

evolutionary change in different organs, which is stated to be most pronounced in less specialized forms, is treated next. The bulk of the volume, however, is devoted to the major role in plant evolution attributed by Takhtajian to ontogeny and its modification, and to the related topics of recapitulation and "evolutionary teratology." "In evolution, new characteristics arise as hereditary alterations of organs at the most diverse stages of their morphogenesis, beginning with the formation of primordia and ending with the last developmental phases." This fact, according to the author, refutes Haeckel's famed biogenetic law, which postulates a recapitulation of ancestral *adult* forms. The principle of alteration of ontogenies is applied by Takhtajian to bridge a wide range of apparently profound gaps between major groups of plants and to explain the rise of new developmental lines differing sharply in adult form from their ancestors. At the same time, he cautions that the ontogenetic method must be used cautiously and in conjunction with comparative morphology, lest its potentialities be exaggerated as, for example, he believes they have been by Gregoire, Thompson, and others in denying the foliar nature of carpels. He concludes: "The evolutionary botany of the future will be erected on the basis of a synthesis of morphology and physiology."

If in all this there is very little that is startlingly new to Western students of plant evolution, it is interesting to discover that the climate of opinion is not radically different between East and West.

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Metropolis and Region. Otis Dudley Duncan, W. Richard Scott, Stanley Liberson, Beverly Duncan, Hal H. Winsborough. Published for Resources for the Future, Inc., by Johns Hopkins Press, Baltimore, Md., 1960. xviii + 587 pp. \$8.50.

The program which resulted, among other things, in this hefty volume was initiated by the Social Science Research Committee of the University of Chicago. It was largely carried on at the Population Research and Training Center of that institution, with support from the Ford Foundation and from Resources for the Future, Inc. (which

also sponsored this volume). It is, according to the senior author, virtually a companion to the Resources for the Future study *Regional Economic Growth in the United States* by Harvey S. Perloff and others. Perloff is credited with being "in large measure responsible" for "the ideas which ultimately crystallized in this study."

The authors attempt an integrated treatment of the orientation of metropolitan structure in the United States, a study frankly cross-sectional, one providing a bench mark for dynamic analysis of future change. Its aim is threefold: (i) to review ideas on the nature of the metropolis, (ii) to test these ideas against an outline of the structural characteristics of the metropolitan economy of the United States about 1950, and (iii) to survey the industrial composition and regional relationships of the larger U.S. cities.

In analyzing metropolis structure the authors emphasize location and function. Influenced by Gras, they think of "the metropolis as an industrially developed city, strategically located at a focus of a transportation network." Such concepts are tested with statistical data on the 56 SMA's (SMA: Standard Metropolitan Area) with a population of 300,000 or more in the 1950 census.

Data on manufacturing industries are broken down into categories (i) according to the extent that raw materials are processed or materials already processed are fabricated, (ii) according to whether their output is for final or nonfinal markets.

With the aid of an ingenious diagram (Fig. 15, page 264) that plots commercial against manufacturing activity, the 56 cities are divided into seven categories: national metropolis, regional metropolis, regional capital, submetropolitan (diversified manufacturing with metropolitan functions), diversified manufacturing with few metropolitan functions, specialized manufacturing, and special cases. The authors are less interested in getting each city into a proper pigeonhole than in establishing a typological classification demonstrating how U.S. cities are differentiated in metropolitan functions and regional relationships.

The remaining half of the book is given over to data, discussions, and summaries for 51 of the cities. (The five national metropolises are omitted because their analysis would have overtaxed the available resources.) A detailed "industrial profile" is presented for each. The extent to which each in-

dustrial category has inputs and outputs that are local, regional, or national is discussed in considerable detail and summarized in tabular form. The salient facts for each city are presented in brief summaries. The Denver summary, for example, reads as follows: "Denver appears to be chiefly a commercial and financial SMA performing metropolitan functions for a large portion of the Mountain States. Some processing of resources is carried on—notably meat packing and sugar refining—and inputs appear to arrive from the immediate hinterland (Area B) in the case of sugar beets and from both hinterland and regional areas (B and C) for livestock. Transportation, wholesaling, irrigation, administrative, and educational services appear to be performed for a large but sparsely populated area (Area B) consisting chiefly of Colorado and parts of New Mexico and Wyoming, while financial, military and tourist functions are performed for a regional or national area" (page 380).

Stylistically the book tends toward a dull, polysyllabic, professional mumble. The following sentence is characteristic: "If we are right in thinking that times are ripening for the appearance of such a signal contribution to the theory of metropolitan structure, then our rather eclectic adaptation of a number of perspectives and analytical techniques may be excused as an effort to temporize with competing claims that we cannot adjudicate satisfactorily" (page 19). Resources for the Future should somehow induce a more straightforward expository prose in its reports.

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Birds of Anaktuvuk Pass, Kobuk, and Old Crow. A study in arctic adaptation. United States National Museum, Bulletin 217. Laurence Irving. Smithsonian Institution, Washington, D.C., 1960 (order from Supt. of Documents, GPO, Washington 25). viii + 409 pp. Paper, \$2.

