pure metal in a compound form, the report says. Preventing criticality—the energy-liberating fission chain reaction—is achieved by limiting the plutonium concentration in each part of the ORNL process.

The report does not describe how much time is needed to melt plutonium into a form that can be machined into bomb parts or describe how to develop the rest of the bomb-production process.

The study has served to fuel antinuclear sentiment, however, by suggesting that commercial power reactors are a risk to nuclear proliferation. A June 1976 report by the Joint Committee on Atomic Energy listed only nine countries which it said did not already have nuclear weapons but appeared technically capable of developing and detonating one within three years of deciding to do so. Those countries are Canada, Israel, Italy, Japan, the Republic of China, South Africa, Spain, Sweden and Switzerland. The ORNL study expands this list to include any country that operates a commercial or experimental reactor or has access to such a facility. Normally the somewhat lengthy development time necessary to safely produce a weapon that could be reasonably assured of producing a sizable yield would allow "timely warning" of that capability. ORNL's process eliminates assured "timely warning."

However, the Energy Department's Dennis Spurgeon told SCIENCE NEWS that the ORNL concept is not much of a real proliferation threat. First, any country that imports nuclear technology in the form of a power reactor does so because it feels it needs nuclear power to assure its energy future. By pirating fuel for weapons it would violate nonproliferation policies of the countries that supplied the fuel or equipment and thereby sacrifice any hope of receiving future supplies, Spurgeon said. Second, he said that it is still very difficult to make a good nuclear bomb, and that it was highly unlikely that "bandits" would have the necessary nuclear sophistication. Except for the possible scare value associated with nuclear weapons, bandits would be better off stealing conventional weapons for a real tactical advantage, he said. Finally, stealing spent fuel is difficult. Commercial fuel rods weigh one-half ton each and are highly radioactive. Thieves would likely die after only minutes of exposure, he said, and one or two rods would be necessary to get enough plutonium for a single weapon. Casks normally used to transport spent fuel would also have to be stolen, and their size, weight and availability would make the action hard to conceal. Since the reprocessing itself is also "dirty," or radioactively unsafe, the lives of the proliferators are threatened.

It appears that what the report best illustrates, then, is that nuclear proliferation need not be especially difficult, but it still requires important, and what may turn out to be unnecessary risks and costs to those involved. □

The cold seas of 18,000 B.P.

Concern about possible future climatic change has led to new scientific efforts to better understand past climates. One of the more intriguing of these activities is the CLIMAP program, a National Science Foundation-sponsored effort to chart climates at specific times in the past. CLIMAP investigators are trying to get as detailed a picture as possible of what the climate everywhere in the world was like exactly 18,000 years ago, at the peak of the last glaciation.

Ocean conditions for February and August 18,000 B.P. (before present) for two widely separated parts of the earth, Antarctica and the eastern Mediterranean Sea, were reported recently at the annual meeting of the Geological Society of America in Seattle. Both showed greater differences from the present than were expected.

The analysis of the waters around Antarctica shows that, in the Atlantic sector, winter sea ice extended as far north as 46 degrees south latitude, a full 10 degrees farther than it does now. Thus the extent of the sea ice in the Southern Hemisphere was as great as the extent of the continental glaciation in the Northern Hemisphere. During summer the surface temperatures then in the southwest Atlantic were 8°C (14°F) colder than they are now.

The Pacific sector of Antarctic waters underwent smaller-scale changes. Sea ice extended 3 degrees farther north than it does today, and temperatures averaged 2°C cooler.

The Antarctic temperature maps were reported by James D. Hays, David W. Cooke and three other colleagues from the Lamont-Doherty Geological Observatory. The maps and data represent the official report of CLIMAP's Antarctic task group. The information in them was gained from analyses that are "very new and not yet published," says Cooke. A variety of evidence was used to produce the paleoisotherm maps. The extent of sea ice during August (winter), for instance, was based on the occurrence in precisely calibrated deep sea cores of fossil remains of a particular diatom (algae) that lives only in near-ice waters.

Although the Antarctic data show that the southern polar regions were undergoing extensive ice conditions at the same time as the period of maximum glaciation in the north, 18,000 years B.P., they also show that these conditions apparently abated faster in the south. By 14,000 years ago, Cooke says, the southern waters had reached much the same ice-free condition as today. By comparison, the major retreats of northern hemisphere glaciation did not take place until about 11,000 years ago.

