RECENT LITERATURE

Edited by Bertram G. Murray, Jr.

MIGRATION, ORIENTATION, AND HOMING

(See also 15, 16, 17, 33)

1. Release-site bias as a possible guide to the "map" component in pigeon homing. W. T. Keeton. 1973. *J. Comp. Physiol.*, **86**: 1-16.—The mean vanishing bearings of homing pigeons at a given release site often show a consistent deviation from the home direction. Castor Hill, 143 km NNE of Ithaca, New York, is a site from which Cornell pigeons consistently depart in the same direction, but with a large clockwise deviation from the home direction (200°). The data reported in this paper were obtained from 34 releases as follows: (1) 13 releases with experienced pigeons under sunny skies yielded a mean bearing of 260°, i.e., 60° to the right of homeward; one of these releases resulted in random vanishing bearings. Birds new to the site had a mean of 273°, significantly different from the 250° for birds with previous experience at the site. (2) Three releases of experienced birds (one group had flown from Castor Hill once before) were made under solid overcast skies. The mean for all groups was 258° (deviation = 58°) and again the site-experienced birds (241°) showed less clockwise bias than birds new to the site (270°). (3) One release was made with 10 first flight birds. They showed approximately the same deviation (mean = 287°). (4) Two releases were made with birds of varying experience that were trained repeatedly in releases from the northwest. This training had minimal, if any, effect on the vanishing bearings at Castor Hill. (5) Four releases of pigeons from two other nearby lofts showed a similar, but slightly reduced, bias. (6) Pigeons from more distant lofts (Fredonia and Schenectady, New York) showed clockwise biases from their home directions similar to those exhibited by the Cornell birds. Pigeons from the Schenectady loft often flew off in random directions, however. (7) 23 Bank Swallows showed a bias similar in sign and magnitude (mean = 282°) to the Cornell pigeons. (8) Three releases with pigeons phase-shifted four, five, and six hours fast were performed to determine if pigeons have an aversion to the home direction at Castor Hill. The birds departed as predicted by their phaseshifts and the release-site bias, indicating that no especially attractive feature toward the west nor repellent feature in the home direction is responsible for the observed results. Despite their more homeward vanishing bearings, the homing performance of clock-shifted birds was poorer than that of the controls.

Based on these results, Keeton concludes that the directional bias observed at this site is not a function of age, experience, season, wind, weather, or landmarks. The results with the swallows indicate that it is not species-specific. This is an important observation because it increases our confidence that what we find with pigeons has some generality. Further, the biasing factor appears to be independent of the sun compass (cf. the clock-shifted birds) and is operative to about the same extent under clear or solid overcast skies. Keeton believes that unless there is yet another compass mechanism (perhaps not too unlikely, given the past history of the field), the observed bias is probably part of Kramer's "map" component of navigation. The experiments did not control for, nor does the paper consider, the possibility that olfactory cues may be involved in this release-site bias (see *Bird-Banding*, **45** (1), 1974, reviews no. 6-10).—Kenneth P. Able.

2. Lengths of resting time in various night-migrating passerines at Hesselo, southern Kattegat, Denmark. J. Rabol and F. D. Petersen. 1973. *Ornis. Scand.*, 4: 33-46.—Hesselo is a 60-ha island located 27 km from land on the main migratory route from the Scandinavian peninsula. During spring and fall thousands of nocturnal migrants stop over on the island for varying periods of time. Recaptures of banded individuals of nine species of nocturnal migrants were used to examine the lay-over times of the migrants. The time course of recaptures for all species approximated exponential decay, but there were significant deviations from the model for nearly all species. The time constants for each species increased with the number of days since banding: individuals that lingered for a long time (in some cases, more than 15 days) were likely to remain longer than the mean for all individuals. Most birds, however, rested just one day and night on the island. Lay-overs were shorter in spring than in autumn, and in spring, earlier migrants rested longer than later individuals of the same species. A similar trend was evident between species as well. While one might expect the same patterns to occur at inland localities, the absolute resting times might be quite different. The island on which the data were collected was quite small and continuously populated by a large number of migrants. The emigration rates seemed to be influenced by long-term environmental conditions, but no attempt was made to examine the effects of short-term weather changes, which are known to have a large influence on the initiation of migration in many areas.—Kenneth P. Able.

3. **Studies on the orientation behavior of homing pigeons under radar radiation.** (Untersuchungen über das Orientierungsverhalten von Brieftauben unter Radar-Bestrahlung.) G. Wagner. 1972. *Rev. Suisse Zool.*, **79:** 229-244. (In German with English summary.)—Homing pigeons released at distances of 18, 42, and 65 km from the home loft were followed with a 150 kW, 3-cm tracking radar. A total of 108 pigeons were released (58 experimentals and 50 controls). Experimental birds were tracked with the radar and all pigeons were observed visually. No significant differences were found between experimentals and controls with respect to track direction at 20, 30, 60, or 120 sec after release, vanishing bearing, or vanishing time. However, in every case, the experimental birds as a group showed greater scatter in flight direction and longer vanishing times than the controls. If the radar beam does have an effect on the orientation or navigation of the pigeons it is apparently a very subtle one. However, the implications of such an effect are of the greatest importance to field studies of bird migration, especially those done with automatic tracking radars. Despite the numerous fruitless attempts to demonstrate an influence of radio waves (reviewed in Eastwood, *Radar Ornithology,* 1967), these results and persistent tantalizing rumors certainly justify additional careful work in this area. Although these releases were made under basically sunny skies, the possibility that the radar energy is in some way interacting with the proposed magnetic compass should not be dismissed. Experiments of this type under solid overcast might prove interesting.—Kenneth P. Able.

POPULATION DYNAMICS

(See 29)

NESTING AND REPRODUCTION

(See also 19, 29)

4. **Nesting of the members of the Corvidae in Poland.** A. Kulczycki. 1973. *Acta Zool. Cracoviensia,* **18**(17): 583-666. (In English with Polish and Russian summaries.)—This is a remarkable monographic study devoted mainly to nesting material analyses reminiscent of old style stomach food content examinations. There are tabulations of nest structure contents giving identification of items with percentages. Species of genera *Garrulus, Pica, Nucifraga,* and *Corvus* (four species) receive particular laboratory and field attention, with many corollary observations. In addition there are comparisons with nests of genera *Gymnorhinus, Cyanocitta, Aphelocoma, Cyanocorax, Perisoreus, Cyanopica, Podoces,* and *Pyrrhocorax.* Most trenchant differences and relationships are seen in the stratification of the material. This is the basis of an attempted dichotomous key, with diagrammatic cross sections illustrated. The primary breakdown comprises four-layered (in *Corvus* spp.) versus three-layered stratification, with a clay layer always present in the former, absent or inconsistent in the latter. Other criteria are presence or absence of feathers, hair, wool, rootlets, or other material. In nest structure the genera tend to form groups corresponding to their anatomical and evolutionary relationships. In genera *Gymnorhinus, Aphelocoma, Cyanacorax* and *Garrulus,* nests are mostly three-layered, clay always absent. *Nucifraga* is intermediate to the above group and other genera, amount of clay lining various or alternate to other soft material. Nests of *Corvus* spp. are the most distinctive and individualistic of the family.—Leon Kelso.

5. The Ross' Gull mystery. (Zagadki rozovoi chaiki.) S. Uspenskii. 1973. *Priroda*, **1973**(8): 102-106. (In Russian.)—Following the first report of *Rhodostethia rosea* in 1823 a long interval elapsed before discovery of its breeding ground and habits. In 1905 Buturlin found it nesting in lowlands of the rivers Kolyma, Alazee, and Indigirka in northeastern Siberia. It arrives at nest sites on lake shores and sedge bogs in late May. One to three eggs are laid in early June. Incubation is about three weeks. By late July the juveniles have fledged and are moving to shores of the Arctic Ocean even farther north, rather than southward. Maturity is reached in their second year. In summer they feed on aquatic insects, crustacea, molluscs, and a little vegetation. The mystery referred to is the lack of observations on its winter life. Like the Ivory Gull, and the eiders other than the Common Eider, its life history is hidden in the polar night. Of main value in this article is a map pinpointing historically its recorded occurrences.—Leon Kelso.

BEHAVIOR

(See 28)

CONSERVATION AND ENVIRONMENTAL QUALITY

(See also 35, 36)

6. The scientific basis for environmental education. N. Gladkov. 1973. *J. Environ. Educ.*, **5**(2): 20-22.—Although new and little known, this journal attracts attention abroad including that of this eminent USSR conservationist and ornithologist. Among many pithy remarks he notes that there are two "natures" to consider, the general or prevalent one, used and not protected, and the special or restricted ones, protected but not used. This in the long run means minimizing the general one and enlarging the protected ones, an exercise in futility. He is critical of the "absolute protection" concept, it being subject to circumstances. Beyond protective exploitation, nature has importance for health and recreation. Nor can aesthetic needs be ignored. "Partnership with nature is an integral part of human life; it contributes to man's personal fulfillment, improves his health, and makes his work more productive."—Leon Kelso.

