

BIOLOGY

Math Killing to Animals

Scientists are using bio-mathematical formulas to determine animal reservation populations, how high birds will fly, which way an eel will swim, where a turtle will carry a balloon.

► **THE NATURE RESERVATION** protects wild animals from annihilation by the hunter, but leaves them wide open to an even less merciful predator, the mathematical formula.

That is a conclusion resulting from a recent merging of scientific disciplines into what is being called bio-mathematics.

The wild animal paradox rests on the assumption that in any natural setting there is a fixed relationship between the number of species of living things and the total number of individual animals thriving there.

The relationship has been noted in many situations and has been expressed in a complicated mathematical formula. What it amounts to roughly is that by shoving additional species of animals into a confined area, the total number of animals takes a big jump, competition for food increases, weaker species are wiped out and the total population is reduced again.

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Life Beyond Earth Sought

► **GOVERNMENT SCIENTISTS** charged with searching for signs of life beyond earth say that the more they learn about biology the more convinced they are that their search is not in vain.

A team from the National Aeronautics and Space Administration's exobiology department outlined the setbacks, advances and future plans for the search at the American Institute of Biological Sciences meeting.

With no luck thus far in attempts to pick up intelligent radio signals from outer space, called Project Ozma, the Government is following a slower, less direct approach.

Balloons, satellites and space probes are the chief devices now being used in the study.

Scientists at the University of Minnesota, working under a NASA grant, are sending up balloons in an attempt to find out how high the earth's "biosphere" goes. They have determined that at 26,000 feet there is one microorganism for every 1,000 cubic feet. The highest capture of a microorganism was at 80,000 feet, which is as high as the balloon has gone.

Another balloon has lofted a large spectrometer to make measurements of Mars, the best prospect in the solar system—excluding the earth—for supporting life. Readings showed that the amount of water on Mars, always thought to be sparse, was from two to three times less than had been estimated.

The formula was drafted by Dr. Frank W. Preston, a glass expert of Preston Laboratories, Butler, Pa. Dr. Preston, who is also a well-known mathematician and bird-watcher, participated in a bio-mathematics seminar at the American Institute of Biological Sciences annual meeting in Amherst, Mass.

He has devised formulas also for predicting the height at which various types of birds will fly and build their nests and the shape of the eggs they will lay.

"His egg equations are mathematically perfect," said Dr. Archie Carr, zoologist at the University of Florida, Gainesville, "but unfortunately the bird eggs are not."

Take Dr. Carr's balloon-toting green turtles, for example. For many months, he has been following with field glasses the paths turtles take over a seven-mile stretch in Florida.

Mathematicians, he said, have offered to make formulas out of his charts and unveil

NASA and the Air Force have a program to attach microorganisms to the outside of satellites to find out how they fare in outer space.

A part of the test is to examine the strength of the theory of panspermia, which holds that life was seeded throughout the universe in tiny spores, evolving into higher forms of life in the right environments.

Several life-detecting devices are being built to land on the moon and planets. By remote control they will seek clues of life, such as growth, metabolism, enzymes, deoxyribonucleic acid, proteins, amino acids and the optical activities of molecules associated with life.

Much research still can be done on earth, said Dr. Carl Bruch, NASA biologist. He said "hopes are still high" for finding life-like compounds in meteorites which crashed to earth from outer space.

Dr. F. H. Quimby, also of the exobiology department, said support for the belief that life exists elsewhere is found in: the cosmic distribution of elements, the theory of evolution by natural selection, recent ideas concerning the solar system's origin, the making of organic compounds from gases thought to exist in abundance when the earth was formed, knowledge of the structure and function of trait-bearing molecules, and new experiments which are closing the gap between living and non-living matter.

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some truth about animal migrations. But they forgot to consider such factors as whether or not a male turtle suddenly veered off course because it spotted an attractive female turtle.

On the other hand, many biologists are confused by simple math and engage in circulatory reasoning, said Dr. LaMont C. Cole of Cornell University, Ithaca, N. Y.

A zoologist by training, Dr. Cole's interest in math was sharpened by his studies of population distributions. He is perhaps the country's top matchmaker between biologists needing mathematical help and mathematicians looking for a practical application for their skills.

The proper use of bio-mathematics, Dr. Cole said, has resulted in many significant revelations. These include a way of determining whether an eel will swim to America or to Europe; a way of estimating the varieties and numbers of trees in a forest, and Dr. Preston's disturbing formula about animal reservations.

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Population Explosion

► **PROGRESS** in controlling disease, contrary to most persons' thinking, is not the main cause of the world's population explosion.

More important to the increase in the number of people are biological and social factors not now well understood, Dr. Rene J. Dubos, chairman of the bacteriology and pathology department at Rockefeller Institute, New York, told the American Institute of Biological Sciences meeting.

Animal species in the wild and in laboratories are known to adjust their population so that their resources are not overtaxed. Several human populations have done the same with their food and other resources, he said.

"The social group is qualitatively different from the sum of its parts, not through any mystical property, but simply because its characteristics are determined primarily by the interplay between parts," he said.

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Fungi as Protein Source

► **A TASTELESS**, odorless fungi food, which looks like cooked tapioca or caviar, is being tested as a new source of protein for livestock and even people.

A 50,000-gallon tank of the preparation could take care of the protein needs of 1,400 people for an entire year, Dr. F. Fern Och, mycologist at Ohio University, Athens, reported at the American Institute of Biological Sciences meeting.

Research done in cooperation with Prof. William D. Gray, botanist, and Mohamed Abou El Seond, research assistant at the university, shows that more than half of 175 species of fungi warrant further study as potential sources of edible proteins.

The fungi is grown in an aerated, submerged liquid culture, a process that takes about 30 hours.

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