FOLGER WORKSHOP - May 28, 2013

Behaviour of a sponge in response to changes in ocean properties over time and in 3D

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We are interested in the responsiveness of suspension feeding invertebrates to changes in sea water conditions over time. Sponges are the focus of our interest since they filter vast quantities of water (up to 800x their body volume in water each hour) and can form large communities which therefore affect overlying water column properties.
Sponges lack conventional nerves and muscle, but can sense and respond to mechanical and chemical stimuli by either arresting filtration (in glass sponges, Class Hexactinellida) or contracting their entire body (all classes of sponge). Responses are slow – on the order of minutes – but effectively prevent material entering the filtration apparatus. While it has been shown that sediment can trigger immediate contractions sponges also contract without apparent trigger over the course of a day, over several days and in some cases over months. We hypothesize that changes in pressure, possibly caused by internal waves, might cause these responses, in addition to changes in turbidity or rapid changes in temperature. Tiny sensory hairs – similar to hair cells of the lateral line system of fish – project from the cells that line the excurrent oscula (the single vent of the entire filtration system of sponges). Laboratory experiments in freshwater sponges suggest these hairs are responsible for coordinating whole body contractions.

At the Folger node a camera has been deployed around a fortuitously located small demosponge (species to be determined). Our aim is to measure changes in dimension of the sponge over minutes, hours, days and months. We will use Matlab and ImageJ scripts that our group has written for measuring change in shape over time. Shape changes will be correlated with changes in water column properties (pressure, current, light, turbidity and temperature) measured by instruments located adjacent to the camera. Because sponges can change shape in three dimensions, the Folger camera is designed to capture an array of 8 images which can be reconstructed into a single 3 dimensional image to allow quantification of volume. Volume measurements will be calculated together with Herb Yang's group (U of Alberta) to determine changes in growth of the sponge over time.