7. Taps for songbirds. C. Sterling. 1974. *Washington Post*, 16 April 1974: B 3.—This newspaper article reports that small "songbirds" are still fair and popular game hunting in some civilized countries. It is not only prevalent but on the increase. So we learn that in one country, the two million armed hunters equal the total armed forces of its seven neighboring nations, and "yield to none in their resolute determination to kill anything that moves." Reportedly an armed hunter cannot be ordered off private land, whereas an unarmed intruder can be banished at gunpoint or even jailed. The annual kill claimed for this country (150,000,000 songbirds) seems rather an overestimate, and some of the details given on hunting methods recall remarks they would tell a "tenderfoot" in the old Western U. S. in an early day. However, we are informed that the Max Planck Institute, Radolfzell Observatory has the activity under observation and reports a pernicious increase in passerine shooting since 1968.—Leon Kelso.

PHYSIOLOGY

(See also 28, 29)

8. Geographic variation of thermal conductance in the House Sparrow *Passer domesticus*. C. R. Blem. 1974. *Comp. Biochem. Physiol.*, **47**: 101-108.—The cooling rates of house sparrow carcasses from eight locations in North America (ranging from Churchill, Manitoba, to Vero Beach, Florida) were measured. Conductance values calculated from these data fell into two distinct groups—those for the five northern sites and those for the three southern sites. No sex differences in heat losses could be established. Conductance varied inversely with latitude and with isophane. Weight specific conductance varied exponentially with body weight in both northern and southern samples, the exponent being greater for southern birds (−0.893) than for northern birds (−0.462). Conductance per unit surface area was linearly related to body weight only in southern samples, whereas for total heat loss the relation was exponential only for northern house sparrows.

There are several inconsistencies in this paper which require rather careful reading. First, the results presented in Blem's Table 1 (weight and conductance data for each of the eight sites) "indicate no significant differences between collections made at the five northernmost sites, or between the three southernmost samples," yet his later analyses are based on pooled results for the four northernmost sites and the four southern sites. The discrepancy arises from the sites in fifth and sixth place sharing the same latitude so that a 4/4 split leaves one with latitude groupings of (59, 52, 44, 40) and (34, 34, 32, 28); statistically, however, only a 5/3 split is acceptable.

The second set of inconsistencies arises from Blem's use of log transformations in testing for exponential relations: the scales in Figs. 1 and 3 are linear scales yet logarithmic regression lines are drawn as straight lines on such plots! Add to this the fact that Fig. 2 is indeed a linear (not logarithmic) plot on linear scales and one has cause for confusion.

My final reservation relates to the interpretation of the results. Blem shows a difference in the conductance-weight equations for northern and southern samples. However, most northern birds are heavier than about 29.5g and most southern birds were lighter than 29.5g so that an alternative interpretation of the results is possible, viz., that the whole effect is a function of weight rather than of latitude. Blem does indeed discuss the role of body composition differences between northern and southern populations but he does not make the critical calculations, of the partial correlation between conductance, body weight, and latitude, to show conclusively to what extent the pattern of conductance is explicable in terms of weight components (feather weight, fat content) controlled by environmental factors rather than in terms of genetic factors peculiar to particular latitudes.—Raymond J. O'Connor.

9. **Caloric equivalents of body weight change in homeotherms: ratio of oxidized substance to evaporative heat loss.** (Kaloricheskie ekvivalent izmeneniya vesa tela u gomoiotermnykh zhivotnykh: zavisimost ot okislyaenykh veshestv i ot isparitelnoi teplootdachi.) V. Dargolts. 1973. *Zhurn. Obshch. Biol.*, **34**(6): 887-899. (In Russian.)—The content is only partly ornithological with some correlated data and tables cited. The ratio of heat loss to evaporation of water is stated to be relevant to environmental temperature in general. But, paradoxically, in units of energy released, birds in flight lose no more water by evaporation than birds at rest. The use of dehumidified air to evaluate experimental heat loss results in overestimation of evaporative water loss especially in the Temperate Zone. Endogenous water manufacture is taken into consideration, with the suggestion that birds suffering water deficiency during migration may shift to protein metabolism if fat resources are exhausted.—Leon Kelso.

10. **Seasonal variations and the effects of nesting and moulting on liver mineral content in the House Sparrow (*Passer domesticus* L.).** H. Haarakanga, H. Hyvärinen, and M. Ojanen. 1974. *Comp. Biochem. Physiol.*, **47**: 153-163.—Four minerals (calcium, zinc, copper, and magnesium) were measured in monthly samples of House Sparrows in Finland. Calcium and zinc content increased in females about the time of egg-laying, presumably due to their role in yolk synthesis, and again in September when molt was in progress. These latter increases also occurred in males and were paralleled by copper content; these changes are attributed to the roles of these minerals in protein synthesis. The results for magnesium show a marked seasonality with a mid-summer peak and a winter low in both sexes; no clear explanation is available to explain this pattern. —Raymond J. O'Connor.

11. **Temperature regulation of the Pyrrhuloxia and the Arizona Cardinal.** D. S. Hinds and W. A. Calder. 1973. *Physiol. Zool.*, **46**: 55-71.—An interesting example of the painstaking care now being taken by the environmental physiologists once labelled "bush physiologists." Oxygen consumption

was continuously recorded with a paramagnetic gas analyser where evaporative water losses were simultaneously determined by an ingenious arrangement allowing maintenance of a constant dew-layer thickness on the surface of a mirror; mirror temperature then equalled dewpoint.

The Pyrrhuloxia (*Cardinalis sinuata*) and Cardinal (*C. cardinalis*) occur sympatrically in the Sonoran Desert, the former inhabiting more arid habitat than the latter. Correlated with this difference Hinds and Calder found that at 45 °C the Pyrrhuloxia lost less water (both absolutely and as a percentage of its body mass) than did the Cardinal, yet dissipated the same amount of metabolic heat production while maintaining a slightly lower body temperature than the Cardinal. Little interspecific difference was obtained for thermoneutral zone (29-42 °C) and metabolic rate (2.2 ml 0_2 g^{-1} hr^{-1}) but these values were respectively higher and lower than those previously obtained for the eastern race *C.c. cardinalis* by Dawson. At higher temperatures the desert subspecies lost less water and dissipated more of its (already lower) heat production than did the eastern subspecies.

Two points of methodology in this paper deserve special mention. First, its authors have been careful to note the physical distinction between heat transfer rates and "thermal conductance"; the latter refers strictly only to heat loss by conduction, whereas experiments of this type normally measure only the difference between heat production and evaporative heat loss. Second, Hinds and Calder conclude their paper with a sensitivity analysis of derived physiological variables, thus assessing the possible effects of systematic experimental error (as against statistical error) on the calculated parameters. This practice would have a salutary effect on the claims of some other workers, were they to adopt it.——Raymond J. O'Connor.

12. Temperature regulation in the Bedouin Fowl (*Gallus domesticus*). J. Marder. 1973. *Physiol. Zool.*, **46:** 208-217.—This study examined the response of summer acclimatized domestic fowl in Israel. The birds were "exposed for 2-4 days a week to air temperatures between 25 and 48 C" for two months before study; the remainder of their time was spent in outdoor cages under unstated temperature conditions.

Body temperatures increased linearly with ambient temperature from 41.0 °C at 26 °C ambient to 43.2 °C at 48 °C ambient; the author nevertheless concludes that the species does not show an obvious tendency to use hyperthermia for passive heat dissipation nor as a barrier against heat gain from the hot environment. There was no obvious thermoneutral zone for metabolic rate, although oxygen consumption was minimal at about 40 °C ambient. Evaporative water loss rose with ambient temperature, accounting for 34% of metabolic heat production at 30 °C but for 159% at 48 °C; despite this, body temperature rose at the rate of 0.1 °C/hour at 45 °C! Heart rate rose sharply at T_A above 40 °C, and ventilation became more rapid and shallower under these conditions. Finally, when the birds are free living they dig holes in the soil and sit in them, thus maximizing contact between ventral surface and cooler soil; calculations suggest that this accounts for about 18% of metabolic heat production.

The discussion section of Marder's paper deals with his experimental results point by point, with little final overview. Since the paper also lacks a summary it will no doubt cause some problems for its "abstract only" readers.—Raymond J. O'Connor.

