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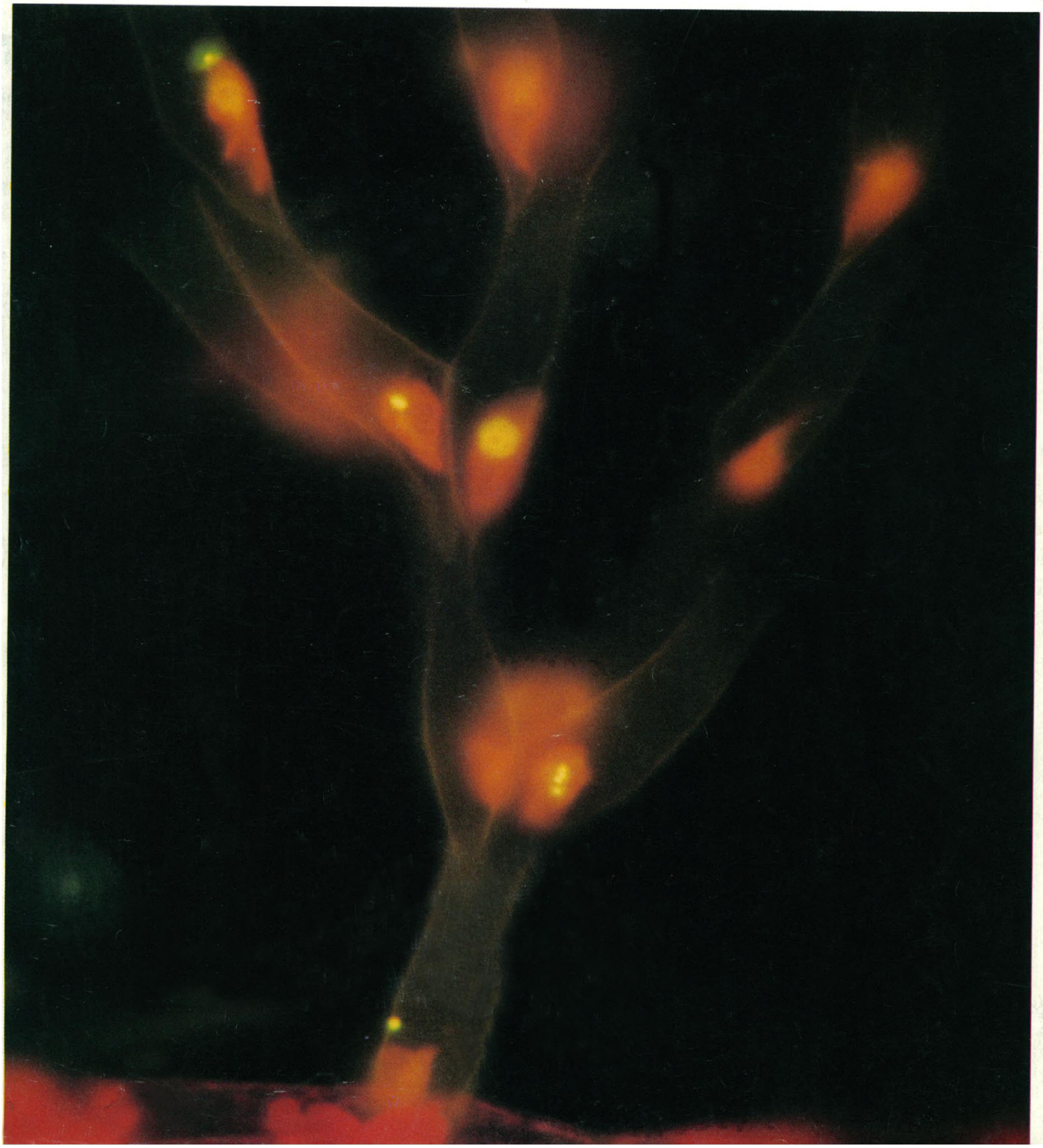

