

Clear cutting and conservation



Forest logging operation: Timber production rated over conservation values.

Current concern over the environment grew partly out of the classical conservation philosophies of Theodore Roosevelt and Gifford Pinchot. Today's environmentalism includes a broad scope of concerns, ranging from pesticide pollution of the oceans to high-rise buildings in suburbs. But the original Roosevelt-Pinchot emphasis was on the nation's forests. Pinchot became the first head of the Forest Service, which was set up in 1905 under the Department of Agriculture at the same time the national forest system, now comprising 187 million acres, was established.

Roosevelt and Pinchot had no intention of making virgin preserves out of the forests; rather they believed in a policy of sustaining yield, management of the forests to make them an ever-renewing resource in a variety of areas besides simply timber production. Classical conservation aimed at both economic development and respect for the integrity of natural processes, as opposed to the pure preservation advocated today by such groups as the Sierra Club.

But the Forest Service has since grown into a complex and often rigid bureaucracy. And although the exploitive 19th century practices have largely been abandoned, a recent report from an interdisciplinary committee at the University of Montana makes it clear that the dominant emphasis in the Forest Service is toward lumber production to the exclusion of delicate ecological and social concerns. And the Forest Service itself has cautiously conceded that the committee, headed by Dean Arnold Bolle of the UM School of Forestry, is correct in many of the points it makes. The suggestion, both in the UM report and the Forest Service's apologetics, is that the agency has be-

come a partly unwilling captive of economic interests.

The report, first requested by Sen. Lee Metcalf (D-Mont.) and released late in November, is on a single forest, the Bitterroot National Forest in southwestern Montana. But, says the report, "The Bitterroot . . . is really representative of a large part of the Rocky Mountain West" where most of the national forests are located.

Singled out for particular criticism is the practice of clear cutting, commercial cutting of all the trees in wide swaths through a forest. This practice, says the report, is highly destructive to delicate ecological balances and esthetic considerations. "There is a great deal of waste material left on the ground after clear cutting. Brush is scattered throughout the area. The soil has been scarified by bulldozers, there are great windrows of material piled up." And the effects are not only on the immediate local ecology. The Federal Water Quality Administration reports that this practice can create soil erosion and consequent pollution of waterways all the way to estuaries on the coasts.

The Forest Service's single-minded devotion to timber production is clear, says the committee, in the short shrift it gave to wildlife values in an earlier report on the Bitterroot Forest by an in-house task force. The task force report discusses the impact of forest management only on the elk, a primary game animal in the West. "There are other big game species besides elk, however, and other game species besides big game, and other wildlife than those species sought by hunters," says the committee. The emphasis on the elk once again is evidence of the Forest Service's preoccupation with the most obviously exploitable resource "with little feeling for the equally

important, if less exploitable, members of the forest ecosystem."

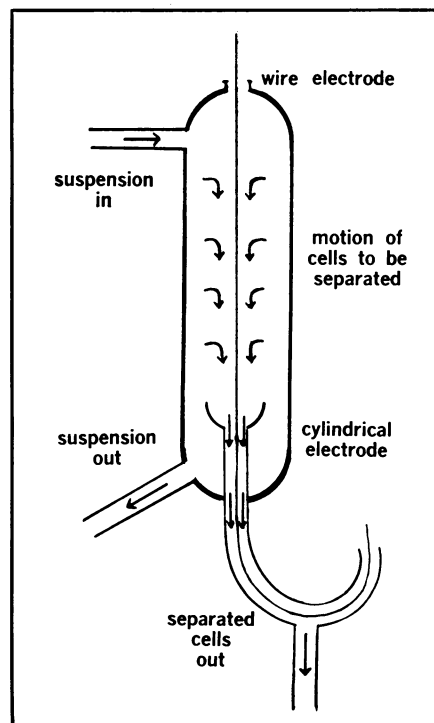
Although the committee does not explicitly say that the Forest Service practices are directly in violation of the agency's ostensible philosophy of a sustained yield, this is a clear implication in the section on forest economics. Current practices, says the report, make it economically impossible ever to recover even the timber values lost through clear cutting, let alone the wildlife, esthetic and recreational values.

The problem, in part, says the committee, is created by a top-heavy and inflexible bureaucracy, which it suggests is unresponsive to public needs and easily manipulated by special interests who want to make a short-term killing.

In the light of current environmental concerns, says the committee, such approaches are "completely out of step with the interests and desires of the American people." □

PHYSICISTS IN BIOLOGY

New basic laws



Pohl/Armistead

Suggested cell-separation apparatus.

The word interdisciplinary has become a cliché among scientists in recent years. Nevertheless it represents a fact: The partitions between specialist compartments are breaking down. Scientists of very different backgrounds collaborate on joint endeavors.

A fundamental example of the interdisciplinary trend is the growing interest of physicists in biological problems. So great has this trend become that at the meeting of the American Physical

Society in New Orleans last week the initial steps were taken toward the formation of a Division of Biological Physics.

There have always been some physicists who were interested in biological problems, but the feeling of most has been that the physics of a biological molecule, let alone a whole cell, was altogether too complex. Physicists had better study very simple systems, like hydrogen atoms.

Nowadays hydrogen has lost some of its glamor, and more physicists are interested in hemoglobin. Meanwhile biology has become more and more fundamental, and many of its outstanding problems relate to the physical and physicochemical processes that make biological substances do the things they do.