13. Some features of water economy and kidney microstructure in the large-billed Savannah Sparrow (*Passerculus sandwichensis rostratus*). O. W. Johnson and R. D. Ohmart. 1973. *Physiol. Zool.*, **46:** 276-284.—This is one of those fascinating papers which disagree with previous workers on just about every conclusion, although since in this case the previous work (*Physiol. Zool.*, **32:** 230-238, 1959) was based on a single specimen, the discrepancy is perhaps not too surprising.

The Savannah Sparrow *Passerculus sandwichensis rostratus* lives in salt marsh conditions and its water economy is therefore of interest. Johnson and Ohmart found birds on distilled water regimes drank only moderate amounts of water while those on sea water showed high consumption (with only 50% survival). Birds without access to water died quickly unless previously "primed" with distilled water. Each of these results disagrees with the previous work cited.

Kidney structure in *rostratus* showed adaptations to salt marsh conditions, with relatively large kidneys and many more long and elaborately curved medullary lobules than occurs in other avian species. These features correlate well with the species ability to drink 0.6 M NaCl and sea water.

The paper as a whole raises the general issue of how to treat results that disagree with previous work in the field. In this respect Johnson and Ohmart have to some extent failed: their kidney microstructure section reads like the elegant piece of work that it is but their water economy report is top-heavy with the attempt to relate it to the previous study of a single specimen. Surely our knowledge of biological variability in this field is now sufficient to justify on the grounds of sample size alone relegating conclusions based on a single specimen to a footnote?—Raymond J. O'Connor.

14. Organic material and calories in the egg of the Brown Pelican, *Pelecanus occidentalis*. J. M. Lawrence and R. W. Schreiber. 1974. *Comp. Biochem. Physiol.*, **47**: 435-440.—This paper reports analyses of egg composition in terms of wet weight and energy content. The main conclusion—that the proportion of the egg formed by the yolk is a function of the units of measurement (g wet weight, g dry weight, kcals) used—is acceptable. The quantitative measurements are not: of the six eggs analysed three contained embryos, one of which was about 3 weeks old and weighed 16g (against an average egg contents weight of 81g)! Since Romanoff has shown that egg composition changes with incubation the use for comparative purposes of the figures reported for the Brown Pelican in this paper is obviously unsafe. One can only wonder why the authors did not collect newly laid eggs for their analysis in the first place.—Raymond J. O'Connor.

15. Detection of changes in atmospheric pressure by the homing pigeon. M. L. Kreithen and W. T. Keeton. 1974. *J. Comp. Physiol.*, **89**: 73-82.—If birds could accurately measure barometric pressure or changes in pressure, they might be able to perform several important tasks. A migrating bird might be able to control its flight altitude even when visual cues are not available, tell something about turbulence structure, or detect large-scale weather changes. There is reason to believe that migrants do all of these things, but until now the evidence that they have the capability to accomplish them by measuring barometric pressure has not been convincing. Kreithen tested a dozen homing pigeons in a 40-liter pressure chamber. The procedure was to make small changes (usually less then 20mm H_2O) in the pressure inside the chamber over a 5-sec interval and then deliver a mild shock to the restrained pigeon 5 sec later. Heart rate was monitored continuously. After a few such training sessions, a conditioned response developed and the birds' heart rate increased when the pressure changed. Control experiments were run with a valve open to the outside of the chamber to make certain the birds were not being conditioned to the sounds of the apparatus used to change chamber pressures. Of 12 birds, 10 showed consistent cardiac acceleration responses. Most of the birds had thresholds of response to positive and negative pressure changes between 6 and 10 mm H_2O, but there was some evidence of responses to pressure changes as small as one mm H_2O. Nearly all the birds performed better when white noise (*ca.* 60 dB at 500 Hz) was added. The authors believe this may implicate the ear in the detection mechanism (via changes in auditory sensitivity with pressure).

In practical terms, these results imply that pigeons can detect pressure changes equivalent to a change of 10 m of altitude or less, if applied over a period of 5 sec. Longer intervals were apparently not tried although Kreithen and Keeton believe that it is probably safe to extend the findings to 30 sec or more. Based on what we have observed with radar, these rates of altitudinal change are not at all unreasonable. The important unanswered question is whether flying birds can detect such small changes above the noise of other pressure fluctuations.

The authors discuss possible mechanisms briefly, but their elucidation awaits further experiments.—Kenneth P. Able.

16. Detection of polarized light by the homing pigeon, *Columba livia*. M. L. Kreithen and W. T. Keeton. 1974. *J. Comp. Physiol.*, **89**:83-92.—There has been a recent rebirth of interest in polarized light perception in vertebrates. Papers have appeared on fish and amphibians, and this report describes the first evidence of polarized light detection in birds. A classical conditioning paradigm similar to that in the preceding paper was used. The same pressure chamber was used and the light source was a 100 W slide projector located 65 cm behind a rear projection screen 1.9 m from the chamber. A linear polarizing filter mounted in front of the projection lens could be rotated at 53.6° per sec. At random intervals the screen was illuminated for 20 sec during which the birds were exposed to either (1) nonrotating light or (2) 11 sec of nonrotating light followed by 9 sec during which the axis of polarization began to rotate counterclockwise. If rotation had occurred the bird was given a brief shock when the light went off. During the training period cross hairs were presented on the stimulus screen and they rotated with the plane of polarization. These were gradually dimmed during training and removed during testing.

Twelve pigeons were trained to discriminate a rotating from a nonrotating polarized light source with the cross hairs in place. Only four of these birds continued to discriminate when the cross hairs were removed. Of these four, three showed a decrement in ability when tested without the cross hairs. However, six of the remaining seven gave higher scores in rotating light. The small proportion of certain responders may suggest that if pigeons use information from natural polarized light, they receive it or process it, or both, differently from the way it was presented in these experiments.

The results seem to show that pigeons can detect the plane of polarization of polarized light. They do not tell us the mechanism of detection (the authors suggest that it may occur in the fovea) nor what (if any) use pigeons or other birds make of the information. It could, of course, be useful in determining the position of the sun on partly cloudy days or when it is below the horizon. We will have to await some imaginative field experiments for the answer to the latter question.

The possibility of extra-ocular perception, recently demonstrated in salamanders, was not considered.—Kenneth P. Able.

17. On the functional differences between frontal and lateral visual fields of the pigeon. P. W. Nye. 1973. *Vision Res.*, **13**: 559-574.—What the pigeon can see and what it cannot is a particularly important question to students of avian orientational mechanisms. Pigeons are easily trained in a Skinner box for almost any kind of visual discrimination in which they see the stimulus in front of them and peck straight at a key in response. Nye confirms that when the stimulus is toward the side the pigeon's discrimination is much poorer, but his studies further show that it is not (as previously thought) due to the bird's being far-sighted in the lateral field. Tracings of light rays from the side show the pigeon can accommodate (focus) on stimuli only a few centimeters away. It seems likely that the pigeon's lateral field projects on a retinal area specialized for movement perception and other visual parameters important in detection of predators, whereas the frontal field is specialized for discriminations needed in feeding.—Jack P. Hailman.

18. Eye movements of the owl. M. J. Steinbach and K. E. Money. 1973. *Vision Res.*, **13**: 889-891.—Previously it was thought that owls, which are so fine at moving their heads, could not move their eyes within the sockets. This study on four Great Horned Owls (*Bubo virginianus*) recorded three kinds of eye movements, much like those known from the pigeon only of smaller amplitude.—Jack P. Hailman.

19. Avian breeding cycles: are they related to photoperiods? A. Phillips. 1971. *An. Inst. Biol. Univ. Nac. Auton. Mexico*, **42**, Ser. Zool. (1): 87-98.—This may be considered a critique of what has been called elsewhere "desert dogma," or of the uncritical acceptance of the correctness of what has not been proven. One should recall that much of the vast literature on photoperiodic effects draws conclusions from unimaginative simple indoor experiments, "which throw little if any light on the interplay of stimuli and inhibitors in the wide complex world outdoors." Phillips notes that desert birds are as thoroughly "at home" in their environment as man is in his, and are able to manufacture water as do rodents and, thus, are not so threatened by dehydration as supposed. This idea is explored with evidence cited under "Breeding seasons in arid areas," "Complexity of breeding seasons," "Unstable breeding seasons and sites," "Dual breeding ranges," "Breeding seasons near the solstices," and "Special groups," including late nesters. "Optimum conditions depend, then, on the *species* and its habits and environment, normally highly complex. Whether photoperiodism actually helps wild birds adjust to these remains to be ascertained."—Leon Kelso.

