Tour of TO along with Seismo Lab tour
March 1, 2012, 10 AM – noon
St. Bede's School, LaCanada, 30 6th graders

Volunteers: Sylvain Barbot, Thomas Ader, Erin Burkett, Jamshid Hassanzadeh

- Looking for the next earthquake in the Himalaya - Thomas Ader
- Are we children of the stars? - Jamshid Hassanzadeh
- Looking Inside the Earthquake Machine: How do we simulate the San Andreas Fault? - Sylvain Barbot
- What it's like doing Geoscience research, and example models of plate tectonic processes - Erin Burkett

Thomas: I presented my field work in the Himalaya for the TO tour, and briefly mentioned the implications my research has on seismic hazard assessment in Nepal. I started by presenting Nepal, asking the kids if they could recognize the flag, a statue of a Yak, and the money. Which some of them did. I then carried on with a couple videos showing the creation of the Himalaya and the seismic cycle in a subduction zone. To back up the video of the earthquake cycle, I had them play a little bit with the earthquake machine. I then showed a bunch of pictures from one of my field trips where we trekked for 3 days to install a GPS station. In the last minutes of my talk I showed them the seismic implications that this would have, showing them where the fault under Nepal is locked and where it is creeping, and explained them how it can help us see where earthquakes can happen.

Some kids are shy and it is a bit hard to reach to them in such a short time. Maybe a good way to involve them would be to ask questions with multiple-choice answers, making it more interactive and easier for everyone to participate. I felt that the kids were interested and got the message right. I don't know if there can be an experiment that shows them that depending on where the fault is locked or creeping, the deformation of the ground that we measure with the GPS will be different. Maybe I will also select different pictures from the filed for my next presentation.

Sylvain: On March 1st, a group of 6th graders from St. Bede visited the Tectonics Observatory and the Seismolab. I gave a presentation to two small groups of no more than 10 students and their accompanying chaperones. I was equipped with the small earthquake machine, a geological map of California, my laptop and a projector. I showed the students the important tectonic features on the map and introduced them to the San Andreas Fault and the Pacific and the North American Plate. I then used the earthquake machine to introduce the concept of friction. My mac is equipped with SeimoMac - a real-time seismometer -. That was useful to introduce and talk about earthquake magnitude and earthquake epicenters. Then I asked a student to sit at my computer and navigate a 3-D fault model of California. This is a model developed by SCEC - the Southern California Earthquake Center -. It consists of a 3-D representation of all the known faults in California on the free 3-D

visualization software Paraview (www.paraview.org). The visualization was projected so all the students could see. Finally, I showed them a movie of the earthquake cycle at Parkfield - this is what I do for my research -. After the tour, on the way out, a student said to another: "That was so cool!!". Mission accomplished.

Jamshid: The title for my presentation was “Are we children of the stars?” I opened with a slide of the Old Woman iron meteorite on display in the Desert Discovery Center at Barstow, and I passed around a piece of iron meteorite with a regular magnet bar and a small neodymium magnet. I briefly mentioned the meteorite's history and added where it came from. Then I showed a slide of “blood” in a test tube and said that iron in our hemoglobin is like the iron in the meteorite and they were both produced by fusion of lighter elements in some stars. Then I showed a slide of the periodic table and asked the question "Can you name anything not made of elements?" I moved on to other thought-provoking questions "Are elements in other galaxies different from those on Earth?" I finished with a demonstration of how the atmospheric carbon dioxide gets trapped in the carbonatic parts of marine organisms. I put some of the common mineral calcite into a test tube, and added a few drops of dilute HCl. The students were excited about the result. I concluded that if limestone production was not possible on Earth our world would be something like the planet Venus.

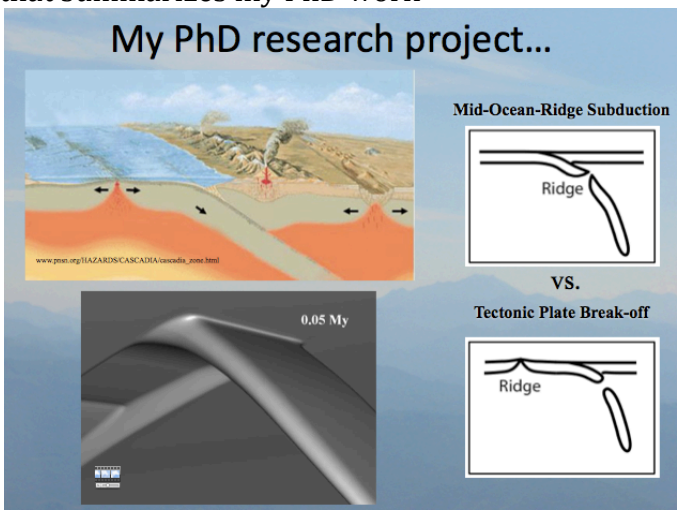
This was my second experience with 6-graders. San Marino students in my first experience last year were better-prepared and highly motivated. If I knew ahead of time that not every private school children are that way then I would have modified my presentation at a different level.

Erin: I introduced myself to the students, asked if they knew what a ‘post-doc’ is, then explained. I presented a short powerpoint, encouraging them to interrupt with questions anytime. I outlined my career path to present. I asked the kids what they imagine when they think of geologists and showed a slide with pictures to illustrate what a geoscientist might do day-to-day (field work/trips, camping, computer work, teaching, write papers to share research results, conferences (often traveling!). I then showed a number of simulations representing results of research by other scientists, particularly at Caltech, which gave an overall view of plate tectonics, eventually leading to describing the ‘in a nutshell’ version of my PhD research. Example simulations I showed:

(1) Continental Drift plate reconstructions
http://www.tectonics.caltech.edu/outreach/animations/drift2.html
(2) Seafloor spreading…
http://www.tectonics.caltech.edu/outreach/animations/seafloor.html
(3) Himalayas movie (as a zoom-in of what’s going on in cross-section where india collides so rapidly with asia) …good illustration of subduction, and then leading into the newer research field they may not have seen before of the possibilities of pieces of tectonic plates breaking off (leading to my research)
http://www.tectonics.caltech.edu/outreach/animations/himalayas_small.html

(4) Another scenario related to my research (and plates breaking off) is what happens when the separate processes of ocean spreading and subduction collide (when a spreading ridge meets a subduction zone). Show other version of plate motion reconstructions (Tanya atwater animations for plate reconstructions of western north America): http://emvc.geol.ucsb.edu/download/pacnorth.php …pointing out spreading ridge getting closer to subduction zone.

(5) …then briefly describe my research, including a movie result from one of my 3-D models (http://www.gps.caltech.edu/~erb/Movie2_Model3d1zm.mov) that summarizes my PhD work



…Pointing out the movies/models show rock flowing with time, so took the opportunity to use silly putty (pass out some to the kids to keep) to demonstrate that silly putty and rock can both similarly demonstrate viscous, elastic, and brittle behavior! Demonstrate and have the kids quickly pull to break the silly putty (brittle), pull more slowly to demonstrate viscous flow, and bounce the putty (elastic). (Note: kids may get distracted by the silly putty based on the class mood & size, so plan the timing appropriately (near end?) or collect it again before any other more focused attention is expected!).

Misconception addressed:
--The plates do not float on magma, but on solid mantle rock, but that flows over time as demonstrated with the silly putty example.