AEC-NASA TECH BRIEF

AEC-NASA Tech Briefs describe innovations resulting from the research and development program of the U.S. AEC or from AEC-NASA interagency efforts. They are issued to encourage commercial application. Tech Briefs are published by NASA and may be purchased, at 15 cents each, from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Compound Equation Developed for Postnatal Growth of Birds and Mammals

A study, entitled "Postnatal Growth of Birds and Mammals," has been reported by Anna K. Laird of Argonne National Laboratory, Argonne, Illinois. In the work, mathematical models of postnatal growth curves of various birds and mammals have been interpreted based on the compounding of an exponential growth process and a linear growth process. These models were then superimposed in the growth data from different species for comparison of the growth rates and the factors which affect these rates.

In previous studies, the growth of tumors and of embryos and their parts was analyzed using a growth equation of the Gompertz type. This equation is based on the observation that the specific growth rate tends to undergo an exponential decay with time.

In the postnatal growth of many mammals and birds, however the sigmoid curve described by the Gompertz equation continues into a straight line growth process, which is often extensive in time and contributes significantly to the final weight of the organism.

In this study, a compound growth equation has been developed in which the rate of this linear growth process is regarded as proportional to the mass already attained at any instant by an underlying Gompertz process. This compound growth model has been fitted to the growth data of a variety of birds and mammals of both sexes. Within this sample of organisms, the linear growth rate differs greatly in absolute magnitude, but also, to a much smaller degree, in proportion to the normalized Gompertz growth curves. Because the linear growth process varies in magnitude and may even be absent in normal growth, and because it can be eliminated by experimental means, it seems likely that linear and Gompertz growth are separate biological processes.

In agriculture, this compound growth model may be useful for the production of food animals. In some cases, for example, the empirical breeding methods used thus far actually have involved the selection of animals that complete the Gompertzian growth more quickly, and have a larger linear growth component. The present mathematical model will enable the breeder to deal with these two growth processes as separate entities.

Notes:

1. Available information includes tables for the growth of the various species, results, and a discussion of the results.
2. The information may be of value in the control and treatment of tumor growth, in studies on nutrition and nutritive substances, and in the identification of factors influencing growth rates of different races.
3. Breeders of birds and animals, medical and biological research laboratories, cancer prevention groups, and nutritionists may find this study of interest.
4. Reference: Additional details may be found in "Growth", 1966, vol. 30, pp. 349–363.
5. Inquiries concerning this report may be directed to:

Office of Industrial Cooperation
Argonne National Laboratory
9700 South Cass Avenue
Argonne, Illinois 60439
Reference: B68-10427

Source: A. K. Laird
of the Biological and
Medical Research Division
(ARG-10192)

(continued overleaf)

Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

Mr. George H. Lee, Chief
Chicago Patent Group
U.S. Atomic Energy Commission
Chicago Operations Office
9800 South Cass Avenue
Argonne, Illinois 60439