MORPHOLOGY AND ANATOMY

(See also 31)

20. Foot-scute differences among certain North American oscines. G. A. Clark, Jr. 1974. *Wilson Bull.*, **86**: 104-109.—By "foot-scutes" Clark means scutes of or at the base of the toes, not the "tarsal scutes" of the tarsometatarsus, which have long been used in passerine taxonomy. Clark has pioneered the use of this set of characters. In this paper he reports on the value of foot-scutes to understanding the relationships of some taxonomically problematical oscines. *Auriparus*, *Peucedramus*, and *Icteria* differ from the families to which they are usually (if tentatively) assigned. *Chamaea* resembles many Old-Word Timaliidae. *Rhodinocichla* appears to belong with the New World, nine-primaried oscines. These new data on old problems are welcome. However, in some cases, closely related species differ significantly in the arrangement of foot-scutes. For this reason the ultimate value of this new set of taxonomic characters must remain uncertain.—Robert J. Raikow.

21. A new mode of examination of the fundus oculi of birds. (Novyi sposob prosmotra glaznogo dna ptits.) G. Demirchoglyan. 1974. *Z. Zhurn.*, **53**(1): 117-119. (In Russian.)—With *Columba livia domestica*, the domestic pigeon, as subject, a mode of internal eye observation is elaborated, which avoids sacrificing, anaesthetizing, narcotizing, or severing of the tissue of the bird. The eye's relatively ample size and its proximity to the roof of the mouth are exploited. With body, neck, head, and (open) bill restrained in suitable clamps, an arrangement named the "diaphanoscope" is applied. A concentrated beam of light through an illuminator (light probe) is inserted through the open mouth past the palate. A "transilluminator rheostat" provides control of the electric current source. The resulting rosy glow from penetration of the eye by the light beam reveals the eyeball interior, including the retina surface, its blood vessels, the pigmented areas of the central fovea, and with especial clarity the well-pigmented pecten, even its folds. This author and associates still hold hopes for their hypothesis of a dominant role of the pecten in avian vision and navigation. The eye here is converted into its own projector, the retina the reflector, with the pupil aperture as lens, projecting an enlarged image of the eye interior to the observer's eye, or onto a glazed screen suitably adjusted. Directing of the light beam to show certain areas and other refinements are obviously possible. So more eye analysis of more birds is probably on the way.—Leon Kelso.

22. Morphology of the bony stapes in New and Old World suboscines: new evidence for common ancestry. A. Feduccia. 1974. *Auk*, **91**: 427-429.—In a study of over 1,000 avian species it was found that most nonpasserines and the oscine passerines possess a primitive, reptilian bony stapes with a flat footplate and a straight shaft. In contrast, a peculiar derived form with a bulbous, fenestrated footplate area is found in the suboscine families Eurylaimidae and Pittidae (Old World) and Furnariidae, Dendrocolaptidae, Formicariidae, Conopophagidae, Rhinocryptidae, Cotingidae, Pipridae, Tyrannidae, and Phytotomidae (New World). This argues strongly for a common origin of the New World and Old World groups. The Oxyruncidae, Acanthisittidae, Philepittidae, Menuridae, and Atrichornithidae were not included in this study, but hopefully they will be described in a larger paper to follow. The condition in the aberrant Menuridae and Atrichornithidae would be of particular interest.—Robert J. Raikow.

23. Aberrations in the tongue structure of some melanerpine woodpeckers. R. A. Wallace. 1974. *Wilson Bull.*, **86**: 79-82.—Abnormalities in the distal ends of the hyoid horns are surveyed in three species of *Centurus* and two of *Melanerpes*. Normally the tips of the horns lie side by side on top of the skull, and are attached by a connective tissue sheath to the right nostril. Aberrations include horns of unequal length, horns with crossed tips, and abnormal curvature of the horns with displaced attachment of the connective tissue sheath. No suggestion is made as to the cause of the aberrations. One possibility might be damage to the connective tissue resulting from forceful overprotraction of the tongue.—Robert J. Raikow.

ZOOGEOGRAPHY AND DISTRIBUTION

(See also 29)

24. The Common Starling in Eastern Siberia. (Obyknovennyi skvorets v vostochnoi Sibiri. S. Lipin. 1974. *Proc. VI Allunion Orn. Conf.*, **2**: 75-76. (In Russian.)—Having penetrated to the Pacific states and Alaska, may *Sturnus vulgaris* effect encirclement, so far as the oceans will allow, of the northern hemisphere? According to recent records it has appeared in Yakutiya, and now its breeding range in Siberia has advanced eastward to include the Angar River and numerous points around Lake Baikal.—Leon Kelso.

SYSTEMATICS AND PALEONTOLOGY

(See also 20, 22)

25. The subspecific status of the New Zealand population of the Little Owl, *Athene noctua* (Scopoli, 1769). F. Kinsky. 1973. *Notornis*, **20**(1): 9-13.—First introduced to New Zealand by the local Otago Acclimatization Society in 1906 (28 individuals from Germany, followed by many subsequent consignments) *Athene noctua* is thoroughly established in South Island but scarce or absent in North Island. Whether partly of British or other origin, the present population does not definitely depart in characters from those of the English and west German subspecies. The dark brown and pale brown color phases persist. The rufous phase, common in continental populations, is absent in both New Zealand and British specimens of the species.—Leon Kelso.

EVOLUTION AND GENETICS

(See also 31)

26. Adaptive variation in body size and skeletal proportions of Horned Larks of the southwestern United States. D. M. Niles. 1973. *Evolution*, **27**: 405-426.—This paper reports variation in Horned Larks at one Arizona, three Kansas, six Colorado, five northern Texas, and 18 New Mexico localities, based upon computer analyses of 18 linear measurements of 1,346 adults, and certain environmental data. The author assumes "in part as a result of work to be reported elsewhere than the lark samples were . . . from local breeding populations" (p. 408), but no basis is given for this assumption. The possible effects of winter and migrational factors on such a highly mobile species (which originated in the Old World and has extended across strong barriers to South America) are not discussed. Mobility is important in this species. As an example, I passed a large hayfield daily in Nebraska one year, into July, seeing no larks in the tall grass. One day the hay was cut; two days later, on 4 July, larks were displaying and flying about, and within the week a dense population was breeding there (whence came this population?). The report mentions previous taxonomic papers in its introduction but does not allude to them or to systematics again. Among the many conclusions of this treatise may be cited these: larks tend to be larger in the northern and eastern samples and smaller in the southwestern samples; limbs are longer in the south; larks are smaller in areas of low productivity and larger in more productive areas; and montane populations are under environmental selection "largely independent of that prevailing in surrounding lowlands" (p. 424-425). I look forward to amplifying, correlative, and corroborative reports by the author and his colleagues.—L. L. Short.

FOOD AND FEEDING

27. Food of the Little Owl in the north Aral Sea Area. (Pitanie domovogo sycha v Severnom Priarale.) V. Lobachev and G. Shenbrot. 1974. *Ornitologiya,* **11:** 382-390. (In Russian.)—The use of raptor pellets for animal census work in deserts still intrigues field workers, presuming that proportions of prey taken reflect percentages of occurrence in local populations. In the present analysis 3,303 pellets of *Athene noctua bactriana* were collected at 17 stations, mostly in the Kyzylkum Desert. As in previous studies of this owl in other arid localities, the prevalent food item was small rodents, largely jerboas and gerbils, with a moderate proportion of insects, mostly locusts and beetles. Reptiles and birds comprised but comparative traces. During nesting the foraging radius of this owl was 2 to 3 km. The authors suggest that through suitable pellet analysis epizootic plague infestations may be detected.—Leon Kelso.

BOOKS AND MONOGRAPHS

28. Avian Biology. Volume III. D. S. Farner and J. R. King (eds.). New York, Academic Press. 1973. 573 p. $40.00.—The eight chapters of this volume in the Farner-King series address reproduction, the endocrine system (broadly defined), the senses, and behavior. Each contribution compares well with those in the previous volumes in organization, accuracy, and comprehensiveness. Because of the nature of the assignments, they vary in detail and approach. Since each area was represented in the Marshall series, it is tempting to make chapter-by-chapter comparisons. Perhaps this should be done by the individual reader in order to gain the same impression as the reviewer, namely, that there has been an immense amount of progress in avian biology in the last decade, probably more than any one individual can comfortably sense and understand. On this basis alone, series such as this one are justified. Such a comparison leads to the conclusion that most areas of avian biology, especially our knowledge of the senses and the structure, function, and integrative controls of the endocrine system have undergone explosive growth. The authors, in general, have done an outstanding job of assimilating and presenting this material.

