actions visible. This is what everyday perception accomplishes. In this manner Arnheim develops the theme that there is intelligence at every level of cognitive functioning.

The discussion of abstraction brings us to the center of Arnheim's concern, and here he makes telling points. The classical account of abstraction as the removal of elements from other elements presupposes knowledge of what is to be abstracted and is therefore circular. Moreover, the same element cannot, strictly speaking, be found in more than one entity, nor can an arbitrary selection of elements produce a sensible abstraction. To abstract is not to free oneself of what is concretely present, but to apprehend a structure through its embodiment; abstraction occurs from organized wholes. More generally, Arnheim takes exception to the view that thinking involves detachment from the concrete, that it is an ascent to a more powerful but sensorily more impoverished representation of experience. Thinking is for him a direct apprehension. His ideal of understanding is the kind of self-evidence in which relations and forces become simultaneously visible, as they do in perceiving.

Arnheim has stated an issue of absorbing interest and has thrown new light upon it. He is most challenging when he points to continuities between perceiving and thinking. These are indeed impressive: in both regions one finds evidence of ordering, transposing, judging, restructuring. One of the merits of this work is to provoke further questions. Since continuity is not necessarily identity, what is the precise import of the foregoing similarities? Are the operations of perceiving and thinking identical, or are the similarities based upon different mechanisms? What is, for example, the relation between inference in thinking and inference-like perceptual operations? At the risk of sounding inconsistent one is tempted to say that Arnheim is more convincing about perceiving than about thinking. It is unlikely that the distinction between them is simply the product of inadequate theory. The fact that perception often accomplishes instantly what thinking finds difficult to comprehend suggests that each solves its problems in its way. In the present state of knowledge it may be fruitful not to lose sight of the differences or of the similarities.

Among the most valuable parts of this work are the discussions of a variety of relevant topics, to which the author brings insightful, often surprising observations. Few readers will fail to enjoy what Arnheim has to say about pattern perception of computers, about discrimination learning experiments, Kurt Goldstein's treatment of concreteness and abstractness in brain-injured patients, or education in the visual arts. They will not learn much about the nuts and bolts of psychology, but they will make the acquaintance of an author with a keen appreciation of the structure of experience. Arnheim deepens the reader's sensibilities about the nature of psychological events. In the current intellectual climate it is easy to slight a contribution that does not claim to produce new information or discoveries. Yet the clarification of a basic problem eventually controls the course of investigation. The refreshing angle of vision of this work should appeal to experts and to nonpsychologists. As befits its content, the format and the reproductions of the book are most attractive.

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Down's Syndrome

Epidemiology of Mongolism. ABRAHAM M. LILIENFELD, with the assistance of Charlotte H. Benesch. Johns Hopkins Press, Baltimore, 1969. xiv, 146 pp., illus. $7.

Sequín in 1864 described a form of mental retardation that he called "furfuraceous idiocy" ("furfuraceous" meaning "scurfy," "resembling bran"), a term suggested by the dry, cracked, and scaly skin often seen in older patients with this disorder. In 1867 Langdon Down described the same syndrome as "mongolism" because of a supposed facial resemblance of the affected individuals to persons of the Oriental race. (The unfortunate term persists although the disorder was later renamed Down's syndrome or Down's anomaly.) For almost the next 100 years little was added to our knowledge of the disease except to establish its incidence as about 1/750 births and show it to be one of the more frequent causes of moderate and severe mental retardation. The disorder was noted to occur more often in some families than would be expected by chance, and repeated observation was made of an increasing incidence of the disorder associated with advancing maternal age. At least 40 different etiologies were suggested.

A major breakthrough occurred in 1959 when, independently, Lejeune, Gautier, and Turpin in France and Ford in England observed that patients with mongolism had 47 chromosomes; the additional small, acrocentric chromosome was arbitrarily labeled a No. 21 chromosome. This was the first example discovered of a chromosome aberration as a cause of disease in man, and the observation has stimulated an enormous number of cytogenetic, biochemical, and epidemiological studies on mongolism, many of which are discussed and summarized in this volume by Lilienfeld.

The author, an epidemiologist, has been very resourceful in assembling the scattered literature on mongolism, in presenting the most useful and accurate studies, and in using frequent tables and figures to illustrate his points. The reader can obtain a great deal of information in relatively few pages.

In the opening chapter the author gives consideration to the chromosomal abnormality; more appropriate figures and legends would have improved this portion of the book. The majority of studies show the incidence to be between 1.0 and 1.9/1000 live births; the incidence at conception is estimated at 7.3/1000, the difference being reflected in fetal loss due to spontaneous abortions. The studies on maternal age point out that 20 percent of affected children (compared to 1 percent of all births) are born to mothers over 40 years of age, 50 percent (compared to 7 percent of all births) to mothers 35 years of age or older. The author comments on reduction in incidence of mongolism through family planning; more recent events suggest that the use of early amniocentesis to detect the disorder in utero, followed by abortion when indicated, could be an equally feasible preventive measure.

