

of Shatsky Rise, north of the Marianas, was the deepest water in which drilling has ever been attempted, 19,622 feet.

Sediments deposited on the ocean floor over the millennia by the rain of organic debris and silt are invaluable tools in the study of sea-floor spreading. Since the sediments ride passively as passengers on the crust as it is slowly forced outward from its birthplace at the mid-oceanic ridge by even younger crust, marine geologists expect to find older and thicker sediments in cores taken farther away from the ridge. This was found to be the case in the Atlantic Ocean, during the first four legs of the project.

The geologists expected to find the sediments increasing in age westward across the Pacific. And since the distance is so vast, they hoped to obtain cores of material from the early Mesozoic or even late Paleozoic eras—about

225 million years ago.

From Hawaii westward, the sediments did increase steadily in age. Layers of nearly impenetrable chert, or flint, in the sediments often prevented the diamond-tipped bits from penetrating as deep as the scientists had hoped, but samples at least 140 million years old—from the Jurassic period of the Mesozoic—were recovered. The area of antiquity lies east of the Mariana-Bonin Islands and north of the Caroline Islands. Only in a thin strip at the very western edge of the Atlantic have sediments this old previously been found.

“What we found is a substantial segment of the Pacific floor which is as old or older than the entire history of the Atlantic Ocean floor,” says Dr. Peterson. “It is just one section of the ocean floor that has survived the vicissitudes of continental drift and sea-floor spreading.” ◇

## ORAL CONTRACEPTIVES

### Only a yellow light

Legally, birth control pills are safe. After three years of exhaustive study of oral contraceptives, advisers to the Food and Drug Administration conclude that the benefits of the pills outweigh the risks and, within the meaning of the law, it is safe for the 8.5 million women in the United States who take these drugs to go on doing so.

However, the specter of dangerous side effects ranging from blood clots to cancer still looms.

A 200-page report issued last week by the FDA's Advisory Committee on Obstetrics and Gynecology raises as many questions as it answers and in no way removes the suspicion that oral contraceptives may be a hazard to health.

**The document is** the committee's second statement on the pill. The first, issued in 1966, said that there were no adequate data to prove these hormone compounds unsafe for human use, though there were “possible theoretical risks” (SN: 8/27/66, p. 131). The second report supplies some of the previously missing data.

The relationship between birth control pills and thromboembolism is but one example, illustrating both a case of known risk and the difficulties in determining a cause and effect connection between the drugs and disease. Says Dr. Louis Hellman of the State University of New York at Brooklyn and chairman of the advisory committee, “Eight years were required from the time of the first reported death to establish the relative risk and an etiologic relationship to the hormonal contraceptives.”

Now, two studies have satisfied authorities that there is a direct connection. Research conducted in Great Brit-

ain (SN: 6/28, p. 611) shows women taking the pill are eight times more likely to develop blood clots than those who do not take it. In the U.S., a survey called for in the 1966 FDA report and directed by Dr. Philip E. Sartwell of Johns Hopkins University finds the risk of clots to pill users is four times greater than for non-users.

A possible carcinogenic action of hormonal contraceptives, by contrast, remains unproved. Estrogens are known to cause cancer in at least five species of animal. Whether or not they can have the same effect in man is open to speculation. But, according to Dr. Roy Hertz, a committee member from Rockefeller University in New York, extensive investigations should be launched to find an answer.

Dr. Philip Corfman, FDA adviser and director of the Center for Population Research at the National Institutes of Health, emphasizes the importance of determining the effect of birth control pills on human metabolism to evaluate their relationship to hypertension, kidney function, neurologic disease and diabetes. To tackle these questions and to find new and better contraceptive drugs, the NIH center has \$3 million to support a host of research projects, with 70 underway (SN: 6/7, p. 556).

Summarizing the FDA's present stance, Commissioner Dr. Herbert L. Ley Jr., says overall findings on oral contraceptives are favorable, particularly in view of the low incidence of reported reactions compared to the extraordinarily high number of women who take the drugs. Dr. Hellman, however, says only that “the light is still yellow—meaning caution.”

