Log 18 Monday

1. 192100Z September 2005
2. Position: Lat: 0-30.0N LONG 132-18.3W
3. Course: 090-T
4. Speed: 11.2 kts
5. Distance: 105.0 NM
6. Steaming Time: 10H 54M
7. Station Time: 13H 06M
8. Fuel: 3548 gals
9. Sky: Cldy: Ci, As, Cu, Sc
10. Wind: 110-T, 07 kts
11. Sea: 110-T, 3-4 ft
12. Swell: 130-T, 4-6 ft
13. Barometer: 1011.0 mb
14. Temperature: Air: 26.1 C, Sea: 26.9 C
15. Equipment Status: No change.
16. Comments: On west to east transect.

MASTER, R/V ROGER REVELLE

From Dr. Mark Brzezinski,

Hello everyone,

I thought I'd share a micrograph with you.

Mark Demarest and I have been experimenting with the compound PDMPO as a means to track silicon deposition in diatoms. This compound was designed by Molecular Probes, Inc to determine the pH inside cellular vesicles. A few years ago we tried to use it to determine the pH inside the silicon deposition vesicle in diatoms only to find that silica deposited in the presence of the compound was highly fluorescent. This allows the silicon deposition activity of individual cells to be examined by incubating samples in the presence of the compound. All newly deposited Si will fluoresce blue.

The attached images are just an example that Andrew helped us put together using Mike Landry's microscope. There are four images. One is a composite of three images (tungsten light, blue light (reveals the red fluorescence of chlorophyll) and UV light (reveals PDMPO)). The other images are the individual images that went into the composite. The image contains a Rhizosolenia cell as well as a long pennate near the top of the slide. Note the scale bar. These are big cells.

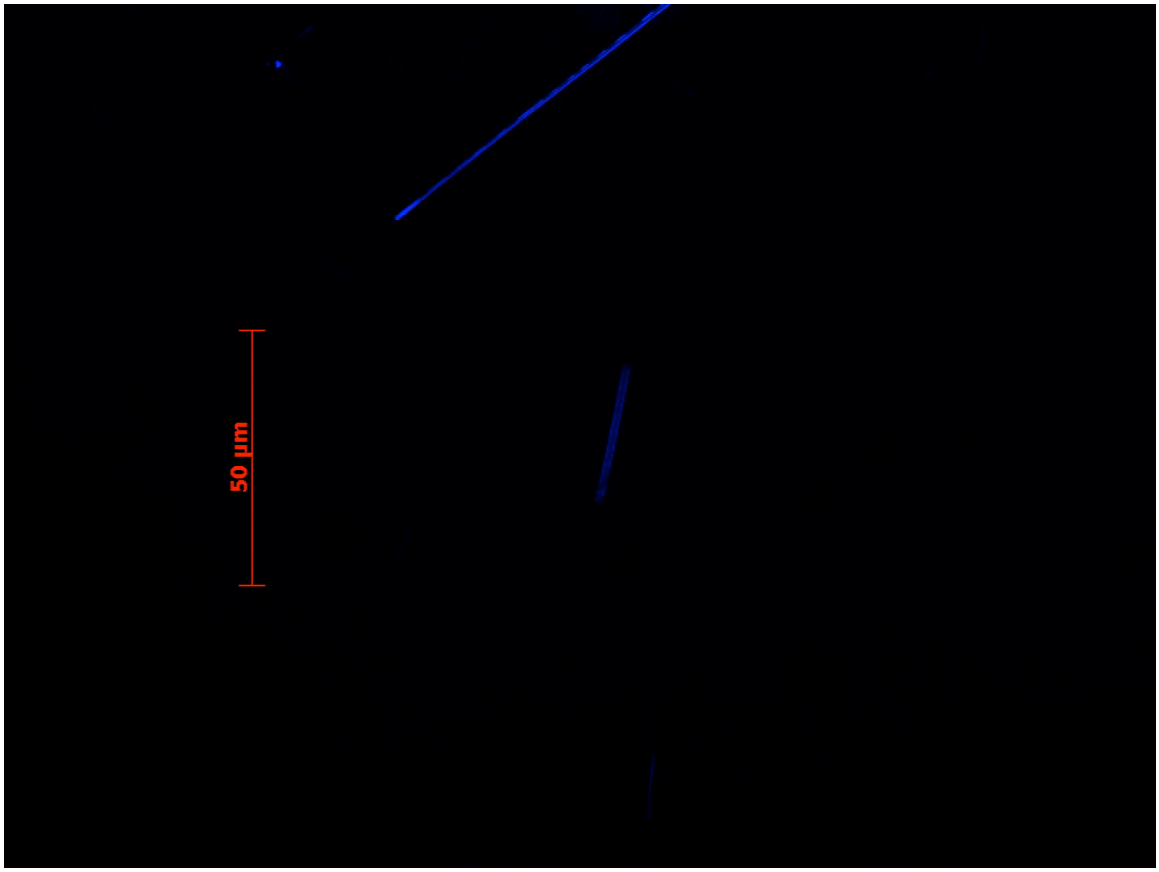
We can use the PDMPO pattern to infer something about the division rate of the Rhizosolenia cell. To do that you need to know something about how the deposition of the frustule in Rhizosolenia works relative to cell division. In Rhizosolenia the valves are the small pointed bits at the very end of the cell. The rest of the frustule consists of a

