

Development of 3-D Interactive Visual Object Using the Scripps Institution of Oceanography's Visualization Center

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My primary interest in promoting visualization use in the classroom is to help strengthen our future generation of Earth scientists. To this aim I have found interactive 3D visualizations key tools for clearly explaining complex multidimensional problems in order to excite, engage and encourage students to explore the many unanswered questions in Earth Science. To use visualizations effectively in geosciences education it is crucial that we pool our resources, skills and abilities, in an organized fashion so that we do not duplicate efforts or fail to effectively share our end products and resources. For my contribution, I would like to introduce the interactive 3D 'visual objects' that we have developed at the SIO Visualization Center:

<http://www.siovizcenter.ucsd.edu/library/demos/index.html>

<http://www.siovizcenter.ucsd.edu/library/objects/index.html>

and obtain feedback on the usefulness of these tools in the classroom. The primary thing I would like to take away from this workshop is knowledge about what type of visualizations are being currently used in the classroom and a 'wish list' of what can be improved or newly developed.

As science director of the SIO Visualization Center, I use the technology at our center, to render visual objects that can be exported to almost any system (Windows NT, Mac OSX, SGI, Sun, PC Windows2000 and PC Linux). This allows access to high quality 3D interactive teaching tools, yet reduces hardware costs for an in-class visualization system to the cost of a low-end laptop (~\$1,500).

My teaching experience spans teaching university level math classes (calculus, linear algebra), and computer classes (which included computer graphics) at UCLA; I am part of the IGPP/SCEC/IRIS/USCS/SDSU/SDSC/BAS team that is developing an annual teacher workshop that incorporates interactive 3D visualizations (see <http://www.siovizcenter.ucsd.edu/workshop/index.html>); throughout the past 2 years I have led 1-hour to 1-day 'exploration of geophysical data' for a wide number of audiences including grade school, high school, college, university, graduate and undergraduate classes as well as interfacing with the general public, emergency response teams, and those in public office and integral in homeland security (see: http://www.siovizcenter.ucsd.edu/news_events.php). My experience in developing visualization tools specifically to meet curriculum needs is minimal, and one of my goals is to begin to partner with curriculum specialists to help them reach their goals. Within the last year I have made initial steps toward this objective, through working with members of the NSF sponsored OptIPuter program to develop Earth Science resources for K-12 Education (<http://education.sdsc.edu/optiputer/>).

For my other 'day job' I'm a crustal seismologist at IGPP/SIO/UCSD, with research interests that include: (1) The role of dynamic and static stress changes in aftershock generation; (2) Earthquake rupture initiation and earthquake source physics; (3) Heterogeneity of aftershock focal mechanisms; (4) Precise relative locations of microearthquakes (seismic waveform cross-correlation).

I expect I'm in a different situation than most that folks attending this workshop – my main focus is developing 3D interactive visualizations for use in the classroom and research. What I want to learn from this workshop is what it is that people need, what they find useful now and what is missing from their 'bag of tricks'. My hope is that this workshop will enhance my ability to successfully develop and distribute interactive 3D teaching tools.

Relevant References

Kilb, D., C.S. Keen, R.L. Newman, G.M. Kent, D.T. Sandwell, F.L. Vernon, C.L. Johnson, J.A. Orcutt, "The Visualization Center at Scripps Institution of Oceanography: Education & Outreach" *Seis. Res. Lett.* V. 74, no. 5, p. 641-648, 2003.

Kilb, D.L., R.L. Newman, F.L. Vernon, J.A. Eakins, L. Ziegler, J. Bowen, J. Otero, "Education and Outreach Based on data from the ANZA Seismic Network in Southern California" *Seis. Res. Lett.* V. 74, no. 5, p. 522-528, 2003.