In the first chapter, Lofts and Murton present reproduction as a major cyclic phenomenon of avian life. Their brief subsection on the gonads and accessory glands is adequate and integrates well the aspects of structure and function. The longer subsections on functional control mechanisms represent a successful effort at integration of an enormously diverse literature. The balance of emphasis is physiological rather than morphological. They discuss secondary sexual characteristics, incubation patches, and behavior patterns as well. Discussion of specific reproductive behavior is limited almost exclusively to those patterns whose hormonal mechanism is at least moderately well understood.

The adenohypophysis is discussed by Tixier-Vidal and Follett in Chapter 2. Devotion of over 80 pages to a single gland contrasts with a six-page treatment in Marshall (Vol. II) and reflects the expansive growth in our understanding of the structure and function of this key gland. The authors accord considerable attention to techniques and their role in identification of specific cells. The cytochemistry involved is reviewed in detail and each cell type characterized. A significant portion of the chapter is devoted to the chemistry and physiology of the hormones produced. Although comparative data are scarce, a considerable body of information is presented. Nevertheless, the authors are careful to discriminate species-specific responses from general effect wherever possible. Unquestionably more information, especially on the chemical structure of avian hormones, soon will become available. Tixier-Vidal and Follett set the direction for further analysis of the wide variety of active products produced by this complex gland. This review is invaluable because of the recent rapid growth in the field.

Assenmacher bravely undertakes a review of the peripheral endocrines within a single chapter. The coverage intergrades with other chapters in this and previous volumes. Assenmacher points out areas of unknown or tenuous relationships and is justifiably cautious in drawing firm conclusions. Coverage of each important gland—adrenal, thyroid, pancreas, parathyroid, ultimobranchial bodies, thymus, and Bursa of Fabricius—is organized in a similar fashion. This encourages cross-references. Attention is given to morphology, including embryology, the hormones produced, the mode of action, overall function, and the role each gland plays in specific regulatory systems. The catalogue is as complete and up to date as possible. One area that would benefit from immediate attention is the comparative chemical structure of many of the avian hormones, especially the polypeptides. Much of the material in the chapter is reviewed critically, an important contribution considering the potential for problems of interpretation associated with experimental and specific differences. Assenmacher carefully indicates controversial areas and those in need of more investigation. Frequently this is accompanied by specific reasons for further study.

The fourth chapter completes the material on the endocrines and is devoted to aspects of overall integration. Specifically, the consideration focuses on the avian neuroendocrine system. Because of a number of recent reviews, Kobayashi and Wada concentrate on material available since 1962. They explain the morphological and design advantages of the avian system and thereby give a review of the evolution of the vertebrate median eminence-hypophyseal region. The morphology is presented at the level of both light and electron microscopy and considerable cytochemical data are included. Since so much of this work has been reported outside of the traditional "bird" literature, individuals interested in the progress of this field are likely to be impressed by the quantity of material available. Especially striking are the details available on the structural and functional relationships of cell types. The correlation among staining reaction, hormone production, and internal and external stimuli are documented to an impressive degree. The chapter ends with the presentation of approximately a dozen unanswered questions regarding avian neuroendocrinology. These outline the major unsolved problems regarding this system and illustrate forcefully the current level of accomplishment.

Chapters 5, 6, and 7 consider aspects of the sensory systems of birds. Stillman's contribution on vision is briskly written and informative. Two high points are the discussion of the structure and role of the fovea and the pecten. Our appreciation of both has benefited from the attention of various workers. Problems revolving about the lack of information on avian cone pigments and pertaining to function are presented as important to understanding the nature of the chromatophore, visual adaptations, and color vision. The avian visual system shows a remarkable plasticity of design and reflects the comprehensive role vision plays in the lives of birds.

The entire field of chemoreception in birds has received renewed interest in the past decade. The chapter by Wenzel recognizes this and integrates the recent prolific work well with previous investigations. The brevity of the chapter indicates the levels of the available fund of knowledge. There are broad gaps in our knowledge of comparative morphology and ultrastructure of the sensory elements of chemoreception. The neurophysiological work is still crude, but adequate in some cases for subsequent analysis. The behavioral data are extremely difficult to evaluate, in spite of the widespread use of pigeons and chickens in experimental psychology. Avian sensory physiology has long been dominated by interest in the visual system. The recent progress in chemoreception reviewed here suggests strong possibilities for alternative approaches to studies in this area and perhaps indicates the development of a new aspect of the science.

The chapter on mechanoreception includes touch, equilibrium, and hearing. Audition accounts for over 60% of the total coverage, a figure that reflects Schwartzkoff's own valuable contributions to this field. Coverage is detailed and thorough, and a conscientious effort was made to include as wide a range of species as possible. Extensive use is made of diagrams of pathways within the nervous system. These are extremely useful in understanding the role of hearing relative to other senses and for comparative studies with the brains of other vertebrates. In regard to performance, the avian system appears comparable to, or better than, many of the other vertebrates.

The final chapter on behavior by Hinde departs from the lead provided by the preceding discussions of sensory function. Rather than pursue the direct role of the sensory input and the consequent transduction into behavioral responses, Hinde attempts an analysis of a more general problem. The approach includes causal analysis of behavior and the consequences and evolution of patterns of behavior rather than discussion of the underlying physiological mechanisms. Ethology is well outside my sphere of scientific competence and immediate interest; therefore I could approach this chapter without preconceived notions or biases towards the standing of various theoretical explanations, the role of description and experimental design, and the types of analysis used. I anticipated a review which would present a comprehensive overview of the current field with the necessary interpretative and speculative information to indicate the directions of future progress. I was not disappointed. In fact, my naive response was that birds are not automata with simple stereotyped responses but are as complex outside the laboratory as within! Further, the clever design of experiments to illustrate this complexity and the subsequent analysis of the data are impressive indeed.

The amount of social, reproductive, and maintenance information that are communicated among birds is immense. Any morphological restrictions are compensated for by the use of a number of keenly-honed sensory systems and auxiliary structures (i.e., colors) which function in individual combination and permutations both in time and space. In addition, birds are apparently capable of considerable plasticity in behavior which is interpretable only as learning. The products, individuals capable of successful environmental adaptation and species capable of survival in time, are the result of integration from the molecular (hormonal, neurotransmitter) to the "supra-individual" (i.e., species interactions). All this, and more, is well presented in Hinde's perceptive chapter.

As in previous volumes of this series, the quality of the individual contributions is high and the editorial hand carefully applied. Species names are given wherever possible and Parkes has done a commendable job as Taxonomic Editor. A general fault is the apparent lag in publication time. One is hard pressed to find references more recent than three years old in most of the bibliographies. This is an unfortunate result of a variety of factors, but does not seriously compromise the book's value.—Alan H. Brush.

29. A Symposium on the House Sparrow (*Passer domesticus*) and European Tree Sparrow (*P. montanus*) in North America. S. C. Kendeigh (ed.) 1973. *Ornithol. Monogr.*, **14:** 121 p. $3.50.—This symposium was organized in September 1969 as an interim meeting for North American ornithologists working within the IBP study of granivorous birds. The publication of its proceedings as an A.O.U. *Ornithological Monograph* represents a departure from the strictly monographic character of the series, and an introductory note to the volume describes this as "deemed justifiable on the basis of the strongly unified theme of the collected papers concerning the biology of introduced congeners and the probability that the study of these species would be enhanced by the publication of all contributions to the symposium in a single volume." By p.2, however, 5 of the 14 contributions have vanished (except as abstracts) from the book "as their publications elsewhere had previously been arranged." Furthermore, the inclusion of the Tree Sparrow in the title proved to refer to a single paper on its status in North America.

Of the nine papers that appear in the volume three deal with the breeding biology of the House Sparrow. The first of these, by C. J. Mitchell and R. O. Hayes, gives some useful information on breeding House Sparrows in captivity. A second paper by these authors (in collaboration with P. Holden and T. B. Hughes) outlines the pattern of nesting activity of this species in Texas, but the data are presented in such a way that comparisons with breeding biology and population dynamics recorded elsewhere are precluded. This is largely a consequence of the authors' interest in sparrows only as hosts for western encephalitis virus. The third paper on breeding biology, by R. L. Will, is considerably better in this respect, with analyses of monthly variation in clutch size, hatching success, and their intercorrelations, allowing ready comparison with other studies.

By far the best paper published in this volume is that by C. R. Blem on "Geographic variation in the bioenergetics of the House Sparrow." This painstaking study of sparrows from 11 localities ranging from Florida to Manitoba examines lethal limits, plumage insulation, energy balance, and carcass composition. The extensive results suggest *inter alia* that northern populations in winter are near the physiological limits of acclimatization and that both lipid content *and* lean dry weight (equivalent to metabolic capacity?) increase with latitude. An important point mentioned in the text but omitted from the summary is that the body composition of birds in long-term energy balance tests was not equivalent to that of free-living individuals: the implications for energy balance studies are disturbing.

