the explosion is on the way up, but most are not noticed until after maximum. However, in a report on International Astronomical Union Circular 4216 (May 15), G. Meurer of Mt. Stromlo Observatory in the Australian Capital Territory says spectra he took indicate that brightness peaked April 21, well before the first sighting. Two more reports on the same circular indicate that the International Ultraviolet Explorer satellite has taken ultraviolet spectra.

Spectra will tell which type of supernova this is — Meurer says his show it to be Type I — and track its development. They may also tell something about the nature and dynamics of the "lane" of dust that lies across the center of Centaurus A. As luck would have it, the supernova lies behind the dust. Such dust lanes are features of several galaxies, and astronomers are interested in their nature and their relation to the dynamics and evolution of the galaxies that have them. Spectra and a profile of the supernova's brightness over time will also help refine the figure for the distance to Centaurus A.

— D. E. Thomsen

Space commission poses future agenda

Slick, full-color covers, numerous illustrations specially commissioned from some of the best-known artists in their field, and a $14.95 price tag are not the stuff of your average government report. But the National Commission on Space, established by Congress nearly two years ago for the express purpose of writing its report, takes an atypically lavish overview of its subject.

Formed to propose an agenda for the U.S. civilian space program's next 20 years, the group observes that those decisions will have a great deal to do with determining what the world of the 21st century will be like. "We're not predicting it," says commission chair Thomas Paine, a former administrator of NASA. "We are simply trying to say what we can make happen." Even so, the report itself observes, "we are confident that the next century will see pioneering men and women from many nations working and living throughout the inner solar system. Space travel will be as safe and inexpensive for our grandchildren as jet travel is for us."

It is more than mere irony, however, that the report appears amid the most wrenching reappraisal in NASA's history, born of the Jan. 28 Challenger disaster. Though the explosion that killed seven people was followed by the catastrophic failure of two unmanned rockets, it has produced renewed calls for reassigning many of the agency's payloads off of the space shuttle.

Only two days before the report's May 23 official release, for example, the National Research Council's Space Science Board strongly recommended return to a balanced fleet of manned and unmanned launch vehicles, rather than the shuttle-dominated policy that had been in effect before the Challenger mishap. "This policy, which has deprived the nation of launch vehicles for major scientific payloads for almost a decade," asserted the board, "has been devastating for space science." Decisions in recent years to reduce or eliminate production of expendable rockets for NASA "had the effect of making unmanned space missions, including those of space science, dependent on manned vehicles, the shuttle in particular, in a way that caused serious problems for both aspects of the space program," the board said.

In an even more strongly worded opinion in the May 30 SCIENCE, University of Iowa space physicist James A. Van Allen, who has worked in the field since before NASA's origin in 1958, proposes that NASA "suspend manned [space] flight indefinitely pending critical assessment of its justification."

In addition, he urges that the United States "postpone development of the space station." Plans for a U.S. space station were initiated by President Reagan in 1984, but have been opposed by many U.S. space scientists who fear that the station, like the shuttle, will draw off funds that might otherwise be used for scientific projects such as unmanned planetary missions. Even before Reagan's pronouncement, the Space Science Board reported it saw "no scientific need for this space station during the next 20 years" (SN:9/24/83,p.199). The Department of Defense, too, failed to add its support at the time, and though the station certainly has its advocates, it remains a less-than-unanimous goal.

The legislation authorizing the National Commission on Space, however, declared that in carrying out its responsibilities, "the Commission shall take into consideration the commitment by the Nation to a permanently manned space station in low Earth orbit." And the commission's report duly recommends that "the U.S. space station program be kept on schedule for an operational capability by 1994, without a crippling and expensive 'stretch-out.'"

