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SHAKESPEARE GOT IT WRONG. IT'S NOT "TO BE", IT'S "TO DO"!: THE AUTOBIOGRAPHICAL MEMOIRS OF A LUCKY GEOPHYSICIST: PART 2

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THE SCIENCE PART

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CHAPTER TWO: RESEARCH IN GRADUATE SCHOOL

Doing Science

Like most students of Ewing, during graduate study I participated in research on a wide variety of topics. Because we were studying the real earth there was plenty of hard and dirty physical labor involved, but there was also and always a dazzling array of stimulating challenges to face, often the adventure of seeing new places on earth and observing them in ways never before attempted, and frequent doses of the inner thrill and excitement of learning things about earth that no one had known before. There was a friendly, congenial, and spirited group to work with, lots of help and advice, and plenty of opportunity for initiative on the part of the individual. Ewing's crowd worked enthusiastically and relentlessly on science, regardless of the time of day, or day of the week. There were times when I hated the arrival of a weekend or holiday because it meant that the support technicians or certain facilities would not be available to help us as we worked, and other times when weekends were the best time of all because no one was around to get in the way of our group of hard-working students.

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STORM-INDUCED SEDIMENT DYNAMICS IN DELAWARE BAY TIDAL MARSHES

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ABSTRACT: The impact of storms on short and long term sedimentation rates and erosional processes in marshes is not well understood. While some studies suggest

that storms enhance erosion on marshes along the U.S. Atlantic Coast, others contend that storms may provide all the sediment needed for marsh accretion to keep pace with local relative sea level rise. In this study sedimentation plates were used to measure sedimentation rates and to monitor the influence of storms and unusually high flood tides on sediment dynamics in tidal marsh environments along the Delaware Bay over a 12 months period. Nine to 42 mm of sediment were deposited in various parts of the study area between August 1992 and August 1993. This time period had an unusually high number of severe storms, including the tropical storm Danielle, two winter storms and the Blizzard of 93 or "Storm of the Century". During the first 53 days of this study, over 60% of all sediment was deposited during tropical storm Danielle.

Each storm deposition was followed by moderate erosion in the days and weeks immediately after the storm. However, during the study period there was net marsh accretion as deposition was greater than erosion. Post depositional erosion suggests that there is an optimum equilibrium amount of sediment that the marsh surface can retain, following a major episode of deposition, beyond which the excess sediment is eroded and carried to other parts of the marsh-channel-estuary system.

The sedimentation rate in this study far exceeds the rate of local relative sea level rise of 1-2 mm/year. Since long-term marsh accretion rate has to ultimately keep pace with long-term rate of sea level rise, it can be speculated that in the long term some of the sediment deposited during this unusually stormy year will be eroded during the months following the storm season. In addition, compaction will further decrease the net elevation of the marsh surface. Although storms are important in Delaware salt marsh sedimentation, non-storm deposition also occurs when marshes are inundated by unusually high flood tides.

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FLUID INCLUSION AND STABLE ISOTOPE CONSTRAINTS ON TEMPERATURE AND PRESSURE OF VEIN FORMATION; HUDSON VALLEY FOLD-THRUST BELT, CATSKILL, N.Y.

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ABSTRACT: Syntectonic veins in the Hudson Valley Fold-Thrust Belt near Catskill, New York contain vugs that host well-formed calcite and quartz crystals. Stable isotope analyses of co-exisiting calcite and quartz suggest that the temperature of vein mineralization was between 219 and 315/C at three sampling localities. Fluid inclusions in quartz crystals from syntectonic veins consist of two-phase water and water+methane that form alternating primary inclusion bands. Homogenization temperatures of water + methane inclusions record mineral

precipitation in the range 236-291/C. Burial depth during vein formation was in the range 3.2-4.8 kilometers based on isochore intersection determination of pressure and assumption of near-hydrostatic pressures during vein formation. Assuming lithostatic pressure, burial depths were in the range 1.4-2.1 km. Melting temperatures of water ice indicate fluid salinity near seawater. Calculation of the isotopic composition of waters in equilibrium with syntectonic vein minerals and with host limestone and chert suggest that mineralizing fluids had equibrated with the host strata. The relatively high geothermal gradient (>40/C per km) required suggests derivation of fluids from a more-deeply buried portion of the foreland basin to the west, or local heating of fluids by igneous rocks that intruded at depth beneath the study area.

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MINI-IMAGES OF PAST AND PRESENT CONTINENTS AND OCEANS FORGED INTO MANTLE, MOHO, TOPOGRAPHY, AND SEISMICITY PATTERNS IN THE NORTHEASTERN UNITED STATES

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ABSTRACT: The region's upper 500 KM of velocity structure holds vertical spiral sequences that mini-image the evolutionary stages in the western hemisphere's Devonian-to-present day continent-ocean distributions. The Devonian Acadian image spiral is of regional dimension and is upwardly clockwise youthful. Whereas the superimposed Atlantic spirals are threefold, each being laterally more restricted: a Mesozoic upwardly counterclockwise youthful eastern New England spiral; a Mesozoic-Cenozoic likewise upwardly counterclockwise youthful southern New England spiral; and a Mesozoic-Cenozoic albeit downwardly, counterclockwise youthful Adirondack-Green-White Mountain area spiral. In turn, the upward youthfulness may reflect a downward decrease in strain/imaging capacity, which causes the corresponding mini-images to lock-in sooner at depth, leaving the progressively shallowing strain-worthy overhead column remainder to continue evolving into the successive images within the tectonism's net rotary motion, thus forging the spiral. Whereas the anomalous downward youthfulness may arise where a thermal body has intruded at depth, heat from which adds new strain/imaging capacity notably to the deeper portions of the overhead column, resulting in a spiral structure and/or a dominant young image that is backprinted at the higher levels albeit successively more weakly, the higher hence corresponding less heat affected is the layer. Mesozoic-Cenozoic hemisphere-scaled mini-images are seen as well within the Moho/deep crust, surface topography, and shallow seismicity patterns.

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