The remaining five papers are a mixed bag. Two papers deal with distribution, of House Sparrow and European Tree Sparrow, respectively; the latter paper (by J. C. Barlow) also presents a morphometric and colorimetric analysis of individuals from American and European populations, concluding that *Passer montanus* is morphologically more stable in North America than is *P. domesticus*. A short paper by R. F. Johnston deals with sexual dimorphism of bone structure in the latter species but adds little new to Johnston's previous work. The other papers published in the volume are by C. A. North, on postfledging movements of House Sparrows, and by W. Klitz, on an electrophoretic study of the North American populations.

Abstracts of the five other contributions to the symposium are printed in this monograph but are not reviewed here; one does not expect to consult a symposium volume to be referred elsewhere for the full paper. Because these papers along with Blem's in fact constituted the real meat of this particular symposium I can only describe the published volume as disappointing.—Raymond J. O'Connor.

30. The Dictionary of American Bird Names. Ernest A. Choate. 1973. Boston, Gambit, Inc. 261 p. $6.95.—In my recent review of Gruson's "Words for Birds" (*Auk*, **91**: 443-445, 1974), I expressed the hope that somebody would do a *competent* lexicon of bird names (which Gruson's is not), but also the fear that no publisher would venture a competitive book on the basis that Gruson's had killed the market. I was unaware at the time that a similar lexicon was being prepared simultaneously with Gruson's, and its publication thus already committed. Direct comparisons between the two books will form an inevitable part of any review of Choate's "Dictionary," which appeared a few months after the Gruson book.

At $6.95, the Choate book is clearly a better buy than Gruson's at $8.95. It is also a better book—barely. Both authors have obviously consulted the same classical references: Newton and Gadow, Coues, T. S. Palmer, etc., and they often quote the same passages. The dust-jacket blurb tells us that "Dr. Choate has been a distinguished enthusiast of ornithology since his youth . . ." whereas Gruson (his publisher tells us) relatively recently "searched for a totally irrelevant area of study. This book is the result. . . ." Choate's superior background in bird study is evident in the pages of his book, as is his career as an English teacher. Nevertheless, I can only reluctantly recommend his "Dictionary," solely as an alternative to Gruson's "Words"—my hopes for a *good* lexicon have yet to be fulfilled. Critical comments later—first, a description of the book.

Gruson's book is arranged in A.O.U. *Check-list* sequence, with indices to English names, generic names, specific names, and persons after whom birds have been named. Choate's book serves as its own index; his approach is to have separate sections, in alphabetical sequence, for "common names," scientific names, and a "biographical appendix." The English names are arranged by group name (bunting, grebe, jay, owl, etc.), under which derivations are given first for these group names and then, in alphabetical order, for the English adjectival words. Thus, under **"THRASHER"**, the derivation from a variant of the English word "thrush" (not, as most people think, from "thrash") is given, followed by **Bendire's T., Brown T., California T.,** etc. Similarly, the scientific names are alphabetized by genus, with species names alphabetized thereunder. The Greek derivation of **TOXOSTOMA** Wagler is followed by derivations of **T. bendirei** (Coues), **T. curvirostre** (Swainson), **T. dorsale** Henry (the origin of which is known neither to Choate nor to Gruson; see Phillips, Marshall and Monson, "The Birds of Arizona:" 125, 1964), etc. For honorifics, the reader is referred to the "biographical appendix"; thus, **"T. bendirei** (Coues): BENDIRE'S THRASHER; for Charles E. Bendire (see Appendix)." The biographies in the appendix are usually shorter than those given by Gruson, but are generally quite adequate, and almost always mention *who* named a bird in the biographee's honor, and *why,* information omitted by Gruson. Choate sometimes quotes prolix encomia, especially those of Audubon, thereby producing biographies whose lengths are not in proportion to their subject's importance to ornithology. Thus Edward Harris gets 24 lines, 16 of which are quoted from his good friend Audubon, whereas the giant Elliott Coues is allotted 7 1/2 lines.

The biographical appendix is followed by a bibliography of reference works consulted, and an "English/Latin glossary." The latter is nothing more than a repetition of the names listed in the "common names" part of the book,together with their scientific names (which are not given in the body of the text).

There is a brief introduction to the book as a whole, and longer introductions to the English and scientific name sections. These are adequate, but should have been critically read before publication by someone with a more professional understanding of scientific nomenclature and its history than Dr. Choate. He is on especially thin ice in his explanation of name changes, and falls through several times. His attempt at explaining the history of the generic name *Colymbus* (p. 92) is hopelessly confused, and a quotation on p. 91 from E. O. Wilson, on mammalian relationships suggested by insulin structure, is wholly irrelevant and can only bewilder the average reader. Choate errs in stating that the names of authors of genera are placed in parentheses if the genus is no longer valid. More than one half of the text that purports to interpret the subspecies category is given over to an anecdote about the murder of George Parkman, after whom Audubon named *Troglodytes parkmanii*. The chief reason for including this story seems to be that one Rufus Choate refused to act as the murderer's attorney.

Choate shares a number of Gruson's faults. Both authors seem to believe that names should be "useful" or "helpful." A case could be made for this viewpoint with respect to English names, but the rules governing scientific nomenclature make no provision for appropriateness. Thus Choate wastes space with remarks like that under *Icterus graduacauda*: "the label 'graduated tail' is not obvious nor is the tail distinctive as is the head. It would have been more helpful if the original describer of the bird had concentrated on the other end of it." On the same page, Choate gives the derivation of the name of the Spotted-breasted Oriole from "L[atin] *pectoralis*, 'pertaining to the breast.' We now have the part of the anatomy which is distinctive in appearance, but not the reason for the name. It could not have been in the interest of brevity, as *maculata pectoralis* would be *anatis jusculum* (duck soup) to any scientist." Brevity is certainly not one of Choate's faults, and the quotations above suggest that his attempts at humor, although not as ponderous as those of Gruson, can quickly become tiresome.

Where Gruson devoted an inordinate amount of space to biographies of obscure and peripheral persons after whom birds have been named, Choate's obsession is clearly mythology. More than a page is devoted to a legend, retold in typical jocular Choatian style, in which one of the characters is changed by the gods into a *ciris*, "a bird which has not been identified," the name used by Linnaeus for the Painted Bunting.

It is well known that the true *vernacular* names for the 700-odd species of North American birds are legion; Choate himself cites McAtee's admission that the latter's collection of about one half million names was by no means complete. It is impossible to guess how Choate decided which of these to include along with the standardized names—certainly not on the basis of widespread usage. "Accentor" is given as "a local name for the Ovenbird"—*Prunella* is not mentioned, although *P. montanella*, the Mountain Accentor, has occurred in Alaska. I have never heard of "Accentor" being used for the Ovenbird, but "Golden-crowned Thrush", which I *have* encountered, is missing. Any reader could make similar comparisons. I doubt the value of including a handful of these vernacular names, but if any were to be included at all, the author might have told us more about them, especially *where* they are "local names." Where, for heaven's sake, is the Great Blue Heron known to the populace as "Big Cranky?" Similarly, Choate includes five terms from the specialized vocabulary of falconry (eyas, eyrie, haggard, lanner, tiercel). Why these? They are virtually the only words included that are not names applied to a kind of bird. Why give the origin of "eyrie" and not of "nest?" Why "eyas" and not, say, "pullet?"

A number of Choate's derivations are questionable or erroneous, although his batting average is higher than Gruson's. I wonder what Choate's evidence is for saying that "Bananaquit" has "no connection with the banana tree or fruit." And whereas "quit" may have had its ultimate origin "for the note of the bird," it should be pointed out (as Newton and Gadow did point out) that this word is applied to a number of small birds in the English-speaking West Indies (e.g., Grassquit, Orangequit). The cere of jaegers (whence the name "Pomarine," from Greek *poma*, a lid, and *rhynchos*, bill) is not a "growth at the base of the bill in the breeding season." I doubt that "kingbird" originated from the seldom-seen crown patch, but rather from the bird's domineering temperament (although over other birds, not over insects as Gruson interprets it). "Shore Lark" is said by Choate to be a "local name for the Horned Lark"; it is the standard British name for the Old World forms of the species. The markings that give the Hooded Warbler its name are somewhat infelicitously described as a "ring of black feathers about the head." Choate interprets the scientific and English names of the Monk Parakeet as deriving from the solitary aspects of monasticism, although he admits that the species is gregarious; most authors consider the name to be derived from the gray hood. Both Choate and Gruson quote MacLeod's euphemistic account of the origin of "wheatear"; Oliver Austin ("Birds of the World"; 254, 1961) does not hesitate to derive it from "white arse." "Arctic Three-toed Woodpecker" is not "a local name" for *Picoides arcticus*, but its former A.O.U. *Check-list*-sanctioned "book name." The Greek *rhamphos* has long been accepted as a root meaning "bill," although ultimately derived from *ramphis*, "hook." Under *Brachyramphus*, Choate criticizes the use of "*ramphos*" [*sic*] as "not too appropriate as it implies 'hooked'." This complaint is as far-fetched as if one were to object to *calendula* for the Ruby-crowned Kinglet on the basis that *calendus*, "glowing," is derived from *calor*, "heat," and the kinglet's head is no hotter than the rest of the bird. Incidentally, Choate wrongly derives *calendula* from *caliendrum*, "false hair or a wig." *Carpodacus*, from Greek *carpos*, "fruit," and *dacos*, "biting," is "a questionable name for a genus of seed-eating birds" according to Choate, but a quick look at any reference on food habits would have revealed the fruit-eating propensities of these finches.