However, the report, budgeted at $1.4 million, also calls for "an aggressive science program," as well as other steps that it envisions will point toward manned planetary exploration by the 21st century, and a six-fold increase in NASA's budget by 2035. *— J. Eberhart*

A world unready for its own hazards

The threat of nuclear war and other nightmares that humans could bring upon themselves have weighed heavily on the public mind for years. But the recent Mexican earthquake (SN: 9/28/85, p. 196) and the volcanic eruption of Nevado del Ruiz in Colombia (SN: 11/23/85, p. 326), each of which killed thousands of people, graphically remind us that nature possesses a violence of its own. Moreover, embedded in the geological record is evidence for mass extinctions that may have been caused by the impacts of asteroids or comets with energies several thousand times greater than the nuclear arsenal, and for volcanoes that erupted with a fury far exceeding any volcanic eruption in historic times.

The message of University of Chicago geologist Joseph V. Smith and other earth scientists is that, while there have been many improvements in geoscience and technology, "the earth is still flying blind" when it comes to recognizing and planning for natural hazards. Smith is rallying for an International Decade for Hazard Reduction, first proposed in 1984 by Frank Press, president of the National Academy of Sciences. In Baltimore last week, at a special session of the American Geophysical Union meeting, he and other scientists discussed the threats of earthquakes, volcanoes, asteroids and comets. A future session will focus on hazards from storms.

Hazards have been assessed in at least 12 countries for more than 30 volcanoes, according to C. Dan Miller at the U.S. Geological Survey (USGS) Cascades Volcano Observatory in Vancouver, Wash. But as Smith notes, more than 800 volcanoes in the world are potentially dangerous. For small to moderate-sized eruptions, says Miller, the technology now exists to monitor and assess these hazards. "But the problem is that we don't have the money to implement them," especially in developing countries, he says.

Even when the scientific work has been done, there are communication problems among scientists, the public and officials, notes Robert W. Decker at USGS in Menlo Park, Calif. "If [your warning] fails, you don't want someone to say you cried wolf, because you didn't," he says. "The wolf was there; he just wasn't hungry."

Cataclysmic eruptions, which occur on average about every 500,000 years and spew out as much as several thousand cubic kilometers of magma, are also a certainty for the future, says Miller. The effects of these events have not been well studied, but Miller notes that their ejected sulfate aerosols could produce "volcanic winters," which, like "nuclear winters," would severely affect climate and food production for years. Since the world has enough food in storage to last only about 70 days, Miller and Smith urge that scientists and policymakers explore the scientific, economic and social issues revolving around the stockpiling of food.

Perhaps the most violent but least likely natural event would be a collision with a large asteroid. Eugene M. Shoemaker of the USGS in Flagstaff, Ariz., and Alan W. Harris of the Jet Propulsion Laboratory in Pasadena, Calif., estimate that the chances of an asteroid 0.5 kilometers in diameter hitting the earth in the next century are about 1 in 1,000. Such an asteroid could be detected decades before impact, they say, leaving some time for evacuating the target area or perhaps for deflecting the asteroid's orbit or breaking it up in space.

"In my mind, the most significant hazard is . . . from smaller bodies whose dimensions are about 10 to 20 meters and which enter the earth's atmosphere once every few decades," says Shoemaker. These meteoric fireballs would not reach the ground, but would deposit into the atmosphere energies equivalent to 1 to 10 megatons of TNT. Shoemaker's and Harris's greatest fear is that the resulting blast would be mistaken by less technologically savvy countries as a nuclear explosion and trigger the more violent action of humans. *— S. Weisburd*

'Weird' crocodile

Jeff Lane/Nat'l. Geo. Soc.

The bone structure shows this to be the skull of an ancient crocodile, but the teeth look oddly mammalian. So the geologists who found this previously unseen head have dubbed it the "weird" crocodile.

Louis L. Jacobs of Southern Methodist University in Dallas and Zefe Kaufulu of the University of Malawi in Africa picked up two of these skulls in southeast Africa in 1984, while looking for mammal fossils in northern Malawi. Kaufulu estimates their age at about 135 million years.

The find is significant because so little is known about the evolution of reptiles or mammals in the Southern Hemisphere during that part of the Mesozoic era, Jacobs says. The scientists — whose work was funded primarily by the National Geographic Society — did not find mammal remains, but they intend to look again in the same area. "It would be silly to think that there weren't mammals living there at the same time," Jacobs says.