## QUARKS

### Five cosmic events

Physicists using the most powerful accelerators available have repeatedly failed in their efforts to produce and detect quarks, theoretical particles with fractional charges, of which all known particles might be composed. Failures at Brookhaven National Laboratory's 33-billion-electron-volt (GeV) accelerator, CERN's 27 GeV and Serpukhov's 76 GeV have convinced the physicists—those who still believe in the physical existence of quarks—that they would have to go to considerably higher energies (SN: 5/31, p. 538).

**And while those** physicists await the next generation of accelerators, CERN's 300 GeV and the 200-400 GeV at Batavia, Ill., theorists, including quark inventor Dr. Murray Gell-Mann of the California Institute of Technology, have tired of the hunt. They are willing to call quarks simply a mathematical concept that helps explain particle physics, and go on to greener pastures.

But there is a source of particles more powerful than even the most powerful foreseen accelerator can produce: cosmic rays. And from a British-born cosmic ray physicist who has built the world's largest array of cosmic particle detectors has come a report of the discovery of a quark, a report that has physicists buzzing and, if it stands, could set the whole world of particle physics on its ear.

Dr. Brian McCusker of Sydney University invested eight months and 60,000 photos of tracks in four intricately connected low-pressure cloud chambers. His report of five heavy quark tracks, each two-thirds the charge of an electron, was made last week to the Budapest cosmic ray congress of the International Union of Pure and Applied Physics. His paper has been referred and accepted for the journal *PHYSICAL REVIEW*, where it will be published shortly.

Quarks are supposed to come in three configurations, each with an antiquark: one with two-thirds the charge of an electron and two with one-third the charge, one plus and one minus. McCusker's five tracks are described as those of the two-thirds variety. And, despite criticism from his colleagues of the possible statistical inadequacy of his results, McCusker and his allies stand firm. He is convinced that, despite the small number of positive events he has detected, the deviations of the tracks he has recorded from what would otherwise be expected are adequate proof of the discovery of the fractionally charged particles he was seeking.

“Too many precautions and too much care was taken for five tracks all to

have been gate-crashing, low-energy particles," he declares. "The chances that this could have happened five times in our circumstances are about one in a billion.

"I believe we have found the quark and that this is the final particle . . . I am 99 percent sure the tracks are those of quarks of two-thirds primary charge.

"I guess this is the end of the road."

McCusker, whose own reputation among physicists is sufficient for his report to be taken seriously, though critically, is backed cautiously by his boss. Dr. Harry Messell, head of the school of physics at Sydney, will not say yet that the quark has been proved, despite the fact that the possibility is "terribly exciting."

"I will not say we have proved the quark," he says. "We will soon search for the one-third charge subatomic fragment, and when we find that all will be tied up."

"If it can be found, we will find it," says McCusker.

**McCusker has built** the world's largest array of cosmic particle detectors, covering nearly 100 square kilometers at Pillaga State Forest in New South Wales. He has been seeking the postulated limit of 100 billion GeV for cosmic ray particles.

Two years ago he became convinced that the frequency of high-energy primary cosmic particles, and the violence in the cores of the cones of secondary particles, made cosmic particle collisions with the atmosphere the only possible mechanism for the discovery of a quark on earth.

Working with physicists Dr. L. S. Peak and Dr. L. R. S. Woolcott and graduate student Ian Cairns, McCusker built the array of cloud chambers and ran them around the clock for eight months.

He surrounded his four-chamber system with a special lead barrier to guard against low-energy debris and background radiation.

From the Pillaga array and other detectors scattered around the Sydney campus, he recorded primary particle collisions with the upper atmosphere at energies upwards of 500,000 GeV. He used these as clues to events powerful enough to have produced quarks detectable in his chambers.

Most physicists in recent years have abandoned cloud chambers for the more popular bubble and spark chambers. But McCusker's enthusiasm over his cloud-chamber results, he says, "will mean people all over the world will turn back now to high-pressure cloud chambers" suited to this kind of event.

McCusker himself is already building a high-pressure cloud chamber near Sydney for his own piece of the search.