The reconstruction of the climate of the eastern Mediterranean Sea was reported by CLIMAP investigators Robert C. Thunell and James P. Kennett of the University of Rhode Island. The greatest differences between present-day and 18,000-B.P. sea surface conditions existed in the Aegean Sea and immediately south of Crete. Winter temperatures in the Aegean were as much as 6°C cooler than at present; summer temperatures south of Crete were 5°C cooler than at present. The Aegean Sea was also less salty than it is today, by about 5 parts per thousand, although near the Strait of Sicily that difference decreases to 1.5 parts per thousand.

All these patterns of differences, Thunnell and Kennett say, are probably due to changing drainage patterns during glacial times and the diversion of cool, low-salinity water into the Aegean Sea.

"The magnitude of the observed oceanographic changes within the eastern Mediterranean," they say in summary, "are greater than those previously reported." □

Child altruism: Saving Johnny not mommy

What would you do if two tigers escaped from the zoo, and one leaped for your mother, the other for your best friend—and you had a gun with only one bullet? You might say it depends on how you feel about your mother and your friend, but one school of sociobiology (SN: 11/29/75, p. 347) says your choice is largely predetermined by genetics.

According to the "kin selection" or "kinship genetics" theory, your altruistic action would be directed toward your mother because social organisms instinctively spring to the defense of relatives before they would do so for nonrelatives. The theory suggests that a person will altruistically defend not only offspring—to insure the promotion of their genes into succeeding generations—but parents, siblings, cousins, nieces, nephews and other relatives as well. Supposedly, the closer the relative, the more likely it is a person will come to his or her aid. In most cases, a non-related individual would be the recipient of aid when the costs to the benefactor are low, and when the non-related individual is not in competition with a relative's need for aid, according to the kin selection theory.

Although this view has been confirmed in field studies of animals, "To date, no empirical evidence has been gathered either in support or refutation of human altruism based on kin selection," says Harvey J. Ginsburg of Southwest Texas State University. Ginsburg, along with co-researchers Sandra Hense and Brian Bielefeld, recently tested the kin selection theory with 70 children, 3 years to 10 years of age. He reported the

study at the Psychonomic Society annual meeting in Washington.

The children were asked to rank in order their five favorite relatives and five favorite friends. The youngsters were then given hypothetical danger situations—such as the leaping tigers—for each friend-kin pair.

"The results of the study did not fully support the sociobiological argument of kin selection as an underlying biological mechanism mediating altruistic behavior," reports Ginsburg. In fact, up to the age of 6, children more often (52 percent of the time) chose to save or help a friend rather than a relative. "There was absolutely no pattern to the decision making," Ginsburg adds. "Moms, dads and siblings were thrown to the wolves as often as cousins or other distant relatives."

In marked contrast, children older than 6 opted for saving a friend only 14 percent of the time; in the 9 and 10 year olds, that percentage dropped to near zero. "Of the 45 children in the 6 to 10 year age range, only three preferred friend over kin in three or more of the five hypothetical danger situations presented," Ginsburg reports.

However, 13 of the 25 children younger than 6 responded in the majority of stiuations in favor of the friend. When asked why, a "significant number" of the youngsters answered, "Because my friend is little"—the implication being that "Mom or Dad would be better able to fend for themselves, even though each situation was inescapable," says Ginsburg.

The results suggest, particularly to opponents of sociobiology, that "devotion to kin is a culturally acquired process, and as such has little to do with any presumed biological origins of altruism," Ginsburg says. "They might also note that the age of the shift occurs at a time when children are entering an expanded social milieu—elementary school—adding further to the claim that loyalty to kin is a learned, reinforced process of childhood socialization and is not a biological phenomenon."

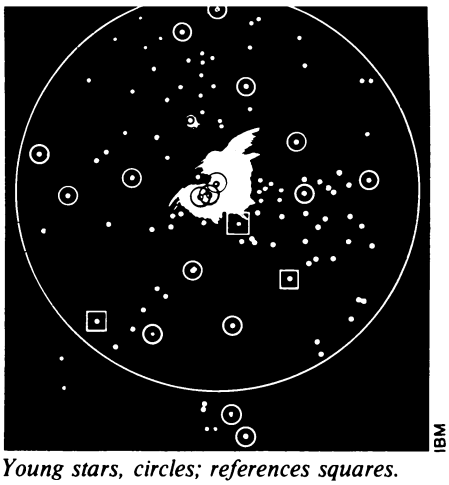
Sociobiologists, on the other hand, might point to the explanation of the friend's "littleness" as an indication that "small children possess physical features ... that release caring and aid-giving on an innate basis, and that this factor temporarily overrides kin selection," reasons Ginsburg. Pro-sociobiologists might also argue that kin selection doesn't really take effect until the approach of pubescence. "As the possibility of one's own genes being placed into succeeding generations nears, perhaps only then does the biological link between kinship and altruism become manifest," he says.

