A Bugs Life: sea levels, earthquakes, tsunamis and murder

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Ecology is the study of the causes and patterns of distribution and abundances of organisms. It is concerned with the interaction between individuals and their physical and chemical environment, interactions between individuals of the same species and between species. I investigate ecology of microscopic organisms, know as foraminifera and diatoms, through field studies in temperate and tropical environments, laboratory experiments and mathematical modeling.

Foraminifera and diatoms are generally small (<1mm), have a broad species diversity, occur in high numbers and are well-preserved in the fossil record. These attributes make them extremely valuable as they provide not only a contemporary but also a historical record of previous environments. They are therefore of interest both to biologists and geologist

I will present a state-of-the-art synthesis of ideas and data on foraminifera and diatom ecology that will be of value to those students that have interests in changing sea-levels, the frequency and magnitude of earthquakes and tsunamis, and even their application in forensic science. I will reveal accelerations and deceleration in sea-level over the last 2000 years from salt marshes of the United States that are directly related to climate changes such as the Medieval Climate Anomaly and the Little Ice Age. The rate of sea-level rise in the 20th century is unprecedented during the last 2000 years. Further, in Indonesia I investigated two coastal estuaries of northwestern Sumatra. The Holocene stratigraphies show regionally-extensive buried tidal wetland soils that suggest megathrust earthquakes have occurred. Finally, I will discuss the application of diatom analysis in determining whether drowning was the cause of death in two high profile murder trial from the UK. The basic principal of the 'diatom test' in drowning is based on inference that diatoms are present in the medium where the possible drowning took place and that the inhalation of water causes penetration of diatoms into the alveolar system and blood stream, and thus, their deposition into the brain, kidneys, and other organs.