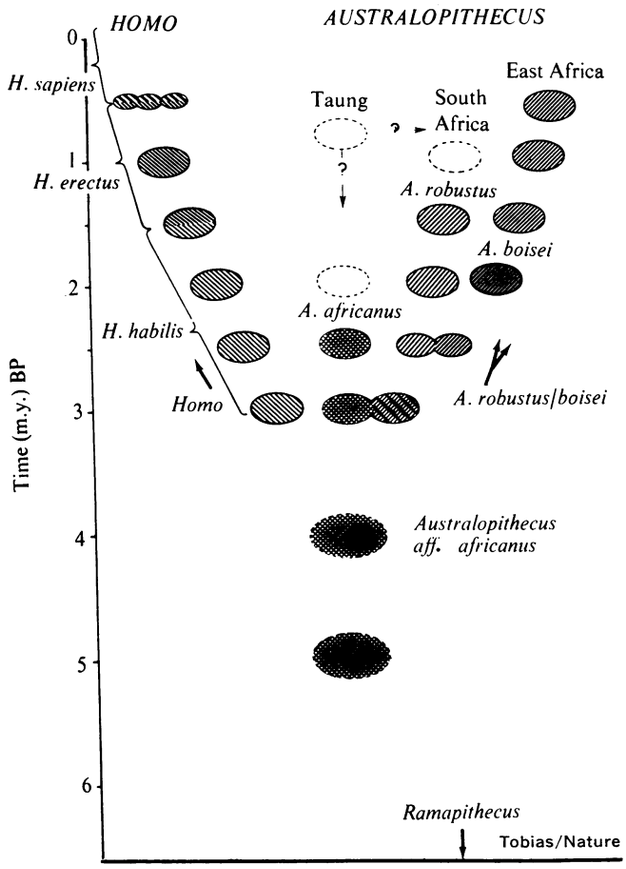
Shaking up the family tree

Like a willow, rather than an oak, the family tree of humanity continues to bend with the breezes of scientific investigation. The winds of change usually come in the form of more precise methods of dating hominid fossils. In the Nov. 9 NATURE, T. C. Partridge of Braamfontein, South Africa, describes a complicated method of dating for the original opening of some fossil-bearing caves.

It goes like this: A river flows for millions of years across the African veld. With continual erosion, as the river cuts deeper, a valley is formed. Along the sides of the hills of the valley, cavities in the earth may be exposed as caves. Working with a detailed analysis of continental landform development, erosion cycles and valley spreading, Partridge has been able to estimate the earliest time at which these caves could have been inhabited.

In the same issue of NATURE, Philip V. Tobias of the University of Witwatersrand in Johannesburg, South Africa, discusses the implications of Partridge's work. The opening dates of several of the caves are much earlier than dates already given to fossils found in them. This apparent discrepancy, says Tobias, can be explained. It took our slow-witted ancestors a million years or more to find the caves and move in.

One cave, however, presents the opposite problem. In 1924, in a limestone quarry at a place called Taung, a small skull was discovered. It was one of the first specimens to be classified as *Australopithecus africanus* and was dated at more than 2 million years B.P. (before the present). But Partridge's estimation of the opening of the Taung cave is only about 800,000 years B.P. This makes the Taung skull 2 million years more recent than other specimens of *A. africanus*, and really shakes up the family tree. More investigation of the Taung skull is called for but Tobias suggests that Taung might have to be plucked from the *A. africanus* branch and hung on the *A. robustus* branch—as a late surviving member of that side of the family.

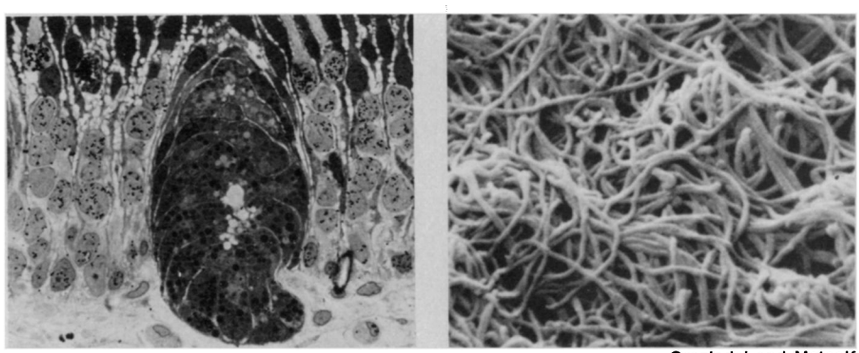


Putting smell back in the whiffer

It is well known, in nerve research circles, that if the ends of mammalian nerves are cut, the nerves will grow new ends. But if the cell bodies of the nerves are destroyed, the nerves degenerate and die.

