Mindfulness & Engineering: A Pathway to Divergent Thinking & Innovation

Dan Rothman, MIT

Abstract: The history of the carbon cycle is punctuated by enigmatic transient changes in the ocean’s store of carbon. Mass extinction is always accompanied by such a disruption, but most disruptions are relatively benign. The less calamitous group exhibits a characteristic rate of change whereas greater surges accompany mass extinctions. But why? Analysis of a two-component dynamical system suggests that disruptions are initiated by perturbation of a permanently stable steady state beyond a threshold. The ensuing excitation exhibits the characteristic surge of real disruptions. In this view, the magnitude and timescale of the disruption are properties of the carbon cycle itself rather than its perturbation. Surges associated with mass extinction, however, require additional inputs from external sources such as massive volcanism. Modern inputs from anthropogenic emissions may exceed the excitation threshold during the present century.

Earth’s Excitable Carbon Cycle

Lorenz Center, Department of Earth, Atmospheric and Planetary Sciences

4-5 pm Wed April 10th
Coolbaugh Hall, Room 209
Reception 3-4
GRLA Annex

Daniel Rothman’s work has contributed widely to the understanding of the organization of the natural environment, resulting in fundamental advances in subjects ranging from seismology and fluid flow to biogeochemistry and geobiology. He has also made significant contributions to research in statistical physics. Recent areas of focused interest include the dynamics of Earth’s carbon cycle, the co-evolution of life and the environment, and the physical foundation of natural geometric forms.

Rothman joined the MIT faculty in 1986, after receiving his AB in applied mathematics from Brown University and his PhD in geophysics from Stanford University. In 2011, Rothman and his colleague Kerry Emanuel co-founded MIT’s Lorenz Center, a privately funded interdisciplinary research center devoted to learning how climate works. He is a Fellow of the American Physical Society and the American Geophysical Union.

dmarrufo@mines.edu