## A manpower oversupply

As the American Chemical Society gathered in New York City this week for what was expected to be the largest assemblage of chemists and chemical engineers of all time, their president was expressing concern about an area of vital interest to all of them—the job market. The outlook—at least for the short range—is far from rosy.

"Let's face it," said Dr. Wallace R. Brode, president of the 115,000-member organization, "we are in a recession. Look at the interest rates. Look at the stock market." (The Dow-Jones industrial average had dropped 7.6 points the day before.) "In addition, cutbacks in Government science funding are affecting us all."

"It is not a very pleasant situation," confirms Mrs. A. M. Bellew, director of the ACS Employment Clearing House. "I would say there is about a two-to-one ratio of applicants to jobs available. This trend started somewhat last year, but it is really bad this year."

One registrant, a Ph.D. chemist with 12 years experience, now working for one of the nation's most respected private research laboratories, says he finds the situation "very, very tight. You have to have almost exactly the type of experience they want."

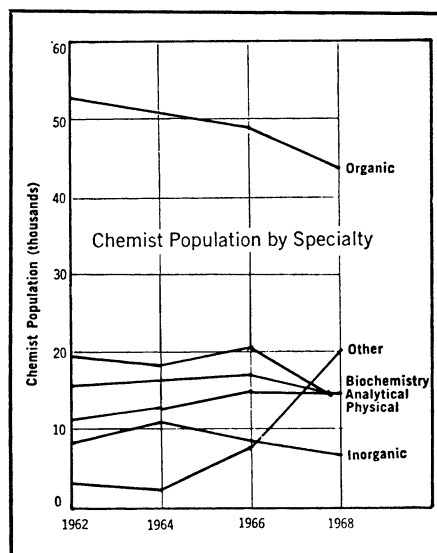
Another, a young Ph.D. inorganic chemist, says things seem to be getting tighter and tighter. "I want to teach, and I find that when an attractive position opens up there are 40 to 50 applicants.

"In fact, the job situation in chemistry is worse than in any other time in the past decade."

The poor economic climate comes after a year that again saw record numbers of persons receiving degrees in chemistry—some 10,800 bachelors degrees and 1,780 Ph.D.'s. In 1965 there were 10,000 BS degrees in chemistry, and 10 years earlier there were fewer than 6,000.

**The trend is still up,** and the two factors combine for the inevitable—a tight job market. Things would be even worse, points out Dr. Brode, if the college graduates who comprise 30 percent of the men now being drafted into military service were placed on the job market. This is of course no comfort to the chemists.

Statistics compiled for the last six or seven years by the ACS show that each year—for whatever reason—about one percent of the persons who receive a degree in chemistry—bachelors, masters, or Ph.D.—have reported that they were unable to find a job in the three summer months following graduation. The cut-off for receipt of this year's questionnaire to new chemistry graduates has



ACS

### Chemical manpower's shifting profile.

been set for next week, and the staff is eager to see how much the figure will rise above one percent. It appears to be a question of how much, not if.

Not only is the market tightening up generally, but, as a recent American Chemical Society survey demonstrated, the patterns within the professions that make up chemistry are shifting radically.

**Fewer and fewer chemists** regard themselves as practicing in the classical fields of organic, inorganic, analytical and physical chemistry. New inter-specific fields are emerging and more persons are finding work on the edges of technical practice.

A chart of the ACS findings shows a decline in all of the classic chemical disciplines, and the only rise in a category called "other."

This includes such occupations as abstracting, indexing and information retrieval, education, chemical literature and nomenclature, patents and library work. The largest percentage of other-occupied chemists is in education, with marketing next in line.

"What we need is another Sputnik," says a postdoctoral fellow, who has found academic positions especially scarce. "Let's hope it's in chemistry."

"Analytical chemistry is not too bad, though, and biochemistry is in pretty good shape. Of course, if you are in polymer chemistry you've got it made—that's always big."

A recruiter for the Johnson's Wax Co. typifies the employer's situation. "We can afford to be fussy this year. In the past we've had a lot of competition, but this year the supply of chemists seems to have caught up with and