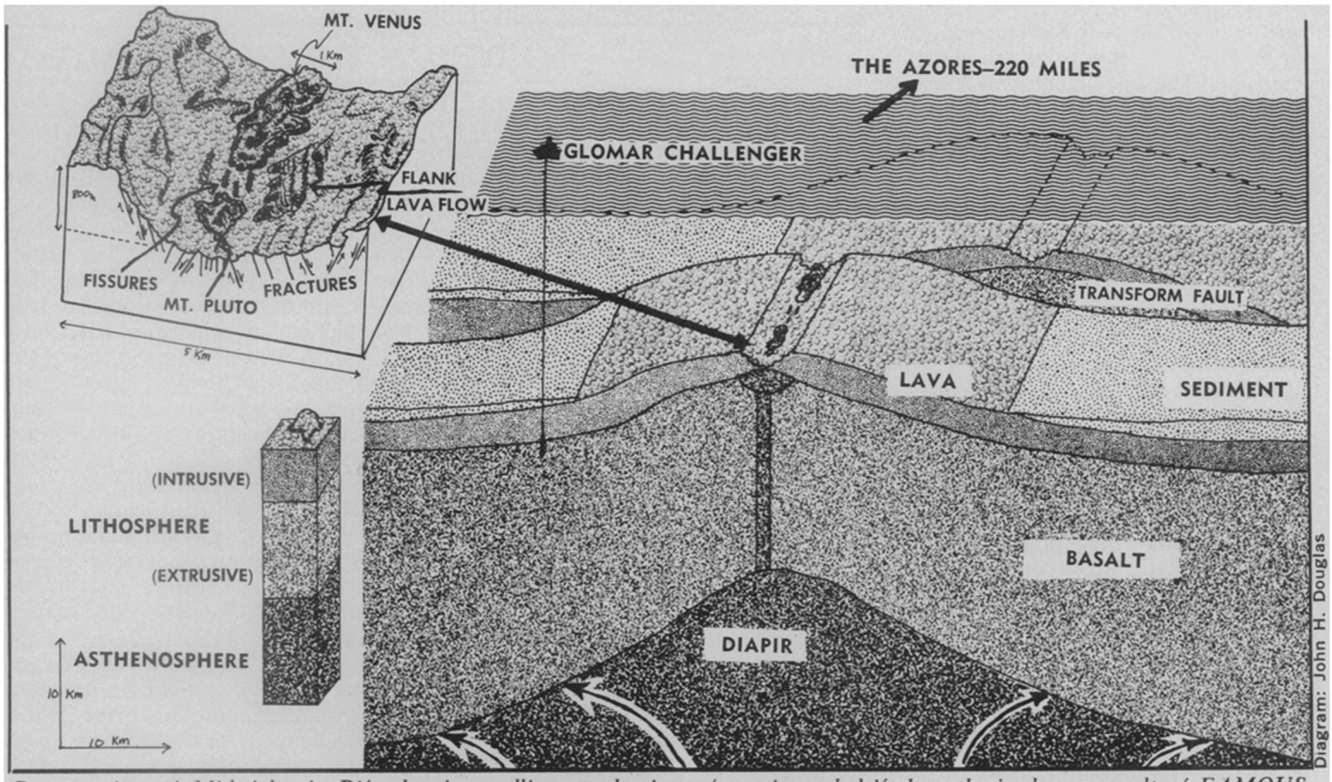

Cross-section of Mid-Atlantic Rift showing pulling mechanism of continental drift hypothesized as a result of FAMOUS.

Voyage to the birthplace of the Atlantic

The first extensive manned expedition to the heart of earth's last great frontier has yielded a wealth of scientific information on how the seas are born. The French-American Mid-Ocean Undersea Study (FAMOUS) may have provided the key to understanding the process by which continents are moved about, while raising a host of new questions concerning the Mid-Atlantic Ridge system, including its potential as a commercial source of scarce metals.

For most of the summer, three deep submersibles and a surface vessel designed for deep-ocean drilling have explored one segment of the narrow, mid-ocean rift that separates the continental "plates," where molten material from deep within the earth rises and forms new areas of the earth's crust. The bulky French sub Archimède, which last year scouted the area in preparation for this expedition (SN: 9/22/73, p. 181), was joined by Alvin of the Woods Hole Oceanographic Institution, which concentrated on the main valley floor, and the maneuverable little Cyana, designed by Jacques Cousteau which probed the narrow transverse valleys that separate segments of the rift. Some 20 miles to the west, the research vessel Glomar Challenger took core samples, as part of the Deep Sea Drilling Project, managed by the Scripps Institution of Oceanography (SN: 6/1/74, p. 349).

