

## A penny for your thoughts

Survey takers are in trouble. Public opinion surveys are the basic tool of social science research. They attempt to understand human behavior as a basis on which to make public and private policy decisions. But in the social climate of the 1970's it is becoming increasingly difficult to get people to complete surveys. The U.S. Bureau of the Census, for instance, gets up to a 96 percent completion rate. Some private survey organizations report completion rates of only 65 percent—a decrease from the 85 percent rate of the 1960's. These figures are part of a report released by the American Statistical Association (ASA).

"The difficulty of obtaining completion rates adequate for reliable data have increased the cost of surveying human populations to the point where costs may become the critical factor in determining whether some surveys can be done at all," the report said.

The report lists several reasons for declining completion rates: a rising concern with the invasion of privacy, a fear of lack of confidentiality and refusal to answer questions as a form of protest against some part or all of established society. The ASA is conducting a study of survey methods in an attempt to find ways to increase completion rates. So far, the only workable answer seems to be cash rewards or premiums for respondents.

## The hypnotic mystery

Hypnosis is often used to control pain but the processes of hypnotism, like those of acupuncture, are something of a mystery. One explanation may be that pain is masked by the hypnotic state while some hidden part of the consciousness actually feels the pain. Ernest R. Hilgard of Stanford University has compared the subconscious and conscious experience of pain. The results were reported at the recent meeting of the American Association for the Advancement of Science.

Subjects were asked to experience pain by immersing their forearms in ice water. While in the hypnotic state, these subjects were told to use their free hand to write or indicate the degree of pain they felt on a scale from 0 to 10, or to say how much pain they felt. At the same time they were told they would not know if they said or indicated anything at all. Returned to wakefulness, they not only were unable to remember any pain but did not realize that they had indicated any pain while in a trance. In fact, the subjects had indicated almost as much pain as when conscious.

## The ancient art of tattooing

Tattooing is now called body art but it certainly is not a recently devised practice. It consists of puncturing the skin in the desired pattern and rubbing in coloring material so that the pattern is indelibly fixed. Early historians and writers, long before the Christian era, mentioned the practice of tattooing the human body. Now there is more than textual evidence of ancient tattooing. Beach erosion on St. Lawrence Island, Alaska, has revealed the frozen, naturally mummified body of an Eskimo woman. She has tattooing on both her lower right and left forearms. Radiocarbon dating indicates that the body is about 1,600 years old. George S. Smith of the University of Alaska is investigating this find with Michael R. Zimmerman at the University of Pennsylvania and Zorro A. Bradley of the National Park Service.

## Satellites join the border patrol

A critical problem facing developers of offshore oil holdings is the uncertainty in locating the boundaries of the leased areas. Since survey teams from the National Oceanic and Atmospheric Administration at present make their measurements from land, the difficulty is greater for sites farther out to sea. To find a way of making more accurate determinations, NOAA is now trying Doppler measurements from the U.S. Navy Navigation Satellite System.

The system has been used to establish the positions of two offshore oil platforms in the Gulf of Mexico, 40 and 100 miles off the Louisiana coast. The platforms provide reference points for measuring the boundaries of a leased area. Since oil deposits can spread far horizontally from the drilling point, a boundary variation of a few dozen feet can cause a major dispute. Officials estimate that the Doppler measurements are accurate to within plus or minus six feet, with the accuracy increasing for greater distances. The test survey was done at the request of a group representing major oil interests in the Gulf, where platforms are up to 150 miles from shore.

## How high the sea

The last time the ocean stood substantially higher than it does today was about 120,000 years ago, according to a team of researchers from the University of Southern California. This has been theorized before, report Teh-Lung Ku, Margaret Kimmel, William Easton and Thomas O'Neil in the March 8 *SCIENCE*, but it has been difficult to pin down. The reason is that such measurements usually depend on dating material along ocean coastlines, which is complicated by the tectonic movements of the coasts.

The California scientists chose the coral surrounding the Hawaiian island of Oahu as a good spot for dating, since the island is considered to have been relatively undisturbed since before the supposed ocean peak. Thorium 230-uranium 234 dating of 18 samples of coral indicates that 120,000 years ago, the shoreline lay about 7.6 meters above its present level (plus or minus two meters).

In the subsequent glacial period, the global ocean level dropped as much as 70 meters, says Ku, and through several up-and-down cycles it apparently never rose any closer than 10 meters to its present level. The global ocean now seems to be just passing the peak of a major rise following a glacial period about 18,000 years ago in which it may have fallen as much as 100 to 150 meters.

## RUFAS rides again

A sledlike robot driver named RUFAS II has been built to help locate new stocks of fish and other undersea resources. Officially known as the Remote Underwater Fisheries Assessment System, it can look up, down and sideways, recording what it sees on videotape and film.

The half-ton explorer was developed by the National Marine Fisheries Services and Mississippi State University, and in tests has dived as deep as 2,400 feet.

Its prototype predecessor, RUFAS, has covered more than 6,000 survey miles underwater, but mostly at depths of only about 300 feet. In addition, RUFAS requires continuous guidance from someone on shipboard, a tedious task when many surveys can run 10 hours at a stretch. RUFAS II has an automatic guidance system that lets it glide along on its own until its sonar detects a hazardous obstacle. It then signals the towing ship, where human controllers can alter its course.