



Society for Risk Analysis New England Chapter

2014-2015 Event Series

MEETING ANNOUNCEMENT

Thursday, June 11, 2015

Refreshments: 5:00 pm – 5:30 pm

Presentations: 5:30 pm – 6:30 pm

Discussion: 6:30 – 7:00 pm

SIX SOURCES OF COLLAPSE: A MATHEMATICIAN'S PERSPECTIVE ON HOW THINGS CAN FALL APART IN THE BLINK OF AN EYE

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TRUSTEE PROFESSOR OF TECHNOLOGY, POLICY, AND DECISION MAKING

PROFESSOR OF MATHEMATICAL SCIENCES AND OF FINANCE

BENTLEY UNIVERSITY

Location

Industrial Economics, Inc
2067 Massachusetts Avenue, Fourth Floor
Cambridge, MA

Please RSVP by Friday, June 5th to Aylin Sertkaya (aylin.sertkaya@erg.com).

Space is limited, so reserve your seat today. For more information on SRA-NE, please go to:

www.sra.org/sra-ne



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SIX SOURCES OF COLLAPSE: A MATHEMATICIAN'S PERSPECTIVE ON HOW THINGS CAN FALL APART IN THE BLINK OF AN EYE

The most common objective in studying collapse events is probably to broaden our sensitivity to the potential for its future occurrence. In some cases that occurrence might be highly desirable, like the collapse of a repressive regime or the cure of a disease. However, in many and probably most cases, collapses are negative events, and we would like to head them off. We don't want our homes, our businesses, and our way of life to collapse. The first line of protection against this is to develop a rich understanding of how things have collapsed in the past. A naive approach would be to focus attention primarily on their "proximate causes": an unusual wind for the Tacoma Narrows Bridge, a large sale or market manipulation for the May 6, 2010, market flash crash, the unpunished beating of Rodney King for the Los Angeles riots. But that approach would only touch a small part of the story, and it would almost certainly give inadequate attention to the wide range of contributing structural factors that are key to such collapses. To understand the broader complexion of collapse processes, we need to use different lenses to study them, each yielding insights of a different kind. Armed with these multidimensional tools, we can be better positioned to face the future with more awareness of danger zones and how they might be approached.

This talk, based on the speaker's recent book with the same title, is an attempt to use the framework of relatively simple mathematics to provide insight into the fundamental dynamics that can cause things to collapse. These dynamics are grouped into six categories: low probability events, group processes, evolutionary games, instability, nonlinearity, and network effects. They are shown to permeate collapse events in a wide range of fields across the natural and man-made world. Examples include extreme weather events, technological disasters, the extinction of species, crashing markets and companies, the chaotic nature of Earth's orbit, revolutionary political change, the spread and elimination of disease, and many others. Not only does the mathematical framework help to extract the key features of these events, but it opens the door to specialized techniques that can provide further insight into preventing or managing similar future events.

ABOUT THE PRESENTER

Charles Hadlock is a "blue collar" mathematician whose views on risk analysis and collapse events are rooted in his earlier consulting career at Arthur D. Little, Inc., during the late seventies and eighties. This was a time when we came face to face with myriad industrial failures like Three Mile Island, Bhopal, Love Canal, Exxon Valdez, and many, many more, and thus became more sensitized as a society to the need for more cautious and rational systems of management, operation, and regulation. During this intense period of reexamination, he visited over two hundred operating facilities around the world on behalf of industrial and government clients with the intention of understanding their associated risks. These included chemical and pesticide plants, mines, nuclear power plants, weapons production facilities, and others. Complementing this practical experience in analyzing risks, he led several projects to treat it more generically. For example, for the EPA he and his colleagues developed the initial technical basis for the regulation of high level radioactive waste disposal. For the NSF, he led a blue ribbon committee to reexamine the use of probabilistic risk analysis in the light of the TMI accident. For New York City, he helped develop a rational approach to the management of hazardous materials transportation at tunnels and bridges.



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He left ADL in 1990 to become Mathematics Chair, and later Dean, at Bentley University. While a Visiting Professor of Earth, Atmospheric, and Planetary Sciences at MIT in 1997-8, he completed a textbook, *Mathematical Modeling in the Environment*, which reflected some of the technical aspects of his consulting experience. More recently, he published *Six Sources of Collapse*, which aims to sensitize a broader audience to the various kinds of dynamics that can lead to sudden shocks and disasters across a very wide range of fields. He is also the author of various research papers and of other books, including *Field Theory and Its Classical Problems*, which won the Beckenbach Award from the Mathematical Association of America. Dr. Hadlock received his PhD in mathematics from the University of Illinois in 1970.



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GETTING TO THE EVENT

Directions to Industrial Economics: <http://www.indecon.com/iecweb/FindUsDriving.aspx> and <http://www.indecon.com/iecweb/FindUsDirections.aspx>

From the MBTA Subway (on foot):

Take the Red Line train to Porter Square. Exit the T Station to the right and cross the street. Turn left and proceed northwest along Massachusetts Avenue, keeping the Porter Square Shopping Center to the right. Continue northwest approximately 0.2 miles to the Henderson Carriage Building, which is located at the corner of Massachusetts Avenue and Hadley Street. IEC is on the fourth floor.

By Bus:

The 77 and 83 bus routes stop in front of the building. Other bus routes that stop nearby include the 88, 87, and 96.

Driving Directions:

From I-95/Route 128: Take Exit 29 for "Route 2 East - Cambridge." Follow Route 2 East approximately 6.4 miles to the first set of lights, located at the intersection of Route 2 and Routes 3 and 16. Bear left at the intersection onto Route 3 North/Route 16 East, following the signs for Arlington and Medford. Proceed approximately 0.3 miles to the next set of lights. Turn right onto Massachusetts Avenue/Route 2A and proceed southeast approximately 0.9 miles, to the intersection of Rindge Ave. and Massachusetts Ave. Continue on Massachusetts Ave. through the Rindge Ave. intersection, then take the first left onto Russell Street. The entrance to the Henderson Carriage Building parking lot is between the second and third private residences on the right, approximately 50 yards down Russell Street.

From Harvard Square: Follow Massachusetts Ave. north approximately 1.1 miles to the Porter Square T Station. Continue on Massachusetts Ave. another 0.2 miles to the Henderson Carriage Building, which is located at the corner of Massachusetts Avenue and Hadley Street. Turn right onto Hadley. The entrance to the Henderson Carriage Building parking lot is on the left, immediately behind the building.

Parking is available along Massachusetts Avenue (meter parking). There may also be spaces available in the lot behind the Henderson Carriage Building.