Over the past hundred years or so, there has been gradually building evidence that olfactory nerves in the mammalian nose differ from the other nerves in the mammalian body. If the cell bodies of these nerves are destroyed, the nerves die, but they are replaced by a fresh population of nerves. Evidence for this regeneration has been less than conclusive, though, primarily because techniques for studying olfactory nerves have been inadequate.

During the past two years, P. P. C. Graziadei and J. F. Metcalf of Florida State University have been producing concrete, and ever more detailed, evidence for olfactory nerve regeneration in mammals. They have used sophisticated techniques such as electron microscopy and autoradiography to conduct their studies. Metcalf reported some of their latest results last week at the third annual meeting of the Society for Neuroscience in San Diego. Other recent results have just been published in TISSUE AND CELL.



Graziadei and Metcalf

Olfactory nerve regeneration (l) is accompanied by growth of nose hairs (r).

To regenerate olfactory nerves in mice or other mammals, Graziadei and Metcalf first cut the nerves. The nerves die. Then, about three days after surgery and for the next two weeks, a new population of nerve cells in the skin of the nose bud and differentiate into new olfactory nerve cells. The new nerves send their axons (filaments) into the olfactory bulb in the brain where the ends of the axons establish normal synaptic connections in place of the old, experimentally degenerated ones (left photo).

"The plasticity of this neuronal system," says Graziadei, "allows a variety of experiments which may lead us to clarify phenomena such as neuronal specificity and patterns in the central nervous system. We are trying to find causal relationships between sensory nerves and the central nervous system."

While olfactory nerves in the nose undergo degeneration and regeneration, other changes in the skin of the nose also take place. The cilia (hairs) on the skin disappear when the nerves degenerate and reappear when a new

population of olfactory nerves appear (right photo).

Might olfactory nerves be regenerated in people who have trouble smelling, thereby restoring or improving their sense of smell? "The phenomena of regeneration are applicable to all vertebrates and most likely to humans," says Graziadei. "Certainly it is possible," Metcalf says. □

Mariner 10's cameras cold but functional

As Mariner 10 heads toward its encounters with Venus and Mercury, flight controllers at Jet Propulsion Laboratory in California have decided that they can live with one of the problems that turned up early in the flight. But the other one has them baffled.

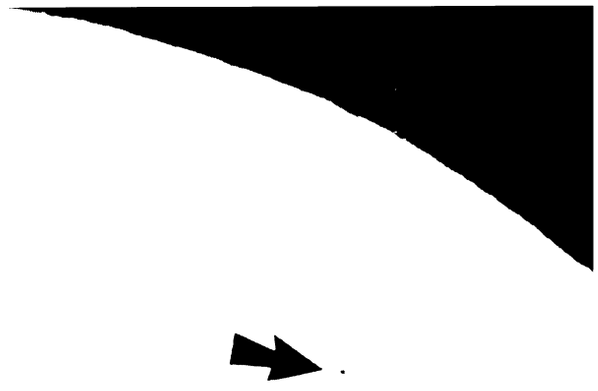
Two heaters that were supposed to keep the spacecraft's TV telescopes warm failed to come on shortly after launch Nov. 3, "and apparently," says one official, "they're not going to come on." Parts of the instruments got as cold as 22 degrees below zero F., while they were taking test pictures of the earth and moon. But putting the telescope platform in its "stowed" position has warmed things up somewhat (the coldest parts—the telescope objective lenses—have come up to minus 16 degrees), and the electronic circuits of the vidicon units are being left on to protect the image tubes from the cold.