Ocean-ridge chemistry at new heights

Some geophysicists would love to cut open the earth like a melon in order to see, once and for all, the inner workings of the mantle. But instead, scientists must be content to study the outer rind for clues to what lies beneath. At the spring meeting of the American Geophysical Union in Baltimore last week, researchers presented dozens of papers intent on trying to decipher and use the complex patterns in the surface topography, gravitational and magnetic fields and chemistry of new ocean crust to understand the underlying mantle movement.

One paper particularly intrigued reseachers at the meeting because it shows for the first time a global relationship between the chemistry of new ocean floor and its depth under the sea surface, a relationship that holds regardless of where the young ocean rocks were found. Moreover, from their chemical analyses, the petrologists who did this work can derive the temperature of the underlying mantle from which magma arose at spreading ridges to create new seafloor.

Geochemists had previously explored the link between the chemistry of ocean crust and its depth, but only in a few, isolated sites. In the recent study, Emily M. Klein and Charles H. Langmuir at Lamont-Doherty Geological Observatory in Palisades, N.Y., measured the content of sodium and other elements in the glasses that coat basalts dredged from a number of tectonically different sites around the globe. These include: the major ridges in the Atlantic, Pacific and Indian oceans; "axial hotspots" at Iceland, the Azores and the Galápagos Islands, where large mantle plumes had arisen; spreading ridges in the small seas behind subduction zones, where one plate plunges beneath another; and small, isolated ridges such as the Cayman Rise in the Caribbean. When the researchers plotted the average values of chemical content versus the average depths of ridges in an area, their data fell along a remarkably clear line.

The chemical content gives Klein and Langmuir a way to estimate how much the now-solid magma had melted. They reason that the greater the extent of melting, the hotter the material had been and the greater the production of melt reaching the crust's surface. More melt would result in thicker crust, which would extend higher than its thinner counterparts and hence would have a shallower depth, being closer to the ocean surface. For example, says Langmuir, "when the mantle is hot it melts more, leading to low sodium content, and thick and shallow crust — that's Iceland." In places like the Cayman trough, which lies 5 kilometers deeper than Iceland, the crust is thinner and contains more sodium.

"Qualitatively, all those features of the ocean crust — depth, thickness and chemistry — correlate with one another in a way that makes common sense," says Langmuir. "But [the correlation] had not been established previously."

Langmuir notes, however, that their scenario of how more melting results in shallower depths, while being "a major contributor," is not the only process governing the depth of the ridge axis. At axial hotspots, for example, other effects — such as uplifting forces of mantle convection — might also play a role in making the crust more shallow.

With their recent finding, Klein and Langmuir think they can create a map of mantle temperatures that would provide an important test for any model of mantle convection. They have already charted temperature variations around the world's ridge systems and have found that the temperature under new crust can change by as much as 200° C over about 1,000 km.

Moreover, says Langmuir, "the chemistry and thickness of [old] ocean crust may tell us the temperature in the mantle at the time the crust was made during the past 150 million years." The researchers tried out this idea at one site in the western Atlantic, where drill hole measurements and seismic studies gave them information on the chemistry and thickness of the crust. They found that when the crust was at the Mid-Atlantic Ridge more than 65 million years (Myr) ago, the mantle may have been much hotter than it is today.

Before the researchers can apply their results to older crust, they need to test their theory at many more sites. They would also like to see if they can link chemistry and depth on much smaller scales — along individual segments of mid-ocean ridges, for example. In addition, Langmuir says, they want to use measurements of sodium and other major elements to a much greater extent than they have been used in geochemical studies in order to help estimate the degree of melting in the mantle.

Finally, Klein says they are using their findings to test an idea about old ocean crust. Scientists have noted that ocean crust gets deeper as it cools. But this process stops at 80-Myr-old crust, suggesting to some that the crust there is conductively heated and uplifted. Klein is now looking at the sodium content of this crust to determine if, instead, the crust 80 Myr ago was simply much thicker. *— S. Weisburd*