"Whatever the case, these results demonstrate that blood and water have nearly the same consistency early in the life span. It takes about six years of fermentation before blood truly becomes thicker than water," Ginsburg told his colleagues. □

Cloud collapsing, stars forming

Spectroscopic studies of celestial bodies can tell astronomers what chemical substances are present in them and also if those substances are moving, but not necessarily which way they are moving. For example, studies of the gas cloud associated with the Orion nebula indicate that the gas is moving, but are ambiguous about the direction. Is the motion an inward collapse of the cloud, or is it local turbulence? The controversy is important because astronomers think the Orion cloud is a place where new stars are forming, and the usual theory of star formation requires a collapsing cloud.

Evidence that such a collapse is taking place is presented in the Nov. 1 ASTROPHYSICAL JOURNAL by Frederick W. Fallon of the University of South Florida, Humberto Gerola of IBM and Sabatino Sofia of NASA. They measured the proper motions (motions across the sky) of 140 young stars in the neighborhood of the cloud. They reasoned that if those stars are really in the cloud (not in front of or behind it) and have formed recently from the cloud's matter, then the stars should be partaking of the cloud's motion. The measurements used 65 stars near the group of young stars as references in a plate-overlap technique recently made available by computers.



Young stars, circles; references squares.

The results show that the young stars do appear to be falling toward the middle of the cloud, the inside ones moving faster than the outside ones as the kinematics of such a collapse requires. The surprise is that even stars far from the center of the cloud appear to be related to it and forming from its matter. The usual theory would not have expected to find stars forming in such tenuous parts of the cloud, but only in its denser inner parts. The answer to why stars form in the outer parts may involve the chemistry of the cloud, and Gerola is experimenting with simulations of reactions that may take place between molecules known to be in the cloud. □

Lasker awards to five Europeans

Development of diagnostic ultrasound and research into prostaglandins (local hormonal regulators in the body) have brought Albert Lasker Medical Research Awards for 1977 to four Swedish scientists and to one British scientist.

The two co-recipients of this year's $15,000 Albert Lasker Clinical Medical Research Award are C. Hellmuth Hertz, head of the Department of Electrical Measurements of the Lund Institute of Technology in Lund, and Inge G. Edler, associate professor of medicine at University Hospital in Lund. Hertz has been recognized for pioneering the development of ultrasound technology, which has resulted in noninvasive methods of diagnosis in obstetrics, gynecology, urology, cancer and other areas (SN: 6/4/77, p.360). Edler has been recognized specificially for developing ultrasound diagnosis of heart abnormalities. Ultrasound is probably the most important noninvasive tool for performing heart diagnosis since the electrocardiograph (EKG).

The three co-recipients of the 1977 Albert Lasker Basic Medical Research Award are K. Sune D. Bergstrom, professor of chemistry at the Karolinska Institute in Stockholm, Bengt Samuelsson, chairman of chemistry at the Karolinska Institute, and John R. Vane, group research and development director at the Wellcome Research Laboratories in Beckenham, England. Bergstrom has been cited for his classic achievements in isolating prostaglandins. According to the Lasker jury, "Dr. Bergstrom is the acknowledged world leader in the prostaglandin field." Samuelsson has been honored for his exceptional accomplishment in explaining the biosynthesis of prostaglandins, analyzing their metabolism and developing new methods for their measurement. Vane is a winner for his discovery of prostaglandin X, now renamed prostacyclin, whose major action is to prevent formation of blood clots that may lead to heart attack and stroke.

In 1970, the first international meeting on prostaglandins was held at the New York Academy of Sciences. Many scientists prophesied then that these messengers, which do an incredible number of things in the body, would become the miracle drugs of the 1970s, just as steroid hormones were the drug finds of the 1950s and 1960s (SN: 10/10/70, p.306). Indeed, a number of prostaglandin drugs have been developed since then and are already clinically available or looking promising, notably in the areas of human and livestock reproduction, stomach ulcers and arteriosclerosis (SN: 9/20/75, p. 188).

Numerous Lasker recipients have gone on to win Nobel Prizes. This year was no exception. All three Nobel medicine winners had previously won Laskers. □