the environment of high altitude which man can achieve. Between the Andean native and the newcomer is the individual with an intermediate degree of adaptation. He is the man of European ancestry lacking any racial or genetic elements of acclimatization which the man of the Andes may inherit." In North America, Leadville—where people have lived for about 100 years—is the only home of these intermediate individuals.

Although scientists strongly suspect genetic factors play an important part in high altitude adaptation, their precise role is still to be investigated. However, evidence of genetic alterations at high altitudes comes from Dr. Elizabeth Carles-Trochain of the National Center for Science Research, Toulouse, France. When African natives migrate to high altitudes, she finds, they lose the blood factors that give them immunity to diseases such as malaria and sickle-cell anemia that are common in their native countries.

Studies of Bolivians, who practically all have type O blood, also suggest high altitudes may modify and standardize genetic factors which are much more variable in lowland populations. Dr. Carles-Trochain says. ◈

SATURN 5

Excellence Aloft; Exuberance in the Bunker

The Apollo 4 spacecraft returned to its Downey, Calif., birthplace last Wednesday after a leisurely, six-day journey aboard the aircraft carrier Bennington. Crewmen had fought high winds and rough seas for two and a half hours to haul the capsule from the Pacific, following a most unleisurely journey in which Apollo 4 traveled more than 11,000 miles into space and put the U.S. men-on-the-moon program back in orbit.

U.S. AHEAD IN MOON RACE! claimed the headlines and, indeed, U.S. space officials were exuberant. They had flown Apollo's mighty Saturn 5 rocket before the launch of any Soviet superbooster, such as the 10-million-pound-thrust monster (a third stronger than Saturn 5) whose existence has already been announced by U.S. space officials. But such an advantage is largely a paper one. Development flight schedules are so complicated—the U.S. must fly at least 10 more missions before trying for the moon—and the Soviet space program is held so close to the vest that winning individual battles tells little about who will win the war.

Furthermore, even if the U.S. leads in the brute force department, the Soviet Union may have an edge in maneuverability. The automatic docking, apparently on the first try, of Cosmos satellites 186 and 188 on Oct. 30 (SN: 11/11) could represent a test of a shortcut technique to enable a manned spacecraft of the Russian Soyuz type to join a second booster in orbit. Eliminating the need for carrying the crew and its equipment up from the ground on the main booster would greatly reduce weight and could save fuel for extended maneuvers or high speeds.

Still, this is largely speculation.

In the real context of the U.S. space program Apollo 4 was an unqualified success. Or rather a series of successes.

There had been several delays—the flight had been scheduled for launch almost a month before, and checkout difficulties had slowed things down so much that one 53-hour test lasted 18 days. But the final date had been set for almost a week, and it held despite problems with batteries, computers, fuel tanks and the fickle Florida wind.

The first cluster of firsts took place simultaneously at the launch, as the Saturn 5's 7.5 million pounds of first-stage thrust lifted the great white needle into the air. This was at once the heaviest object ever lifted off the earth, the first flight of the S-1C first-stage booster and the first flight of any Apollo hardware since some shoddy wiring caused a fire that killed three astronauts in their spacecraft during a ground test last Jan. 27 (SN: 2/4). The flight also marked the first operational use of America's moonport, Cape Kennedy's launch complex 39.

The fiery tail of the booster was visible until Saturn was almost 40 miles up, at which point the first stage ceased firing, blasted free and fell into the sea. The second stage, also on its maiden flight, fired for about six minutes, its total working life, and carried its payload to an altitude of 117 miles. There it in turn was jettisoned while the S-IVB third stage propelled itself and the spacecraft into a circular orbit less than two percent out of shape.

After coasting twice around the earth, the third stage scored one of the most important advances of the flight. Though it had flown three times in earlier tests, the S-IVB had never before had to restart its engine in space. This will be necessary on the manned lunar flight to push the Apollo spacecraft out of its parking orbit around the earth and onto a course for the moon.