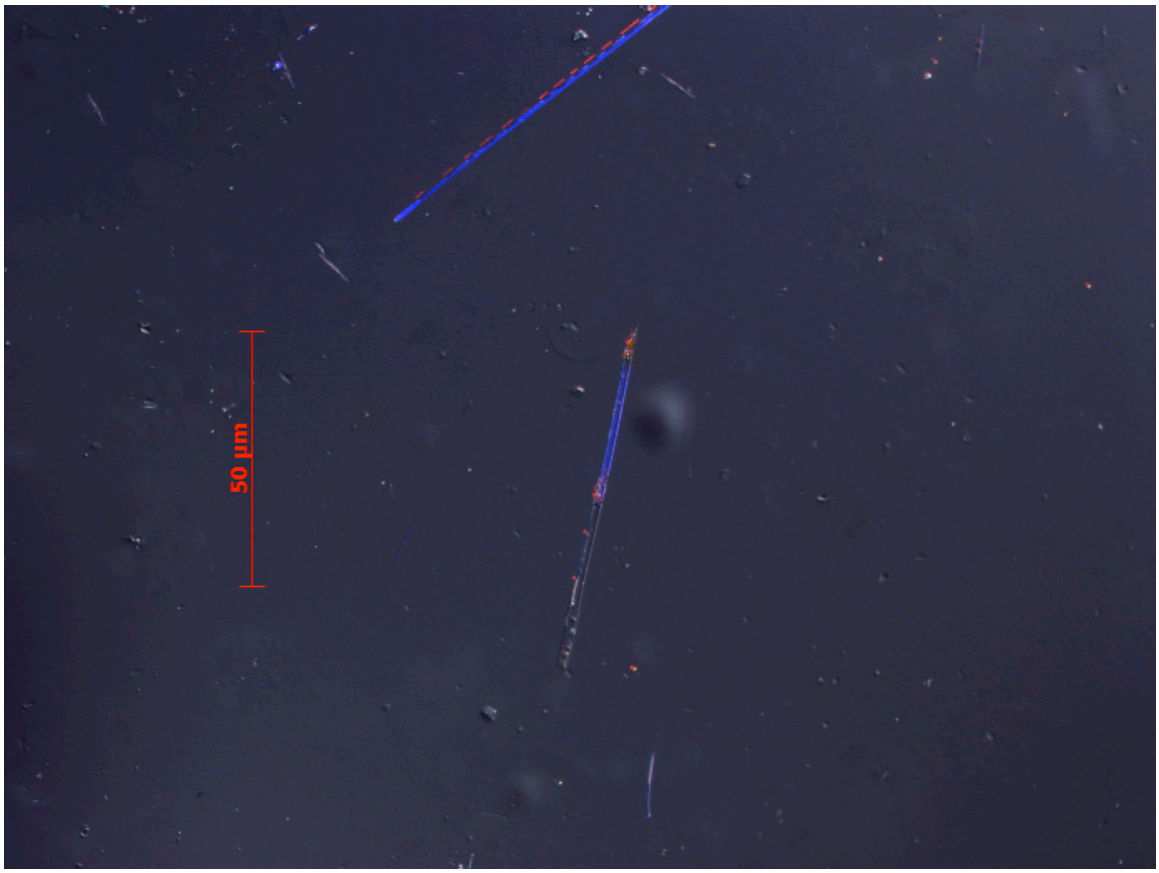
large number of intercalary bands that form the long cylindrical section of the frustule. The valves are deposited inside the mother cell at its midpoint just prior to daughter cell separation. Then each daughter cell begins to form intercallary bands beginning at the base of the new valve. When enough bands have been deposited to double the length of the cell, division begins again.

We can use this information to interpret the image. What we see is that the Rhizosolenia cell was depositing intercallary bands when we added the dye as indicated by the fact that the labeling starts a bit below the pointy valve. During the incubation the cell deposited a large number of intercalary bands that add up to a length that is about half the total length of the cell. This implies that the cell is ready to divide. We incubated this sample for about 10 hours. Assuming a constant rate of Si deposition during the cell cycle this implies that this particular cell underwent most of its division cycle during the 10 incubation implying a doubling time of about half a day. That's pretty fast.