Before Project FAMOUS provided a more intimate view, the process of sea-floor spreading and continental drift was known primarily through the study of such gross features as the age of rocks and the distribution of magnetic anomalies at various distances from the center rift. No direct evidence shed light on the mechanism causing this drift: whether active volcanism was pushing continental plates apart, or whether some other force was pulling them, allowing new material to rise into the rift rather passively.

Evidence from this summer's work now favors the passive alternative. As Woods Hole geologist Wilfred B. Bryan described it to SCIENCE NEWS, "The sea floor is behaving as if it were on a conveyor belt," driven apart by deep convection currents in the plastic layer of rock known as the asthenosphere. While Bryan cautions about the tentativeness of these conclusions—"All you can do is *speculate* on the plumbing in a thing like this"—he postulates that molten material comes from a bulge (or "diapir") in the asthenosphere, located some 10 or 20 kilometers below the mid-ocean rift, and accessible to the surface through what Bryan calls a "master fracture" between the two separating continental plates.

The principle evidence for the passive upwelling of material comes from observations made by Bryan and three other American scientists during their Alvin dives. Most evidence of recent lava flow is restricted to a narrow band, about a kilometer wide, along the center of the rift valley. Along this band, the scientists found two small volcanic hills, which they dubbed Mt. Venus and Mt. Pluto, and several narrow fissures, only a dozen meters wide and less than a kilometer long, running parallel to the valley. They also found some lava along the valley flanks, but it appeared older and less prominent.

An initial interpretation of these discoveries is that the fissures are strain cracks caused by the pulling apart of adjacent plates. As the fissures deepen, they apparently hit material welling up from the asthenosphere through a master fracture, and lava flows out to form the volcanic hills. Since these hills rise no more than 200 to 300 meters above the ocean floor, Bryan concludes that the pressure from beneath must not be too great and that the earth's rigid upper layer (or "lithosphere") is thus formed passively by the solidification of gently upwelling material. The part extruded onto the sea floor is seen as lava; beneath is a layer of basalt, formed by the cooling and welding together of intrusions that well up in a master fracture.

French scientists, working aboard the Cyana in the narrow valley formed by the transform fault that offsets this segment of the rift from one just to the north reported finding deposits of almost pure manganese ore. They speculated that the material had been spewed out of a hot water geyser (SN: 8/10/74, p. 87). However, when the supposed geyser could not be relocated on subsequent dives and when sensitive temperature measurements failed to

show any significant anomalies, skepticism about the French claim mounted.

A manganese crust does cover most rocks in the area, the apparent result of precipitation from the surrounding seawater, but no other localized concentrations were discovered. To find a region of hot water percolating up from the depths that might be the source of manganese, Alvin even performed the risky maneuver of thrusting its heat sensor into one of the narrow fissures. But no hot water was found.

Woods Hole Provost Arthur E. Maxwell says one of the major accomplishments of the expedition was demonstrating "how effectively we could operate out there." Bryan describes a journey along the bottom as being like "hedge-hopping in a helicopter," as the neutrally bouyant Alvin skipped lightly over sediment-dusted formations "like flying over a snow field. Unfortunately the field of view was usually limited to a radius of 50 to 100 feet, "like working in a fog," and pictures could not display the vast scope of the surroundings. Though plans for further exploration of the area have not been submitted and funding for Alvin is currently "in doubt," Maxwell feels confident that the project has "opened a whole new era" in how we view the ocean bottom. □

Rise of antibiotic-resistant bacteria

Since they became available in the 1940's, antibiotics have saved millions of people from life-threatening bacterial infections. But these "miracle" drugs have a serious drawback: Bacteria can build resistance to them. Resistant strains of pathogens have multiplied to the point where they may cause 50,000 to 100,000 deaths a year in American hospitals, according to figures cited by Henry E. Simmons, deputy assistant secretary for Health, Education and Welfare. Now two reports, one in the Aug. 19 JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION and one in the Aug. 3 LANCET, show that antibiotic-resistant pathogens are also becoming a health danger outside the hospital.

