

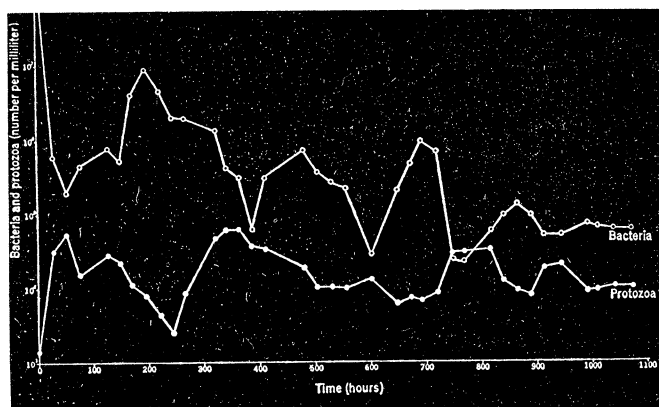
ecology

How predators and prey evolve together

Ever since Darwin established the principle of survival of the fittest as the mainspring of evolution, population ecologists have been trying to determine how the delicate balance between predator and prey is maintained so stably in nature. Eventually, the principle of "competitive exclusion" was developed, which held that no two species could share the same ecological niche simultaneously—if there were no briar patches, the Br'er Rabbits of the world would soon become extinct. Two recent papers dramatically advance the understanding of how this principle operates.

Natural populations sometimes fluctuate sharply, and the mechanism by which groups of predators and their prey reestablish equilibrium after such a fluctuation has never been fully understood, despite having been given a name—"genetic feedback." Presumably, an increase of prey leads to an increase in the number of better-fed predators; the predator population builds until there becomes a shortage of prey, then declines. The cycle can be repeated many times before the variations damp down to a new equilibrium. In the process, strong selection pressure is placed on both predator and prey, weeding out the least well adapted members of both species, thus promoting evolution.

A plant biologist of the University College of North Wales, P. van den Ende, has now demonstrated the damped population cycles and the resulting genetic changes, in the laboratory (SCIENCE, 181, p. 562). Into a culture of the bacterium *Klebsiella aerogenes* (the prey) he introduced a relatively small number of protozoa, *Tetrahymena pyriformis* (the predator). Over the next 1,000 hours he saw clearly the predicted population changes and establishment



of equilibrium. But a mystery remained: Had not both species occupied the same ecological niche.

Apparently not, for genetic changes between succeeding generations of bacteria had prompted a tendency for the *Klebsiella* to form clumps and stick to the glass, effectively removing some of them from the probing grasp of the *Tetrahymenas'* cilia. The predators also changed somewhat between generations.

Because of the longer time needed to produce new generations, similar studies among larger animals are impractical, but J. Maynard Smith and M. Slatkin have developed a model they say partially accounts for the stability of vertebrate predator-prey populations (ECOLOGY, 54, p. 384). Among higher animals, they point out, hunting ability varies greatly between adults and juveniles so that a scarcity of prey should cause a higher juvenile mortality rather than starvation of all the predators. Previous models could not adequately explain why a decrease in prey would not more often endanger the whole predator population.

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behavioral sciences

Values that influence family size

With the increasing number of methods available to women for controlling the number of children they will have, it becomes important to understand what beliefs influence a woman's desires regarding family size. Social scientist Kenneth W. Terhune of the Calspan Corp. in Buffalo, N.Y., has found that personal costs to the husband and wife seem to be central factors in the desire to have a family of a certain size.

Interviews were conducted with 310 married white women, aged 15 to 44, in the Buffalo area, with zero to four children. When asked open-ended questions about family size, the answers given by women who wanted small families were similar to those given by women who wanted large families. "Apparently," says Terhune, "what we were getting was a tendency to express concerns which appear socially acceptable and legitimate, and suppress concerns which seem to be selfish or unreasonable." But when the women were given a stack of 56 cards, each expressing a potential fertility concern such as "Having well-adjusted, normal children" or "How hard I must work as a mother," significant differences began to appear. On rating the cards, the women who wanted small families were most concerned about the loss of their privacy due to more children.

Restrictions on sterilization

About 100,000 sterilizations a year are subsidized by the Department of Health, Education and Welfare. In the past, up to two percent of the operations have been performed on minors and incompetent persons. But last summer ethical questions were raised when the parents of two young black girls from Montgomery, Ala., charged that the girls had been sterilized without parental permission. A short time later, several welfare mothers in South Carolina charged that they had been sterilized as a condition for receiving welfare. HEW has now placed restrictions on such operations.

Regulations that will go into effect by Nov. 1 have been published in the *Federal Register*. Under the new regulations, programs receiving Federal funds will be prohibited from using the funds for non-therapeutic sterilization of persons under the age of 21 and persons legally incapable of consenting unless prescribed procedures are followed. In the case of minors, a review committee will have to approve the sterilization even if parents or guardians have consented to it. In the case of persons who are legally incompetent, a review committee and a court will have to consent to the operation.

Hypertension and hypnosis

Hypnosis has been found to be successful in the treatment of hypertension, say a group of psychologists and physicians at the New Orleans Veterans Administration Hospital. The study included 21 patients with hypertension, ranging in age from 23 to 65 years. Six patients who were not on antihypertensive drug medication and nine on medication were treated with hypnosis. Six patients who were not on medication acted as a control group to rule out the possibility that simply coming to the hospital for blood pressure readings could lower pressure. While under hypnosis, the patients were told to relax internal organs, including heart, blood vessels and arteries. The typical patient, whether on drugs or not, was able to reduce blood pressure to within normal limits by the second or third session.

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