appeared in the presentation by computer scientist Aaron Clauset (Univ. of Colorado Boulder and the BioFrontiers Institute), illustrates the use of these techniques to understand how malaria evades the immune system. The Info-Metrics Institute intends to help new fields like Computational Biology and Bioinformatics adopt methods with sound foundations in statistical and information theory rather than ad-hoc procedures.



Rats Get Nervous, Too!

Info-Metrics Conferences end with a discussion by and amongst evaluator/panelists, with audience participation. This helps address questions that weren't addressed during the presentations, while identifying good topics for future research.

Panelists: Profs. Renault, Stutzer, Szpankowski, and Levine

Prof. Lumsdaine Facilitates the Discussion

Keynote Speaker: Ed Ott (Maryland)
2014 Recipient of the Lilienfeld Prize,
American Physical Society

Conference Co-Organizers Restrepo……and Stutzer

Invited Speakers and Panelists

Charlie Brummitt (UC Davis)
Aaron Clauset (CU Boulder)
Ian Dobson (Iowa State)
Michael Gofman (Wisconsin)
Raphael Levine (UCLA)
Robin Lumsdaine (American U)
Andreea Minca (Cornell)
Camelia Minoiu (IMF)
Edward Ott (Maryland)
Eric Renault (Brown)
Juan G. Restrepo (CU Boulder)
Wojciech Szpankowski (Purdue)
David Wolpert (Santa Fe)
Hongdian Yang (Johns Hopkins)

Amos Golan, Director
Info-Metrics Institute