Both Choate and Gruson derive *Casmerodius* from Greek *herodias*, "a heron," and *chasma*, "an opening" (Gruson) or "open mouth" (Choate); the latter goes on to say "As there is nothing open-mouthed about the egret, the name seems nonsensical." The first half of this generic name is clearly based on a mistranslitaration of the Greek *kosmos*, "ornament" or "decoration" (as used in *Cosmetornis*, a former name for the Pennant-winged Nightjar), certainly an appropriate word for an egret. *Conuropsis* is not directly derived from the Greek words *conos*, *oura*, and *opsis*, yielding "with a tail shaped like a cone," but was coined by Salvadori to indicate the similarity of the Carolina Parakeet to members of the genus *Conurus* (now *Aratinga*); *Conuropsis* thus actually means "resembling *Conurus*." Gruson also missed that one. The specific name of the Short-billed Marsh Wren, *platensis*, is derived by Choate from the Greek *plates*, "flat, broad," "probably compared with the bill of the long-billed marsh wren." This is one that Gruson got right—the name is derived from the Rio La Plata, the type locality of the nominate race. Choate's geographic naivete is further indicated by his statements under *Cyanocorax yncas* and *Stelgidopteryx ruficollis*. Of the former, he writes "*yncas*, same as Inca, the name of the chief of the aboriginal natives of Peru, not of Mexico. As the bird ranges in Mexico and not in Peru, the name is misleading." This is wholly erroneous; the type locality of the nominate race of the species is indeed in Peru. As for the Rough-winged Swallow, Choate gives "L[atin] *rufus*, reddish; L. *collum*, neck. As there is no red in the neck or in the plumage at all, this term is evidently an error." Again, the nominate race of South America does indeed have a cinnamon-rufous throat, which extends laterally in some young birds to form an incomplete collar.

This is by no means a complete list of the errors or misinterpretations in Choate's book, but I must leave myself space to dwell on its most appalling flaw. Never in a quarter-century of book reviewing have I seen any publication so riddled with typographical errors (I am giving Choate the benefit of the doubt; some of what I took to be printer's errors may well have been misspellings in the original manuscript). There is simply no excuse for not having a book proofread. Some errors in common English words are obvious to the reader: "ot" for "to" (p. 222). Others, producing semiplausible words, are more subtle: "drawfish" for "dwarfish" (p. 139). Much more of a problem for the uninitiated reader are the abundant errors in scientific, geographic, or proper names. On p. 5, "*tanaulitensis*" and "Tanaulipas" for *tamaulipensis* and Tamaulipas merely begin the parade. On page 106 alone are **AIS, AJAJA,** and **AMAZILLA** for **AIX, AJAIA,** and **AMAZILIA.** On pp. 146-147, *cucullatus* is misspelled two different ways, and *galbula* is spelled "*gabula*." Others among the myriads include "*labradonum*" (=*labradorium*), "*nostrum*" (=*rostrum*), "*Molothus*" (=*Molothrus*), "Stegneger" (=Stejneger), "*ribundus*" (=*ridibundus*), "*metacilla*" (=*motacilla*), "*Selaphorus*" (=*Selasphorus*) (the last two on the same page), *et cetera ad infinitum*. In the bibliography alone, I found the following errors: Under Auk, "1957" should read 1973; under "Eisenman" (=Eisenmann), pp. "2,100-2,115" should read 210-215;

under Fisher, the designer of "The Shell Bird Book" is listed as the publisher; Grossman's coauthor should be Hamlet, not "Hamley"; Newton's coauthor was Gadow, not "Gaslow"; Robbins' coauthor should be Bruun, not "Braun." I did not check other page, volume, and year numbers, but certainly would not trust them on the basis of the errors I did catch.

Few publishers seem to care enough about factual accuracy in the texts of "popular" bird books to bother paying a knowledgeable manuscript reader to catch some of the kinds of errors I have pointed out earlier in this review, although a suitable fee for such a critical reading would amount to a small fraction of the usual advertising budget. The elementary matter of adequate proofreading is something else again. When the basic quality control of book production slumps as badly as in Choate's "Dictionary," the buying public has a right to protest. I had never previously heard of Gambit, Incorporated, the publishers of this book; the quality of the printing of Dr. Choate's "Dictionary" is not a happy introduction to their wares.

Although I have read my way through two lexicons of North American bird names in the past few months, I am still waiting in vain for a *good* one.—Kenneth C. Parkes.

31. Evolution of the Brain and Intelligence. H. J. Jerison. 1973. Academic Press, New York & London. 482 p. $25.00.—Jerison studies the evolution of the vertebrate brain and of its function by comparisons between living forms and the endocasts of fossils. Endocasts are formed when the cranial cavity of a fossilizing skeleton becomes filled with sediment. What is thus produced is a three-dimensional representation of the inside of the braincase which can be used to estimate the size and form of the brain once occupying that space. This is a potentially misleading process, however, because in most lower vertebrates the brain does not fill the cranial cavity and is much smaller than the endocast. In birds and mammals, however, the brain does fill the cranial cavity except for thin meningeal coverings, and the endocasts of these forms give detailed and accurate representations of the missing brain, even to the impressions of gyri and sulci. Thus a considerable insight into the gross structure of the brain of extinct forms is possible, even though the organ itself is not preserved. The study of evolving brain function, however, is a much more difficult matter. Much of the problem is simply that we know so little about brain function even in living forms. Jerison is not concerned here with the evolution of neural circuitry or cellular organization but with a more generalized assessment of the development of the physical basis for broad, biological capacities. Even so he has difficulty in defining just what it is that brain size, especially in relation to body size, signifies. This matter is taken up in chapter 1, "Principles of brain function and evolution," and is elaborated in subsequent chapters. Jerison speaks of "Biological Intelligence," a vaguely defined quality related to the richness of the animal's perceptual world or to the complexity of its ability to integrate sensory stimuli. This is a direct outcome of what Jerison defines as the *principle of proper mass*: "the mass of neural tissue controlling a particular function is appropriate to the amount of information processing involved in performing the function." This mass is determined by the number of neurons and the complexity of their interconnections in the brain as a whole and in particular parts of the brain devoted to specific functions. Because the size of cells varies only a little in animals of grossly different body size, the brain/body ratio is a good estimate of the amount of neural tissue involved in controlling the body. A relatively larger brain thus signifies an increased complexity in the capacity to integrate sensory stimuli and to construct subjective perceptual models of the world. Lower forms, with less neural tissue relative to body size are limited to the activity of closely coupled stimulus-response mechanisms or stereotyped behavior patterns. Higher forms enjoy an enhanced complexity in the construction of perceptual models intervening between the sensory and motor components of behavior; from this arises the ill-defined concept of consciousness. Jerison believes that birds have evolved the highest level of coupling as shown in their very complicated but still highly stereotyped behavioral patterns, and that true consciousness in the sense developed here is largely limited to mammals.

The book traces the evolution of the brain and intelligence throughout the vertebrates, with special emphasis on the mammals. However, for the purposes of this review I will concentrate on those sections dealing with birds. The first four chapters give the theoretical background for this study and should be carefully studied by all readers who want to understand what follows. Beyond this one can choose those chapters dealing with groups in which one is particularly interested, as I will do here. Nevertheless a full understanding of Jerison's theory requires careful study of the entire book. Some of the ideas presented will no doubt engender discussion and controversy, but the book is full of insights and provocative theories that will reward the careful reader, despite the slippery and poorly-defined concepts sometimes employed.