Anaktuvuk Pass, an area of mountain tundra at an elevation of about 2400 feet, is important ornithologically because many species of birds use it in migrating through the formidable Brooks Range to and from the Arctic slope of Alaska. Kobuk, a village in the northwestern interior of Alaska, is on the Kobuk River about 120 miles from

the river's mouth. Old Crow, a village on the Porcupine River in northwestern Yukon Territory, is not far from McDougall Pass (elevation 1200 feet) through the Richardson Mountains, a pass "shorter and . . . lower than any . . . through the western mountains of America"; Old Crow is also not far south of the "northernmost . . . timber in America." Chapters 2, 3, and 4 are annotated lists of the birds found at these three localities, all of which are north of the Arctic Circle in what the author regards as "a well characterized faunal region." The list for Old Crow is surprisingly short on sandpipers, only nine species having been found there, in contrast to 16 species at Kobuk and 18 at Anaktuvuk. The author considers Porcupine Valley "an unimportant migratory path" for shore birds. Virtually all migration observed in this valley in the spring of 1957 moved in an easterly direction.

The three chapters just mentioned are not ordinary annotated lists. References to the Eskimos and Indians are unfailingly interesting. Of the Alaskan (Eskimo) and Yukon (Old Crow Indian) names for the many birds common to the two regions, those for only two species resemble each other at all closely—the onomatopoeic *Ahalik* (Eskimo) and *Ahaluk* (Indian) for the old squaw duck, and the *Nattak* (Eskimo) and *Nastok* (Indian) for the great gray owl. I am not sure that the "resemblance" of the latter two names is real. I cannot, incidentally, account for the absence of the snowy owl from the Kobuk list; the species certainly occurs there, as is evident from the status list on page 247.

Irving is primarily a physiologist. Yet in his first chapter, "The Background," he makes a statement of profound import to taxonomists: "Winter in the Arctic is so much colder than the freezing temperatures at which vital processes slow down to unproductive levels that it is, in a way, surprising to find there many animals and plants which indicate their long arctic establishment by having evolved special arctic forms. On the other hand, it is even more surprising that some arctic species are scarcely distinguishable from closely related populations living in warmer climates." Notable, too, are some of his taxonomic discussions, for example, that dealing with the white-winged scoter (*Melanitta deglandi*), the only species of North American migratory duck "distinguished into eastern and western races." The author's meas-

urements of bills of dried specimens convinced him that eastern birds were not distinguishable from western; while admitting that eastern and western *wintering* populations are discrete, he believes that eastern and western birds mingle before and after nesting with the result that both the wintering and the nesting populations are "genetically mixed."

Basing many of his ideas directly upon findings reported in the annotated lists, Irving proceeds with chapters titled "Status and distribution," "Migrations and origins," "Residence in the Arctic," "Biological aspects of migration and nesting," and "Arctic metabolic economy of warm-blooded animals," gradually focusing less upon Alaska as a faunal region, more upon the problems of living anywhere in the Arctic. The concept of comfort, of well-being, of contentment (admittedly my own somewhat subjective word) runs through even the most abstruse parts of these chapters. This, to my way of thinking, is wholly justifiable. There is, of course, such a thing as being miserable in the cold. Ludwig Kumlien, in his account of the bird life of Cumberland Sound, Baffin Island, tells of the death of large numbers of small birds during a spring storm. A vast amount of writing capitalizes on the idea of being miserable in the Arctic. Yet every careful observer of life in the far north feels in his bones the exuberance that is part of the long summer days, the swift shifting of the seasons, the brilliance of clear weather in winter, even in what is so often referred to as the "long winter night."

Among the most graphic and thought-provoking paragraphs in the book are those in Chapter 7. Writing of the springtime return to the breeding grounds, Irving says: "The birds arrive in an arctic season changing at a rate which cannot be imagined from experience confined to temperate regions. Daylight becomes continuous in May. In that month, from levels lower than those of the coldest part of winter in temperate regions, the arctic temperature rises to the warmth of summer. The water in the environment changes its physical state from snow and ice to liquid. But in any one year these day to day changes are not orderly, for until early June pleasant warmth, snowfall and bitter cold can succeed each other within a few hours. In these vagaries of the arctic weather . . . the birds arrive, settle, and proceed to nest with such regularity that

their behavior sets the steadiest schedule among the natural phenomena."

Resident (that is, nonmigratory) birds of the far north adapt themselves to a warming of the air as spring advances; migrating birds, on the other hand, must adjust to increased chilling as they move northward. A given day may be warmer than the preceding to the resident form, much colder to the migrant form, yet both take the change in their stride—evidence of their ability to use such thermoregulators as feathers. It is known that arctic warm-blooded animals can keep their bodies some 80° warmer than the air by production of metabolic heat and by conservation of heat through natural insulation. Irving and his associates have ascertained that in winter "at -45°C and in warm summer the mean body temperature of 15 arctic and subarctic resident species of birds averaged 41.3°C." Mean body temperature among these species differ to about the same degree as those among birds in temperate regions. "Body temperatures of homoiothermic species are phylogenetically differentiated, but the differentiation shows no common regard for geographical range, and their temperatures are more stable than the climates of the earth, which have changed appreciably, while the temperatures of the birds that inhabit them apparently have remained fixed."

This is a sample. The discussions of critical temperature, of the stability of the basal metabolic rate, of variability in insulation, of heat loss through the extremities, and notably of the reproductive success of birds, despite the brevity of the arctic summer, make this volume invaluable to ornithologist and physiologist alike.

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Plant Pathology. An advanced treatise. vol. 3, *The Diseased Population*. J. G. Horsfall and A. E. Dimond, Eds. Academic Press, New York, 1960. xiii + 675 pp. Illus. \$22.

In contrast with the two previous volumes which treat the diseased plant and the pathogen as individuals, the present and concluding volume of this series deals with populations of plants in relation to diseases and their control. It gives detailed consideration to the vital concept of inoculum potential de-