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COVER East Amatuli Island, one of the Barren Islands in the northern part of the Gulf of Alaska, is home to several hundred thousand fork-tailed storm-petrels that return to the island only at night. Regional water quality can be monitored by collecting storm-petrel regurgitate and analyzing it for the presence or absence of fossil fuel hydrocarbons. See page 373. [P. Dee Boersma, Institute for Environmental Studies, University of Washington, Seattle 98195]

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This Week in SCIENCE

Weather satellite data weathering well

Data on global weather, ocean conditions, and patterns of precipitation and temperature have been collected by the National Oceanic and Atmospheric Administration weather satellites with increasing sophistication for more than 25 years (pages 455 and 463). Smith *et al.* describe technological improvements in the on-board equipment used for identifying and tracking normal and severe weather conditions and advances made in designing models to which the data collected can be applied for weather forecasting. Yates *et al.* detail how weather satellite data have been used in studies of oceans and rivers, patterns of vegetation, and land forms and their effects on water and ice flows. As the satellites are outfitted with increasingly refined data-gathering equipment, with both imaging and remote-sounding capabilities, and as data points are gathered at more frequent intervals, both the accuracy of observations and the correctness of predictions are expected to improve.

Theory of batholith emplacement

A new theory explains how large (100 square kilometers or more in area) bodies of igneous rock called batholiths get positioned in the earth's crust, how the bowl-shaped surface depressions known as calderas, which result from volcanic activity, form, and why batholiths and calderas are found close to extensive volcanic ash flows (page 483). Whitney and Stormer envision the formation of batholiths as a process in which magma at depths of 10 to 20 kilometers rises because of a pressure differential between the upper part of the body of magma and the surrounding rocks. Lower crustal rocks, preheated and plastic, push inward and help force the magma up. Cracks are propagated and enlarged in overlying rocks, and rising magma eventually reaches the surface, where the mixture of materials erupts as large amounts of volcanic ash. Previously fractured kilometer-sized roof rocks are pulled into the magma chamber and react with the magma. Eventually the roof caves in, and a caldera forms at the surface. The volcanic eruption may continue, and the magma disperses, cools, and crystallizes, and a large batholith forms that consists of cooled magma, plastically deformed surrounding rocks, large crustal blocks, and other crustal and volcanic constituents. This model explains a geologic puzzle—what happened to the materials that the batholith supplanted—and accounts for some observations that have been made during drilling and seismic exploration. It has implications for the selection of sites where geothermal resources can be developed, for gauging how long such resources will remain active, and for predicting volcanic activity, since very large ash flows could erupt directly from a deep magma source without prior pooling of magma closer to the surface and, thus, with little warning.

Organ damage from alcohol abuse

How does alcohol abuse lead to organ failure (page 497)? It is known that in the liver (the organ that is typically damaged in alcoholics), ingested alcohol is metabolized to a toxic substance, acetaldehyde, by an oxidative process. However, alcoholism also frequently damages a number of other organs in which oxidative metabolism does not occur. Laposata and Lange found a nonoxidative pathway that is active in these organs (pancreas, heart, and brain) as well as in the liver; through the nonoxidative mechanism ethanol is converted to fatty acid ethyl esters. The degree to which any organ was associated with disease from alcoholism was related to the level of activity of the nonoxidative metabolic pathway in that organ. Fatty acid ethyl esters were also stored in large amounts in the fat tissue of chronic alcoholics. The mechanisms by which fatty acid ethyl esters injure cells are not known but may include damaging effects on the mitochondria—the energy generators—in cells of affected organs.

Lake algae graze on bacteria

Freshwater algae (cover) growing in low-light conditions that are not conducive to luxuriant photosynthesis may obtain 50 percent of their energy needs by grazing on bacteria (page 493). This important energy source had not been described previously. Bird and Kalff found that the ingestion rate—up to three bacteria per alga every 5 minutes or consumption by algae of almost 30 percent of their weight in bacteria per day—was of a magnitude similar to that measured for marine organisms that completely lack photosynthetic pigments. The alga *Dinobryon* proved to be a major consumer of bacteria in one lake studied and, in another, depleted the bacterial population more than did the traditional grazers (rotifers, crustaceans, and ciliates) combined.