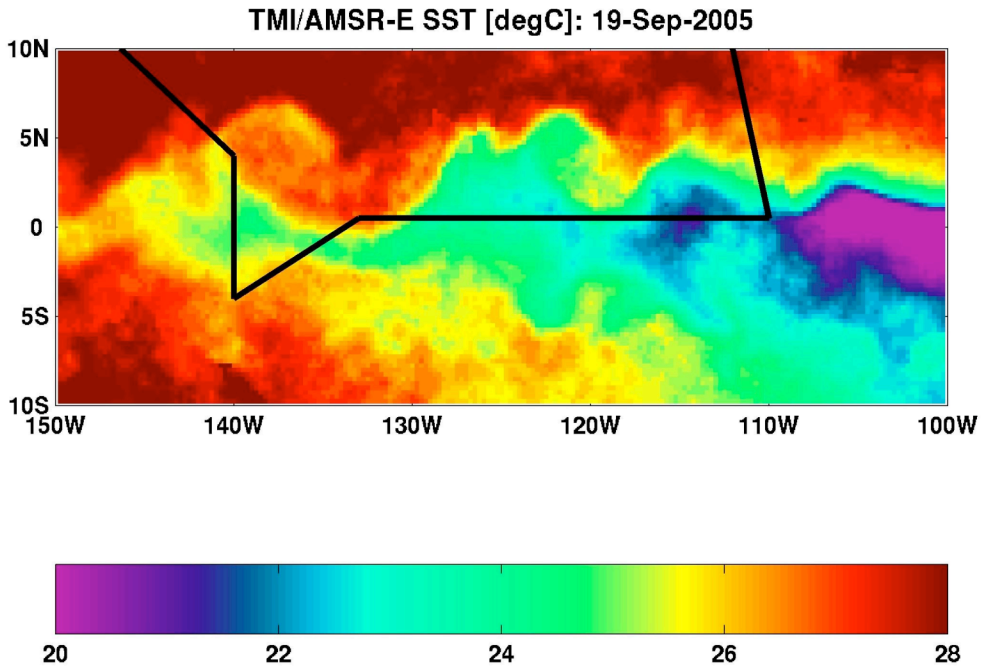
This is just a little story about one cell, but it shows the potential of PDMPO to teach us about the activities of individual cells.

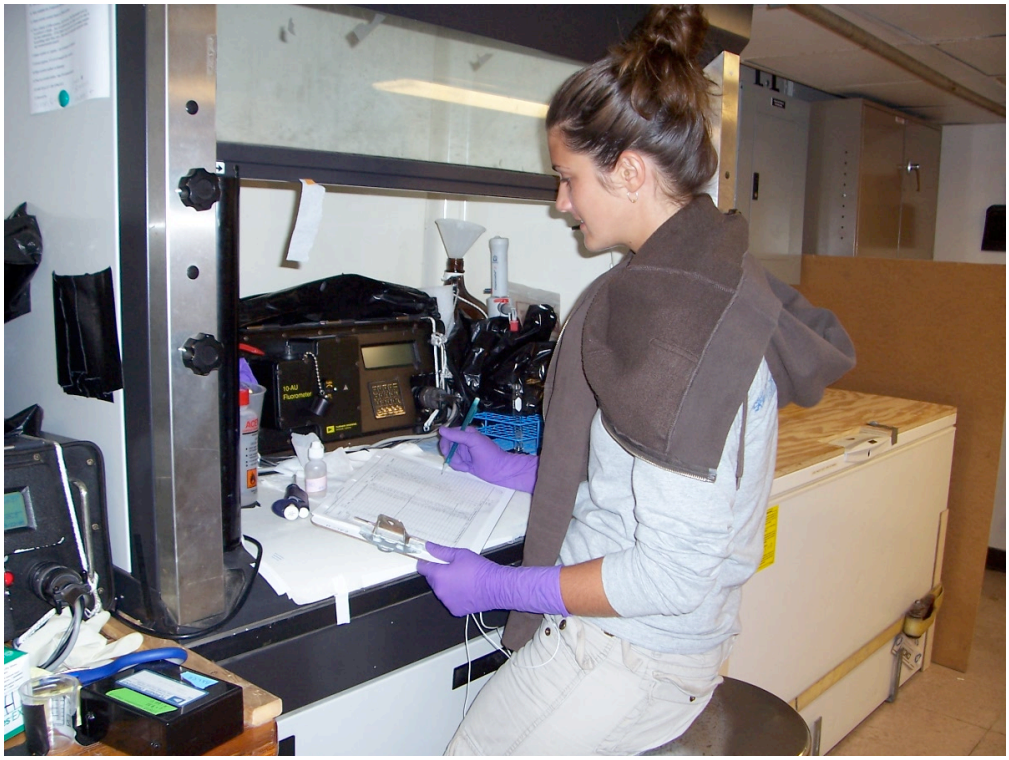
Mark





Here is the SST for today, Sept 19 , with our course as the black line across it.





Jessica working on samples in the Chem hood

Main Lab looking at Mark Demarest doing filtration.