Science on the Web

Activity 7
Hazards

*J*ane's Mom and Dad were thrilled with the 25th Anniversary party. It went off without a hitch. Uncle Josh and Aunt Marcee came down from San Francisco for the weekend, and lots of friends and relatives from around home came too. Richard was happy to have some cousins his age there, and they went off to the basement to play on the computer. He just about missed the whole party, but that was OK. Sandy had an accident on the floor, but Jane cleaned it up right away so Mom wouldn't get upset. Jane had really done a great job making the day wonderful.

As good as the party was, the big surprise of the day came when Jane's father said that he had been asked by his company to move. They hadn't said he *had* to, but had offered him five places to consider: Seattle, Washington; Long Island, New York; Tampa Bay, Florida; Tokyo, Japan; and Sydney, Australia.

Wow. Those were big changes! Jane immediately thought of her friends and her life in L.A. She didn't want to move. Neither did Richard. Her dad reminded them that he didn't *have* to move, at least not yet, but that they ought to start thinking about it.

Late that night, after the party, Jane was haunted by thoughts she had had as a young child, fears of natural hazards like lightning, earthquakes, and floods. It seemed that those fears were always associated with losing the family, and she felt a little bit afraid now. She decided to try to be more adult; that helped her get hold of herself and resolve to do a hazards study for her father. He ought to know about these cities where they might move. With that plan in mind, she fell asleep right away.

In school the next day, she looked for Mr. Goodman to help her with this project. It was a big study, now that she thought of it, and she wanted someone who really liked big, detailed projects to help her. He was delighted at the challenge. Jane and Mr. Goodman began to search the Internet for information on hazards all over the world.

2+ 4= **Where do earthquakes happen?**

NOAA's National Geophysical Data Center (NGDC) has lots of data, and they let you search their database for earthquakes and volcanoes. There are even photographs of hazards.

http://www.ngdc.noaa.gov

> Solid Earth Geophysics
> Natural Hazards
> Significant Earthquakes

The top part of the form will allow you to restrict the search to a certain part of the world. For your first search, leave the search open to the world (don't select anything in this section), but select the most severe earthquakes:

> select **MANY DEATHS** and **EXTREME >$25 MILLION** in damage.
> *Click on Search Database

Look on a map and see where these most severe earthquakes occur. Play around with searches varying all the parameters.

? Questions

7–1. Where are the four most active seismic regions in the world?

7–2. Where is the most likely place to have a very deep epicenter?

Analysis

One of the great things about digital data is that computers can manipulate them. A table of numbers in a book is just that. A table of numbers in a computer can become a plot, a graph, or a chart with very little effort. This is often how scientific analysis is done—by displaying data in different ways.

So getting the data to your computer and displaying them is very important.

Grabbing data

When you get a list of the larger earthquakes (say magnitude 8 and above), select the data with your mouse (highlight the data as you drag the mouse downward).

When the data are selected, copy the data (**Edit—Copy**).

Move outside your browser and create a new document (a "text" document from a word processing application already on your computer). **Paste** into that document. The data should appear as they were on the browser screen.

Do a similar search for volcanoes choosing the general regions (North America, Japan, etc.). Grab the data as you did with earthquakes and save to a file.

Large files

With more than one window open, you can move information from one application to another or check on information in other areas. You can run more than one browser at a time, too, in case you'd like to keep one page up while looking at other pages.

Keep in mind, though, that if you open other applications, and especially other browsers, that you can crash your computer if you run out of memory. And the more applications running, the more memory you use.

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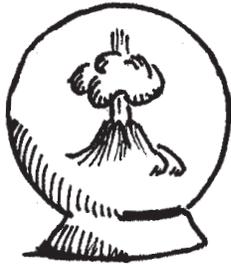
*J*ane now had all the information she needed about earthquakes and volcanoes, but she wasn't at all clear about what it meant. She needed to do the analysis of the data, something her science teacher always seemed to be going on about. This time, she wanted to do this analysis, because it was so important to her family and to herself. By selecting large earthquakes and plotting them, along with volcano locations, Jane was able to see where the really dangerous areas were located. With a map of the cities, she could factor in the chance of an off-shore earthquake causing a tsunami (tidal wave).

Plotting Data

Now that you have the data, you need to analyze them. Working with data is made much easier with tools that plot, graph and sort data. Try to "import" these data into a spreadsheet or plot program so that you can do some analysis. Plot epicenters on a latitude/longitude plot at the same scale as a world map so you can overlay the data on the map. You can also plot some of these by hand directly on a map. Plot the volcano data on the same map in a different color or symbol.

Questions

7–3. Why do there appear to be so many quakes in recent years?

7–4. What was the magnitude of the strongest earthquake in the database?

7–5. Do volcanoes occur in places where earthquakes occur? Why or why not?

7–6. Can you make a reasonable estimate of these risks for Seattle, Washington; Long Island, New York; Tampa Bay, Florida; Tokyo, Japan; and Sydney, Australia, based on your observations?

Plate tectonics

You know from Activity 2 that the U.S. Geological Survey runs the National Earthquake Information Center. Let's see what else they have on the Web site.

http://wwwneic.cr.usgs.gov

> General Earthquake Information
> Plate Tectonics

> Print a copy of the map showing the plates.

? Questions

7–7.   How do the plate boundaries relate to your map of epicenters?

7–8.   Are plate tectonics and earthquake occurrence related?

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*E*arthquakes appear in particular places, but Jane didn't see some of the largest earthquakes in her listing of "many deaths" and "exteme" economic losses. Why? Large earthquakes can be very destructive and cause death and economic disaster, but some large earthquakes cause little damage. She could see that deadly mix was seismic activity *and* human occupation. The most damage and death will occur where there are people and development. She decided to look at one more piece of data before calling it quits.

2+ 4= Damage and Deaths

One quick way to see development and high-population centers is at night in the dark. A satellite photo is worth a thousand words.

Go back to the SPIDR site (did you bookmark it?).

http://www.ngdc.noaa.gov:8080

> *Click* on City Lights

> You can *click* on any of the black maps to enlarge them.

? Questions

7–9.   Pick out New York, Dallas, Denver, Los Angeles, your home town on the City Lights maps.

7–10. How well do the lights correlate with the heavily damaged earthquake sites?

7–11. A very large earthquake occurred in China in the 20th century. When did the quake occur (year, month, day)? How many people died? Locate it on the City Lights map.

Heads Up!

When you are browsing and get an error, first check your URL. Did you type it exactly right? If you are using a hyperlink and find an error, you can help the developer by reporting problems and ideas that you have. You'll often find an e-mail address at the bottom of the Web page to which you can report problems.

At almost every site, you can e-mail to webmaster@*URL (for instance,* webmaster@www.sec.noaa.gov).

Be careful when you state your problem. It just might *be your problem, not theirs.*