Diet alters size of insect head and jaw

An insect's diet is reflected in its head size: grass-feeding caterpillars (*Pseudaletia unipuncta*) that feed on soft artificial diets develop small heads; those that feed on hard grasses develop relatively large heads (page 495). Bernays found that head sizes of the caterpillars reared on grasses were twice as large as the heads of those reared on soft food. The grass eaters also had enlarged mandibles, mandible muscles, and cuticular areas to which the muscles are attached. Since grasses are hard and fibrous, insects must cut, chop, and grind them in order to extract nutrients, and this increased muscular effort is translated directly into increased muscle development and a larger head. Comparison of food preference and head size of 76 caterpillar and 82 grasshopper species in the wild confirmed the relation of head size to diet.

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A Serious Parlor Game

The resignation of George Keyworth II has energized one of Washington's favorite parlor games: guessing who will be the next science adviser to the President. Like psychoanalyzing Russian foreign policy from the lineup of faces on the balcony during the May Day Parade, the only prerequisites for entering the game are a list of likely and unlikely candidates, the ability to drop insiders' names with measured regularity, and a conspiratorial whisper. Beyond this persiflage, however, lies a serious decision that will affect the health of science in this country for many years to come.

This appointment comes at the point of entry into the Gramm-Rudman era, a deceptively inviting territory containing a potentially lethal budgetary minefield. The danger of the Gramm-Rudman amendment is not that it requires a balanced budget; many states, including California, have operated with mandatory balanced budgets for years without difficulty. The danger is the coupling of two "hold-their-feet-to-the-fire" provisions of the bill. The first involves an automatic-triggering action. If the projected budget deficit exceeds the targets voted into law, an automatic reduction process is set into motion. Such cuts are frequently executed across the board, with little or no evaluation of their quality. The second provision is that certain programs are designated as "privileged sanctuaries" for which funding cannot be reduced beyond specified sums. These privileged programs are the biggest, probably the most wasteful, but also the most politically sensitive—defense and entitlements. Reductions then must be achieved at the expense of the discretionary part of the budget, which contains most of the allocations for basic research.

The optimist might say that to prevent arbitrary and inappropriate across-the-board cuts, Congress and the President will compromise to approach the budgetary process rationally. The pessimist might say that the automatic provisions will allow individuals in Congress and the Executive to posture for their beloved favorites, with the knowledge that the automatic sequestration decisions will be invoked when there is a failure to compromise. At this stage no one knows precisely which programs will be cut, but reductions as high as 7 to 14 percent are predicted. Unless science's indisputable priorities are established and adhered to, research could be dealt some devastating blows.

In view of this background the selection of a science adviser becomes vital. Rumor mills suggest that a strong figure with an independent reputation is not wanted because he or she might be primarily loyal to his or her constituency instead of to the Administration. In the past, the country had to operate without a presidential science adviser on the basis of just such logic. However, the urgency of the current decisions does not allow such timidity. And it does not seem necessary, given a highly popular President who will not be running for reelection. An alternative system, in which the head of the National Science Foundation was designated the science adviser, was tried in the past and was rumored to be one of the plans under consideration. The present head of NSF, Eric Bloch, is an intelligent and vigorous leader who would make an excellent science adviser, but a dual role is not good either for NSF or for the country.

An ideal presidental science adviser would be an individual with leadership qualities and contacts with many scientific and scholarly societies in many disciplines. The Administration has a right to demand someone who is publicly loyal, but the scientific community has a right to expect someone who has the courage to fight for science and the long-range good of the country in the face of the inevitably enormous pressures for short-range budgetary fixes.

England's current financial difficulties may have resulted, in part, from the subsidies from her empire having concealed inefficiencies in her home industry. The United States was similarly subsidized, by a land with ample raw materials. In the future, however, we will have to live by our wits. If basic research was important in the past, it becomes even more crucial to the future. The Administration needs, and science needs, a strong spokesperson who can build bridges between scientific communities and the decision-making apparatus of the government.—DANIEL E. KOSHLAND, JR.