Many prenatal factors have been studied and only two emerge as possibly significant: maternal ionizing radiation and the presence of maternal thyroid antibodies. There is a good discussion of the increased frequency in patients with mongolism of other diseases, including leukemia, congenital megacolon, and other chromosomal abnormalities. The trisomic state offers the opportunity to study gene dosage effects, and the author reviews many of the biochemical studies, large-

ly negative, that have been carried out. The only discovery of continuing interest is the "Australia antigen," an isoantigen found in some 30 percent of Down's syndrome patients, 9 percent of leukemic individuals, and 5 percent of patients with viral hepatitis, and not at all in normal controls.

Lilienfeld urges that future large-scale epidemiological studies focus on "specific types of Mongolism," for example trisomy, translocation, and mosaicism, and that clinical mongolism be considered as a heterogeneous entity. Further, he urges a search for different etiologies, with explorations of drugs, radiation, infectious agents, thyroid antibodies, and so on. Equally important are basic biologic studies, which would include meiotic studies in the male and female to define the timing, origin, and mechanism of production of the chromosomal nondisjunction; the development of suitable animal models for study of the trisomic state; and the use of in vitro fertilization methods for study in the experimental animal of the effects of the trisomic state on early embryogenesis.

The book is strongly recommended to those interested in mental retardation, epidemiology, and human genetics. It may also interest those biologists who wish to understand better how a chromosome anomaly, which has analogies in plants and other species, can be studied in man.

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Population and Yield

Theory of Fish Population Dynamics as the Biological Background for Rational Exploitation and Management of Fishery Resources. GEORGE V. NIKOLSKII. Translated from the Russian edition (Moscow, 1965) by J. E. S. Bradley. R. Jones, Ed. Oliver and Boyd, Edinburgh, 1969. xvi, 324 pp., illus. £8.10.0.

During the past four decades the fishery scientists of Europe and North America have studied the dynamics of fish populations with the objective of determining the relation between the amount of fishing and the sustainable catch. They have developed a substantial body of theory that has been applied successfully to a large number of animal populations and has led to major improvement in the management of some major marine fisheries, such as halibut of the northeast Pacific, plaice of the northeast Atlantic, yellowfin tuna of the eastern tropical Pacific, and whales of the Antarctic.

The theory has been developed for single-species populations with man as a predator. Much of it is based on the Darwinian concept of a constant overpopulation of young that is reduced by density-dependent mortality resulting from intraspecific competition. The unfished population tends toward a maximum equilibrium size with a relatively high proportion of large, old individuals. As fishing increases, both population size and proportions of large, old individuals are reduced, but growth is increased and natural mortality is reduced. Fishing mortality eventually takes the place of most natural mortality. If the amount of fishing is increased too much the individuals will tend to be taken before realizing their potential growth, and total yield will be reduced. The maximum sustainable yields can be taken at an intermediate population size that in some populations is about one-third to one-half the unfished population size.

G. V. Nikolskii, of Moscow State University, develops his theory from a different approach. He is a non-Darwinian and is (he says) a nonmathematician; rather he considers himself an ecologist and a morphologist. He argues that Darwin's concept of constant overpopulation has led to neglect of the problem of protecting spawners and young fish. He argues also that Darwin's concept of a variety as an incipient species has led to extensive mathematical analysis of racial characteristics without understanding of the adaptive significance of the characters. Nikolskii considers the main laws of population dynamics to be concerned with the succession of generations: their birth, growth, and death. The details are governed by the relative rates of adaptation and environmental change. The mass and age structure of a population are the result of adaptation to the food supply. The rate of growth of individuals, the time of sexual maturity, and the accumulation of reserves vary according to the food supply. These factors in turn influence the success of reproduction in ways that tend to bring the size of the population into balance with its food supply.

The adaptations of populations of fish are documented extensively from both Soviet and Western literature. There are chapters on food, fecundity and spawning, growth and maturation, population structure, and mortality. The closing chapters include the effects of fishing, basic laws of population dynamics, forecasting, and increasing productivity.

Western fishery scientists should not conclude that Nikolskii is in opposition to their approach to population dynamics. His approach is complementary, in that it suggests ways in which we may study the deterministic and stochastic variation in the parameters we use. He stresses that we should consider more deeply the quality of stocks. Nikolskii documents many of the factors that can be used to measure quality, but by omission indicates that much remains to be done to quantify those factors.

The translation by Bradley and editing by Jones are good, although the publisher has failed to allow Nikolskii to read the proofs, so that a number of errors have occurred. This seems to be a widespread practice in the Western world, and is to be deplored. Publishing houses should, in their own interest as well as as a service to the author, communicate as completely as possible. Scientific authors in the Soviet Union should not be an exception.

In his final chapter, Nikolskii suggests some future problems in the study of population dynamics. He points specifically to the need of better knowledge of variability within populations and adaptations to self-regulation of numbers. He emphasizes the urgency of further studies because we are approaching the end of new stocks to exploit. His book should be in the library of all serious students of fisheries.

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Endocrinology

Steroid Hormones and Metabolism. KENNETH W. MCKERNS. Appleton-Century-Crofts, New York, 1969. xii, 180 pp., illus. $6.95. Perspectives in Cell Biology.

In the last several years McKerns has edited the proceedings of several symposia concerning the biosynthesis and metabolic effects of adrenocortical and gonadal steroid hormones. These volumes have been of great service to experts and to workers wishing to in-