The pathogen *Staphylococcus aureus* can cause severe infections such as pneumonia, septicemia or osteomyelitis. Large numbers of penicillin-resistant staph microbes have been observed in hospitals for many years. But the incidence of resistant staph outside the hospital setting has been much lower. Now Sydney Ross and his infectious disease team at the Children's Hospital National Medical Center in Washington have isolated staph pathogens from 133 children seen in the hospital outpatient department or by physicians in private practice. Eighty-four percent of these pathogens were resistant to penicillin G, compared with a 95 percent resistance among hospital staph. The team also surveyed 309 healthy school children and found that 47 percent of them were asymptomatic carriers of staph. Sixty-eight percent of the pathogens taken from these children were resistant to penicillin G. "These findings," the investigators conclude in JAMA, "suggest a trend of increasing penicillin G resistance of community (street) strains of *S. aureus* similar to that already observed among hospital strains."

M. S. Schiffer and co-workers at the National Institutes of Health have isolated the pathogen *Haemophilus influenzae* type B from children at a day-care center. All of the pathogens isolated were resistant to the widely used antibiotic ampicillin. One child, in fact, had come down with meningitis as a result of the pathogen, and he had received ampicillin before getting meningitis. The investigators admit in the LANCET, however, that "no data are available from the study to support any speculation on the role of this therapy in the development of . . . ampicillin-resistant strains."

The increase of antibiotic-resistant bacteria, especially out on the street, has some serious health implications. Although other antibiotics are available when one antibiotic doesn't work, some physicians wonder how long it will be before pathogens resist all available antibiotics and become dread "Andromeda strains." Meanwhile, it can cost patients more to switch to alternate antibiotics. In an editorial in the Aug. 19 JAMA, Jerome O. Klein of Boston City Hospital points out that substitute antibiotics for penicillin G can cost 10 times as much as penicillin G.

Why are pathogens becoming increasingly resistant to antibiotics? Hearings held by the Senate Health Subcommittee last spring suggest that drug companies overpromote antibiotics to physicians, and physicians overprescribe them, especially for colds and other viral infections that antibiotics can't counter. There is also evidence that lavish dumping of antibiotics into animal feeds to promote livestock growth may be increasing the reservoir of antibiotic-resistant pathogens (SN: 5/27/72, p. 348).

So antibiotic overuse appears to be the major factor in building up armies of antibiotic-resistant bacteria. Antibiotic overuse may also prevent patients from building antibodies to pathogens —antibodies that help immunize them against subsequent attacks by the same pathogens, investigators report in the September AMERICAN JOURNAL OF PUBLIC HEALTH. □

J. Bronowski dies: Did Ascent of Man

Jacob Bronowski, a pioneer in the effort to join the "Two Cultures" of science and the humanities, and to make them accessible to the average person, died last week of a heart attack while vacationing at the home of some friends in New York. He was 66.

Born in Poland and educated in England as a mathematician, Bronowski early branched out into other fields, conducting statistical studies of economics, analyzing biological systems, publishing scholarly works on the poet William Blake and pursuing a distinguished career as a civil servant. At his death he was a senior fellow at the Salk Institute in San Diego. But he will most likely be remembered best for his probing works on the history and nature of the scientific enterprise, particularly the 13-part television series *The Ascent of Man.*

Unlike the cool detachment that Kenneth Clark brought to a similar series on the arts, Bronowski's view of the place of science in man's "ascent" was one of passionate commitment. "We are a scientific civilization," he proclaimed, "that means, a civilization in which knowledge and its integrity are crucial." He once told SCIENCE NEWS (SN: 12/8/73, p. 364) that one reason he took on the project was that a BBC producer had warned him the programs might not go over well considering current anti-science attitudes. "In that case," he replied, "I regard it as a duty to speak out about what I think to be the true philosophy of science."

The programs have already been shown three times on BBC and have premiered as films at the Smithsonian Institution (SN: 5/5/73, p. 285), where they received rave reviews (SN: 6/23/73, p. 409). Ironically, Bronowski did not live to see the fulfillment of his dream of having them shown on national U.S. television (the series is tentatively scheduled to begin on public television Jan. 11, 1975), and he had just embarked on writing the script for a Bicentennial exhibit on science under a grant from the National Science Foundation.

Though he was an optimist who really believed that man's cultural evolution has been an "ascent," Bronowski was profoundly disturbed by what he saw as "a sense of retreat" in Western civilization. "I am infinitely saddened to find myself suddenly surrounded in the West by a sense of terrible loss of nerve, a retreat from knowledge. . . . We are nature's unique experiment to make the rational intelligence prove itself sounder than the reflex." □