Earth Sciences

Richard Monastersky reports from San Francisco at the fall meeting of the American Geophysical Union

Watching the next Hawaiian island

Like a baby baboon riding on its mother's back, Loihi seamount is a mere infant perched on the flank of Hawaii's "Big Island." But this young underwater volcano is still growing and may top the ocean waves in 50,000 years. To study Loihi's behavior, geophysicists plan in the next two years to set up an unmanned observatory at the volcano's summit, located about 35 kilometers southeast of Hawaii's shore beneath some 1,000 meters of water.

AT&T has donated 40 kilometers of electro-optical cable for connecting an onshore station with the observatory. The cable will transmit electrical power down to the observatory and carry back real-time information from the instruments.

Fred K. Duennebier and Alexander Malahoff of the University of Hawaii in Honolulu say Loihi represents an ideal spot for a seafloor observatory. It's the only known example of an active underwater volcano in U.S. territorial waters, and the seamount sits relatively close to land. The researchers plan to install seismometers, thermal sensors, chemical detectors, video cameras and even a small rover to monitor the seamount's volcanic activities.

The seismograph: A new home appliance?

They might not have the same appeal as videocassette recorders or microwave ovens, but personal seismographs could become a hot item in the San Francisco Bay area if a new proposal gains momentum.

Seismologist Edward Cranswick of the U.S. Geological Survey (USGS) in Denver and computer specialist Robert Banfill of Big Water, Utah, suggest that the widespread use of home computers offers an unprecedented opportunity for monitoring tremors in the Bay area and other quake-prone regions. Volunteers could attach small seismographs (costing $500 to $1,000) to their computers, which would then send information via modems to a USGS office in Menlo Park, Calif.

The researchers estimate that 100,000 people with home computers live within a 100-kilometer radius of Menlo Park. If 1 percent of them participated in the program and half of those collected reliable data, that would create an extremely dense array of seismographs. Cranswick suggests the array could detect tremors 10 times smaller than the faintest ones currently detectable in the area. The seismographs would help scientists locate spots most prone to quake destruction and would provide unique information about how faults rupture, he says.

Pinpointing Utah's seismic threats

Eighty percent of Utah's residents live along a quake-prone structure called the Wasatch fault. Geologists have long warned of the danger from the fault but have lacked sufficient information to identify the areas at greatest risk. Now, in the first comprehensive estimates of earthquake hazard along the fault, David P. Schwartz of the USGS in Menlo Park and Stuart P. Nishenko of the USGS in Denver find one region much more at risk than others. "For years I've said an earthquake could happen tomorrow anywhere along the Wasatch fault zone. But I don't think that's true now," Schwartz says.

By cutting trenches across six sections of the fault, the two geologists have compiled a 6,000-year history of major Wasatch earthquakes. Only one of the segments has not generated a quake during the last 1,400 years, and the researchers identify this fault patch, near Brigham City, as the only one with notable risk of producing a shock in the foreseeable future. They calculate a 3 to 8 percent chance that the segment will spawn a magnitude 7 or larger earthquake in the next 50 years, and a 7 to 15 percent chance of such a quake in the next century. While these odds are lower than previous estimates, they nonetheless represent a significant threat, Schwartz says.

Space Sciences

Redesigning the U.S. space program

President Bush's proposal that NASA send astronauts to Mars in 2019 won approval in principle from a panel assessing the future of the U.S. space program, but the group declined to support a specific date. "The *long-term* objective of human exploration of Mars should be tailored or respond to the availability of funding, rather than adhering to a rigid schedule," the panel concludes in a summary of its report released on Dec. 10.

The 12-member group, appointed by NASA in August after the discovery of the flawed Hubble telescope mirror and the hydrogen leaks that grounded the shuttle fleet throughout the summer, urges a shifting of NASA priorities to place primary emphasis on science. While noting that the nation needs a balanced space program, the panelists assert that science, "in our judgment, ranks above space stations, aerospace planes, manned missions to the planets, and many other pursuits which often receive greater visibility."

The report cites wide public support for the U.S. space program but notes a lack of national consensus about its goals. "No two individuals seem able to agree upon *what* that space program should be," it states. "Further, those immediately involved in the program often seem least inclined to compromise for the common good." Addressing the controversy over whether to abandon such manned activities as the shuttle and space station, the panelists say: "Our answer is a resounding 'no.'"

However, they do urge NASA to redesign the planned space station and slow the project's development to reduce its complexity and growing cost — a move already ordered by Congress this fall. The report also prods the space agency to defer or even cancel its envisioned purchase of a fifth space shuttle, and to reduce the present dependence on the shuttle fleet by adding an unmanned version for all missions except those with a specific need for onboard personnel.

The panelists conclude that the "justifying objectives" of the space station "should be reduced to two, primarily life sciences and secondarily microgravity experimentation." They call the station "essential" for studies of life sciences, "for there is simply no Earthbound substitute." Microgravity research is not "sufficient justification for the Space Station in and of itself," but is "an altogether valid element of America's economic competitiveness program," the report states.

NASA plans to begin a "Mission to Planet Earth" next year with satellite observations and increased research on global environmental change. While approving the idea, the panel recommends that the agency place that program on "a 'go-as-you-pay' basis — tailoring its schedule to match the availability of funds."

Even with the envisioned cost-cutting, several of the report's recommendations are likely to prove expensive. For example, the panel urges NASA to provide a "personnel module" that can return space station occupants to Earth in case of emergency; the module might also bring up new crews if shuttle malfunctions arise. To pay for such activities, the panel proposes designing the space program so that its "real growth" (allowing for inflation) will not exceed 10 percent per year through the end of the decade. After that, NASA must hold the growth rate with savings help from redesigning the space station and foregoing a fifth shuttle.

The report also recommends changing federal regulations that now limit the salaries of NASA scientists and other officials, so that the agency can compete with the private-sector.

Headed by Norman R. Augustine, chairman of Martin Marietta Corp., the panel of scientists and aerospace executives included former NASA Administrator Thomas O. Paine.