"The study of life is challenging," says Dr. E. C. Pollard of the Pennsylvania State University, "because it may still require new basic laws for its interpretation." A major problem, he points out, is that "our knowledge of the fine structure of any living system is almost nil. I have tried for 12 years to force a decision as to whether a bacterial cell is a miracle of order or a random mixture. No decision can be made. This necessary study is one *par excellence* for the physicist."

Physicists entering biology, he warns, will find that they have badly neglected the liquid state of matter. Life probably requires the liquid state for its existence, he says.

The behavior of hemoglobin in taking up oxygen is an example of the sort of biological question that interests physicists, says Dr. Mitchel Weissbluth of Stanford University. Not only is it important in itself; its mode of action is similar to a class of enzymes that serve as biological catalysts and are of considerable interest to biologists. And hemoglobin is available for study by physicists, says Dr. Weissbluth: It can be crystallized and its structure is well known.

Hemoglobin interests physicists because it shows what they call a cooperative effect. The hemoglobin molecule has four sections. Each section contains an iron atom to which an oxygen atom can become attached. Study shows that the more oxygen atoms a hemoglobin molecule has, the more it is likely to pick up until saturation is reached. In other words, the four iron atoms do not act independently of one another; somehow the state of one of them influences the state of all the others.

Cooperative effects are familiar to physicists from their studies of magnetism. In a magnet the orientation of the magnetic field of one atom influences those of its neighbors. The larger the number of atoms that happen to be aligned in a given direction, the greater

is the probability that more atoms will fall into line.

In the magnetic case the atoms influence each other's behavior by magnetic forces that communicate the orientation of their fields and urge their neighbors to get in line. In the case of hemoglobin, says Dr. Weissbluth, how the iron atoms inform each other of the presence or absence of oxygen atoms is precisely the question. The iron atoms are too far apart, between 23 and 35 angstroms, for the means of communication that physicists are familiar with to be effective. An unknown means of conveying the information must be sought, and studies of the shapes of the parts of the hemoglobin molecule and their relations with each other are under way in the hope of throwing some light on the problem.

Ever since Galvani applied electric shocks to frog legs, physical techniques have been used to aid biological investigations. One of the latest is dielectrophoresis, a method for separating particular cells and organelles from liquid suspensions in which they are often mixed with many other objects.

Basic to the method, says Dr. H. A. Pohl of Oklahoma State University, is that cells, though electrically neutral, can be polarized. If they are placed in an electric field, the positive charges within them go to one side, the negative to the other.

Each end of the cell feels a force toward the electrode on its side. If the field is uniform in shape the forces are equal, but in a nonuniform field the force on one side will be stronger and the cell will move toward that side. If the field is driven by an alternating voltage, the polarity of the field will reverse periodically and so will the polarization of the cell, but if the shape of the field stays the same, the stronger force on the cell will remain on the same side, and the cell will move in little jerks toward that side.

When the field reverses, the charges inside the cell must move back and forth. How easily they do this depends on the cell, so that different cells respond best to different frequencies of alternation. By adjusting to the proper frequency one can pull cells of a desired sort out of a mixture. In working out the method Dr. Pohl has been successful with live and dead yeasts and chloroplasts, among others. Some day the method, it is suggested, might be used to separate macromolecules such as hemoglobin from suspensions.

Dr. Pohl's current efforts involve samples the size of microscope slides. Wire electrodes are mounted in the slides and the separation process can be watched through the instrument. For the future he suggests a larger apparatus for bulk separations. □

INEFFECTIVE DRUGS

FDA publishes a list

Four years ago the Food and Drug Administration asked the National Academy of Sciences to evaluate the effectiveness of all drugs marketed between 1938 and 1962—a total of about 3,000 products (SN: 10/17, p. 316).

The NAS study was initiated under a law passed by Congress in 1962 which requires that drugs be not only safe but effective.

The FDA is presently reviewing the findings of the NAS study group, and this week it released a list of 359 drug products that it has found to be either ineffective or to have "an unfavorable benefit-to-risk ratio." This list, according to FDA spokesmen, represents 80 to 90 percent of all the drugs that will ultimately be declared ineffective.

The list includes both prescription and over-the-counter drugs. In the latter group are a number of toothpastes, mouthwashes, nose drops and throat lozenges, including such well-known brands as Colgate Dental Cream with Gardol and Pepsodent and Micrin oral antiseptics. In most of these cases, the FDA has decided that there is insufficient evidence that the product reduces tooth decay or has other therapeutic properties.

Among the prescription drugs are Mycillin Suspension, some Aureomycin products, Signemycin Capsules, Neo-Cortef Nasal Spray and Sulfathiazole Tablets.

Also on the list are a variety of fixed-combination drugs—notably combinations of penicillin and a sulfa drug. Though the active ingredients may be quite effective when used individually or in a different ratio, the NAS found that in each instance the particular combination was either ineffective or provided too much of one of the drugs.

The FDA has taken action to have all 359 drugs removed from the market. Some have already been removed. In other cases, the manufacturers are submitting additional data in an attempt to establish the product's efficacy and persuade the FDA to change its ruling. Some manufacturers are making changes in the products to render them effective.

The majority of the drugs on the list are prescription drugs, and though some of the listed products are actually hazardous, most are simply ineffective for the purpose for which they are advertised, according to the FDA.

The list has been sent to the Department of Defense, Veterans Administration, Public Health Service and other governmental agencies whose drug purchases might be affected.

The agency hopes to complete its review by next summer. □