

A Chronicle of Change

Globe-watching encyclopedia pools diverse world views

By JONATHAN EBERHART

Glinda, Good Witch of the North in the stories of the Land of Oz, possessed a magic book that constantly revised itself to include the latest happenings in the kingdom. The Global Change Encyclopedia will embody a similar concept, though its power will rest in science rather than magic. This changeable chronicle is scheduled to make its appearance during the International Space Year of 1992, an international effort to focus space studies on global change.

Planners envision the encyclopedia as an information base pooling a vast range of scientific observations pertaining to global change. It is one of several projects of the Space Agency Forum on the International Space Year, an organization established last year to coordinate Space Year activities and currently representing 24 nations. Canada will fund and produce the \$3 million encyclopedia.

This unprecedented resource will combine and correlate diverse sets of measurements — some global, others regional — from a variety of satellite and ground-based studies, updating those data and adding new ones on a regular basis. Its purpose is to enable scientists and others to study and compare the various results at will. The encyclopedia will not be a book, but will instead consist of computer disks. Designed for personal computers with color monitor screens, it will feature interactive software that allows users to “zoom in” and study computer-generated images and contour lines from different viewing angles and distances.

Computer-graphic techniques such as these are becoming increasingly common. Last year, for instance, scientists at Jet Propulsion Laboratory in Pasadena, Calif., produced a “movie” in which viewers could soar over the surface of Mars, based on nothing but a few still photos taken by the Viking spacecraft in 1976.

But the new encyclopedia will have an added advantage: the ability to show how things change over months and years. “This will be the first atlas of the world to show animated land and sea changes over an extended period of time,” says Wesley T. Huntress Jr. of NASA’s Earth Science and Applications Division.

Echoing that enthusiasm is Ralph Baker of Ottawa, Ont., retired director general of the Canada Centre for Remote Sensing and now a special adviser for the Space Year. “This will be the most sophis-

ticated device to show global change that the public has ever seen,” he says. “It’s breathtaking to see the way oceans, temperatures and land vegetation all change, and with satellite information, we can show this in a dynamic way.”

The encyclopedia should prove a useful tool for scientists, but Baker says he hopes it will also attract students and educators in high schools and colleges, including some in the Third World.

Martin Ruzek of Jet Propulsion Lab is charged with rounding up U.S. data for the project. “We’re likely to get a set of six or seven CD-ROMs [computer disks with permanently stored information] that have global data and represent global change from the period of 1982 to 1992,” he says.

U.S. contributions will include global and regional data sets (organized collections of data) drawn from a number of sources, Ruzek says. Most data sets will cover a span of time so that they can show evidence of change. The exceptions will be sets representing baseline data in which change is a minor or negligible factor, such as continental boundaries, topography and ocean depths.

The encyclopedia’s planners are now pondering which data sets to include from the various nations participating in the Space Year. “We’re testing the waters in many ways,” Baker says. Some of the U.S. offerings, such as weather satellite photos taken every 12 hours for a decade or more, will come from the National Oceanic and Atmospheric Administration. Others may include measurements from a NASA satellite called the Earth Radiation-Budget Experiment, revealing variations over time in the amount of solar energy reaching the planet. Images of waves and other changes in the ocean’s surface elevation, as viewed from a now-expired U.S. satellite called Seasat, may also enhance the encyclopedia. Baker notes that Canada, Japan and European nations are now developing similar satellites — possible further grist for the encyclopedia.

NASA is already working on a project that will pool a variety of Earth data. Called the Earth Observation System (EOS) and scheduled to begin in 1997, it’s a 15-year effort involving U.S., European and Japanese satellites. Ruzek describes

its scope as more comprehensive and detailed than the encyclopedia’s. But Compton J. Tucker of NASA’s Goddard Space Flight Center in Greenbelt, Md., points out that the EOS data will take many years to gather, whereas the encyclopedia can furnish useful information much sooner. “If we have to wait until we have these data sets from EOS [to produce the encyclopedia], we may have to wait for eight or 10 or 15 years,” he says.

Deforestation, such as the devastating changes now occurring in the Amazonian rain forest, is one regional concern (albeit with global implications) the encyclopedia could elucidate. Researchers are now using images from the U.S. Landsat and French SPOT satellites, along with data from ground-based and airborne observations, to monitor natural fires and other burning of biomass. Similar techniques would apply to temperate forests in North America and Eurasia.

A project called the Famine Early Warning System exemplifies the value of collecting and correlating long-term data from diverse sources to study a regional problem. Now managed by the U.S. Agency for International Development, it began in 1985 with *ad hoc* efforts in response to the famine in sub-Saharan Africa, says Jonathan Olsson, technical director for the system. While project officials take into account such factors as rising prices and crop conditions, they also include satellite data and photos. “Right now, what we use is the greenness index,” a scale designed to indicate levels of plant productivity and photosynthesis in satellite images, Olsson says. “If the index doesn’t look high enough in our image, we assume that there’s something wrong with the biomass.”

Many individuals and groups in the United States and elsewhere have indicated strong interest in the Global Change Encyclopedia, says Renee Twombly of the U.S. International Space Year Association in Washington, D.C. She notes that when the European Space Agency sent out a questionnaire to assess demand for such a resource, respondents ranged from an entomologist interested in tracking insect-borne diseases to a researcher conducting carbon dioxide studies. Other enthusiastic replies came from members of more than 100 groups, ranging from the Audubon Society to the Idaho Department of Forest Resources.

Serving the varied needs of potential users will require enormous thought and effort from the encyclopedia’s planners. Glinda’s book gleaned its information by magic, sparing her the time and trouble of amassing the data. But using “only” scientific observations, the Global Change Encyclopedia lacks such shortcuts — and what’s more, it must cover a whole planet. □