The S-IVB restarted on cue. Up to the restart, the entire flight plan was an exact duplication of the one that will be used to send men to the moon. There it began to differ.

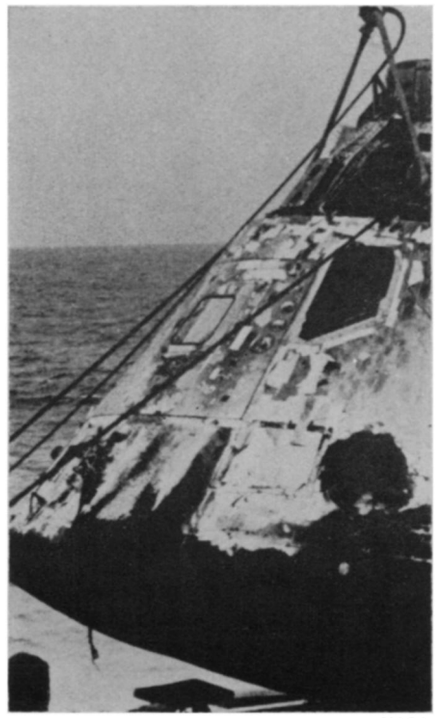
Had the spacecraft been pointing in a different direction, and had the S-IVB's engine burned 19 seconds longer, the unmanned Apollo capsule could have gone to the moon. Instead, its orbit was stretched so that it would reach more than 11,200 miles from earth, in order to provide enough speed coming back in to produce the terrible heat—more than 5,000 degrees F.—that will be encountered on the return from the moon. The spacecraft fully tested for the first time the Apollo heat shield, made of a phenolic material that uses up heat by boiling away.

During the two-and-a-half-hour trip to the distant apogee, the S-IVB was jettisoned. The spacecraft's guidance system kept the vehicle turned so that the thick side of the heat shield, which would bear the brunt of reentry heating, was constantly in shadow, so it could later absorb as much heat as possible.

On the way back from apogee, the spacecraft propulsion system fired a second time, kicking the reentry speed up to about 25,000 miles per hour, equal to that of a lunar return flight.

Reentry presented no problems. Two communications blackouts occurred as predicted, due to the ionized plasma sheath that formed around the spacecraft as it skipped through earth's upper atmosphere. Thanks to the new heat shield, the cabin apparently never got hot enough to become uncomfortable for any human occupants.

Now the command module—almost the only thing left from the 363-foot



NASA

Apollo emerges from Pacific.

stack of hardware that was launched from Cape Kennedy—is back in Downey, where it was first assembled by North American-Rockwell Corp.'s space division. Engineers and technicians have been climbing around it for days, checking the capsule from stem to stern, even though it did everything right. Core samples are being taken from various points in the heat shield, half of which are being sent to Houston for study by NASA while the rest will be examined by the company.

The spacecraft's batteries and inverters are being checked to see how much they were taxed by its power needs. The windows are being examined for micrometeoroid damage. Special attention has been given to the hatch seal, the only part yet flown of the new, quick-opening hatch that was added to the design of all manned spacecraft after the astronauts in the January fire died behind a door that required two unavailable minutes to open. Handholds, antennas and every other item that formed any bump or rough spot on the heat shield, where extra heat concentration might burn a hole through the spacecraft, were under study.

Five flights are scheduled next year in the Apollo program. Two will be unmanned earth-orbital tests of the lunar module, which has not yet been in space; two will be Apollo-Saturn 5 flights, virtual duplicates of the Apollo 4 mission; and the last one of the year will be the first manned Apollo flight, complete with Saturn 5 booster, lunar module and docking maneuvers.