The puzzler is the plasma science experiment, designed to study the solar wind in front of and behind the spacecraft. The aft-looking part is fine. The forward-looking section, however, has somehow struck so that the energy levels it "sees" are above those of the solar wind. Engineers at Kennedy Space Center have been trying to reproduce the problem in a backup spacecraft on the ground, but to no avail. It may be related to the cold, although the actual reason is uncertain, in which case it may clear up as Mariner nears the sun. It might also be that a cover over part of the instrument failed to deploy properly, but the engineers have failed to find what would make it stick.

Meanwhile, on Nov. 10 and 11, flight controllers radioed advance instructions to the spacecraft's guidance computer to adjust its path slightly on Nov. 13. Without the change (which was somewhat larger than anticipated) Mariner would pass about 31,000 miles from Venus on the sunward side, instead of 10,000 miles away on the dark side (later bending in to 3,300 miles on Feb. 5, 1974). At the same time, the spacecraft was given a set of emergency instructions so that it can run its own Venus flyby just in case communications from earth should break down.

Transit of Mercury

Planet Mercury, 3,026 miles in diameter, moves across the face of the sun, 864,000 miles in diameter, Nov. 10 in one of only 13 such transits this century. Mercury, the innermost planet, took about 5½ hours to complete the transit. Photo was taken by 8-inch telescope at Lincoln, Mass.



Wide World

Life-laden Cosmos 605: Cell studies in orbit

As preparations continued for the final Skylab mission to carry life forms such as spores, rice roots, gypsy moths and astronauts into orbit, the Soviet Union already had a lively space probe of its own circling earth. Cosmos 605 was launched Oct. 31 from Plesetsk, about 120 miles southeast of the White Sea, with an animated payload of rats, tortoises, insects and fungi.

The flight is being conducted to study the relationships between weightlessness and radiation, particularly, according to Soviet Deputy Health Minister Avetik Burnazyan. It will "investigate what functions and processes at the cellular level . . . are particularly sensitive" to those factors. "Serious attention" is also being devoted to the nervous, endocrine and other systems "that ensure the organism's adaptation to changing conditions."

The mission is apparently a continuation of studies which, at least in previous flights, have focused on the formation and development of radiation injuries in space. Different parts of yeast, seed and onion bulb samples, for example, were exposed to radiation before, during and after the flights of Vostok 5 (piloted by cosmonaut Valery Bykovsky in 1963), Cosmos 110 (which also carried two dogs during its 23-day mission) and Cosmos 368 (in 1970).

For Cosmos 605, the numbers of each life form were calculated to provide statistically meaningful data. Sensors were implanted in the rats' brains to measure the effects of cosmic rays on nerve cells. The most sophisticated aspect of the mission, however, is a newly developed monitoring system that registers the movements of each animal in its cage, keeps running totals and gives flight controllers periodic summaries of the animals' motor activity.

Cosmos 605 is believed due for recovery sometime this month. □

Two honored for heart-research innovations

Over the past 28 years, the Albert Lasker Medical Research Awards have become the most prestigious American awards for biomedical research. For intriguing reasons the Lasker awards are often a ticket to Stockholm. Twenty-two Lasker awardees have gone on to claim a Nobel Prize (SN: 10/2/72, p. 365).

This week the 1973 Albert Lasker Clinical Medical Research Awards were made to William Bennett Kouwenhoven of the Johns Hopkins University and to Paul M. Zoll of the Harvard Medical School for their life-saving advances in the treatment of acute heart attacks—specifically for correcting abnormal heart rhythms.

In 1933 Kouwenhoven and his colleagues confirmed that electric shock could reverse ventricular fibrillation of the heart. Ventricular fibrillation—irregular contractions of the heart's ventricles—is a major cause of death in acute heart attacks. He then developed devices for both open and closed chest defibrillation and, in 1958, originated external cardiac massage. Kouwenhoven made the final two contributions after he was 68 years of age and had retired from a career in electrical engineering.

Zoll showed in 1952 that when a human heart stops, it can be induced by externally applied electrical stimulation to resume beating. He then showed that externally applied alternating current countershocks are similarly effective in stopping ventricular fibrillation. He developed the theory and technique of continuous monitoring of heart rhythm. Pacemakers, which have saved tens of thousands of people from sudden and unpredictable death, are Zoll's invention. More than 60,000 Americans have received pacemakers; some 15,000 new pacemakers are implanted annually. □