Another five flights are set for 1969, and the last of them might—NASA is much less positive than it was before the fire—actually take astronauts to the moon. ◈

AS LEAKEY PREDICTED

Man's Earliest Known Ancestor

Last February, renowned British anthropologist Louis S. B. Leakey declared (SN: 2/25) that someday he hoped to discover in Kenya traces of a "missing link," some 5 million years old. He predicted, however, that an even earlier ancestor of man's might be turned up by Prof. Elwyn L. Simons, curator of vertebrate paleontology at Yale's Peabody Museum, who had been digging for six years in the Fayum desert region of Egypt, about 60 miles southwest of Cairo.

Dr. Leakey's prediction has come true to the letter. Late last week, Prof. Simons announced the discovery of a skull belonging to the oldest known member of man's family tree. "Not only is the skull some 8 million to 10 million years older than any previously uncovered," glows the scientist, "but it is better preserved than any fossils related to man that are older than 300,000 years."

During early excavations in the area, lower jaws had been unearthed which indicated that a previously unknown genus and species had been found. Prof. Simons named it Aegyptopithecus zeuxis, the linking Egyptian ape. Recently, Peabody research associate Grant E. Meyer was exploring the site when he caught sight of a frontal bone, exposed by erosion, some 300 feet below the top of a lava flow. He shipped the skull, still encased in rock, to the museum, where painstaking cleaning revealed that it is in remarkable condition. Portions of the skull's top and bottom are missing, as are four incisor teeth; otherwise, it is relatively complete.

The topmost, and therefore newest, layer of the lava flow in which the skull rested was revealed by potassium-argon dating to be 25 million or 26 million years old. The skull itself, deposited when the flow was 300 feet lower than it is today, is some 2 million years older than that.

The skull belongs to a creature which seems to be a link between a primitive animal called Propliopithecus, which lived in the Eocene epoch 35 to 55 million years ago, and a much more man-like primate from East Africa called Dryopithecus, which occupied the Miocene epoch that lasted from 25 million to 12 million years ago. Aegyptopithecus was about the size of an organ-grinder's monkey, Prof. Simons says.

Though the creature was highly primitive, in many ways reminiscent of early lemurs, it already possessed most of the distinct features of higher primates, according to the scientist. "Development of the eye socket is advanced but not as completely closed as in modern apes and man," he says. The brain case, relative to face size, is smaller than in any subsequent ape or hominid. The auditory canals are not enclosed in any external bony tube.

Prof. Simons announced Aegyptopithecus before the Society of Vertebrate Paleontologists, which was holding its annual meeting at Yale. The skull, he said, is a "major connecting link" in the evolution of primates, and is the only Old World primate skull known from the millions of years separating the Eocene and Miocene epochs.

Yale

Out of Egypt: Aegyptopithecus

MEDICAL RESEARCH

From Lab to Patient

An apparent gap between biomedical research and the people it can benefit will be closed, or at least narrowed, if a newly appointed Board on Medicine does the job expected by the National Academy of Sciences.

The Academy's choice of a chairman signals some of its interest in practicality. Dr. Walsh McDermott, chairman of the department of public health, Cornell University Medical College, is perhaps best known for organizing the successful program to control tuberculosis among the Navajo Indians.

The 21-member board is made up of a "balanced mix of people," Dr. McDermott says. There is a professor of economics, a professor of law, a nursing specialist and administrators of funds as well as specialists in communications, although the board is weighted with medical specialists.

The board's formation was announced in mid-November by the Academy president, Dr. Frederick Seitz, who says it reflects the growing concern of the Academy, the medical profession and a number of Federal agencies.

The problems of urban and rural slums are expected to be included in the board's studies. The ethical and legal implications of human experimentation are almost sure to be probed. The entire matrix of social and political institutions will be involved, and as the board's mission develops, additional members probably will be named.

Setting up the board is the latest in a number of similar steps since President Johnson declared he wanted to see human payoffs for medical research almost two years ago.

Serving as executive secretary of the board will be Joseph S. Murtaugh, director of the Office of Program Planning, National Institutes of Health, whose retirement at the end of November ends 20 years of government service. ◈