Chapter 9 deals with the evolution of the brain in birds. We are fortunate that the "missing link" *Archaeopteryx lithographica* of the Jurassic includes a brain endocast. Jerison has a very different idea about the structure and significance of this earliest known avian brain than that developed by earlier writers, such as Edinger and de Beer. These workers believed that the brain of *Archaeopteryx* was basically reptilian in form. Jerison claims that it was clearly avian in external form and intermediate in size between those of reptiles and modern birds. He feels that the earlier workers were mislead by the fact that the endocast was only partly excavated, and that they underestimated the amount of material still embedded in the rock matrix. By examining a new copy of the endocast, he has relocated the apparent midline of the specimen within the matrix, rather than at its surface where the earlier workers placed it. On the basis of his estimate of the animal's weight, he concludes that *Archaeopteryx* had begun, but not completed, the evolutionary enlargement of the avian brain by which birds achieved a new level of brain organization setting them distinctly apart from the reptiles, and paralleling, in a broad sense, the evolutionary expansion of the mammalian brain which was occurring during the same period of the Earth's history.

The brains of the Cretaceous toothed birds *Hesperornis* and *Ichthyornis* were described in detail by O. C. Marsh nearly a century ago, and these reports have been widely accepted as accurate. Jerison warns that they are largely imaginative and should not be taken seriously. Yet he commends Marsh on the insight shown in his "reconstruction" of these primitive avian brains, because they closely resemble the actual brain of *Archaeopteryx* as Jerison has described it.

Next there is a discussion of an endocast of *Numenius gypsorum* from the Upper Eocene, compared with the Recent *N. tahitiensis.* According to this analysis the brain within this genus increased in size about 20% in the last 40 million years. The significance of this finding is in showing that the avian brain did not reach the limit of its expansion during the Cretaceous, when many of the modern groups of birds arose. According to Jerison's analysis, *Archaeopteryx* exhibits a doubling of relative brain size compared with reptiles in the Jurassic, *N. gypsorum* shows that by the early Cenozoic this expansion had reached seven times the reptilian "base line," with a modest further increase to eight times the reptilian level in *N. tahitiensis*. These figures make a neat story if they are highly accurate, but one wishes for more data.

It would seem reasonable to suppose that the expansion of the avian brain was related to the development of flight, but the story is not that simple. The pterosaurs or flying reptiles of the Mesozoic did not show an increase in relative brain size compared with reptiles generally. Jerison rejects the idea that brain enlargement was associated with the neural control of powered flight, and suggests instead that it may have been related to the "unusually difficult problems in the analysis and use of visual information by active, diurnal, tree-dwelling animals that live in a mottled world of branches, leaves, and other foliage." This and other factors are considered further in chapter 12.

This book is the product of two decades of investigation (Jerison's references in the bibliography go back to 1955). It is a carefully reasoned and thoroughly documented study, whose limitations are clearly stated, and with speculation clearly distinguished from fact. Readers interested in the analysis of vertebrate history will be amply rewarded for a careful study of this sometimes difficult but frequently intriguing book.—Robert J. Raikow.

32. A Coded List of Birds of the World. Ernest Preston Edwards. 1974. Ernest P. Edwards, Sweet Briar, Va. 174 p. $9.00.—Because the author states that he believes "that this book represents the first time an attempt to list all the species of living birds of the world has been brought to completion and published," it cannot fail to attract some interest. I bought my copy from the "limited edition—1000 copies" because it is a *coded* list, not just a list. In other words there are two aspects to this book—the list and the code—and I wish primarily to address the latter after explaining the former.

There are 8,909 species listed, according to page 8 (I did not count them), of which 3,656 are "sub-passerines" and 5,252 species are passerines. Each is listed with its Latin binomial and a vernacular name, along with a coded number and a coded summary of its range. Obviously a work of this ambition requires taxonomic decisions, and I propose not to discuss whether or not these were wise. Some traditional genera are lumped; some species are split; the order is some sort of compromise among existing schemes; and vernacular names are often shortened. The book is offset from typescript, but scientific names are not italicized (which would have been possible with modern typewriters).

It is not entirely clear why this list was drawn up, for the author makes no specific pretext toward a taxonomic contribution. One suspects that the world of bird-listers will find most use for it in ticking off their "life-lists." I bought it because I had myself created a taxonomically based coding scheme for computer indexing of behavioral field notes, and I simply wanted to compare Edwards' scheme with my own. The author even states (p. 3) that "these code numbers should be very useful in working with computers and for such things as labeling eggs . . . ."

The usefulness of the coding scheme for computers can be questioned. The basic scheme assigns a letter designation for each order, and number designations for each family and species. Three immediate problems arise. (1) the number of letters or digits used at the same level of designation is not constant. Any computer buff will attest to the formatting difficulties this oversight causes. For example, all orders except the Struthioniformes are single letters, whereas the Ostrich and Rheas become "AA." Likewise, families and species are simply listed, so that they vary from one to three digits. Edwards laudably attempted to avoid the letter "O" as confusable with the digit "0", but if one calls the Struthioniformes "O" instead of "AA" he saves a column on every IBM card (the letter and digit are usually easily distinguished in most computer printing systems). Then, to solve the variable-digit problem with families and species, one could right-justify all digits (that is, add zeros to the left to make three digits for each species and two for each family). The result of these changes creates a 6-symbol designation for each species.

(2) The second problem is that genera are not coded in any way, so that one cannot sort the code for a particular genus. This drawback could be trivial or crucial depending on use of the scheme.

(3) The code is not hierarchial in sequence. To make a more readable code, Edwards placed the ordinal letter between the digits designating family and species; e.g., the American Robin is 41Z314, the 314th species of the 41st family listed in order Z. This lack of hierarchial sequencing in the code makes computer-sorting unnecessarily illogical, and makes certain "hand-sorting" by electric machine a nightmare. (My system also reads digit-letter-digit, but the orders are numbered, the families are lettered, the subfamilies are numbered, and so on.)

I conclude from this first perusal that for a list with stated intentions of computer-use insufficient attention was paid to the problems of programmers. Some other aspects of the list warrant mention as posing additional problems that are not specifically computer-related. For example, no specific provision has been made to handle taxonomic changes. The solution offered does not do the trick. The offered solution is to treat this edition as "edition *a*" and to prefix *a* to the code number. By the author's admission, species *a*1H2 might prove to be a quite different species from c1H2 (should the book ever go two more editions). Whatever are one's complaints with the A.O.U.'s numbering system—which has apparently survived only in the Bird Banding Laboratory—at least the basic number of a species did not change with subsequent editions and taxonomic alterations. Another point, I suppose, is that one could ask consideration of Moreau's well-articulated arguments for alphabetical listing of genera within families and species within genera. At least one could more readily find a given species in the incredible list of *Zosterops*. Finally, there is no provision in the scheme for inserting fossil forms, which might be a useful addition for some workers.

This is an ambitious work, and I refuse to fault the whole attempt on its present inadequacies. As the author says ". . . if errors are discovered and reported, so much the better for any possible future edition . . . ." My notes are not even on errors, they are merely suggestions for improvement; the format, however, should demand more of the author's attention than correction of taxonomic slips if a future edition is to gain the stature of an indispensable reference.—Jack P. Hailman.

33. The Visible Migration of Birds at Ottenby, Sweden. C. Edelstam, (ed.). 1972. *Var Fagelvarld*, Suppl. 7. 360 p. No price given.—This book summarizes the data collected during 10 years (1947-1956) of uninterrupted observation of visible diurnal migration past the Ottenby Bird Station, Sweden. Observations by teams of volunteers were made for the entire light portion of every day (with a few reasonable exceptions) from the first of June to the end of October. Nearly four million birds were tallied on over 1,500 observation days. All species were recorded, with the time, number, track direction, and sometimes the height of flight recorded for each observation.

In judging this book, it is imperative to note its intent, stated in the Preface, "that no scientific analysis of the material should accompany its publication." Thus, the book is a detailed report of methods, possible sources of error, and the data themselves (almost exclusively in the form of histograms). On the one hand, it is the kind of work that can be undertaken only by a team of volunteer workers in these days of quick and often dirty science. What professional ornithologist can wait 10 years to publish work that has occupied his time for nearly one half of each year? This book is elegant testimony to the valuable contribution that can be made by dedicated amateur ornithologists. It is the kind of work that should be done in many areas, but will probably never be done if it is left to professional ornithologists. On the other hand, there are few things more frustrating than 300 pages of essentially raw data. They obviously have interesting things to say, but virtually no attempt to synthesize them has been made. This is not, therefore, a book that someone can sit down and read to learn something about patterns of visible migration in Sweden. Its main value will be as a source of numerical data that can be analyzed by someone else. Even though Edelstam goes to considerable pains to point out possible sources of error or misinterpretation of the data, the further removed the analysis of such information is from its collection, the greater are the dangers of false inferences. Thus I would hope that someone who has had a hand in the project would be interested in taking on the formidable, but productive, task of synthesizing the data.

The following kinds of data are included: (1) Annual totals for all species are presented in numerical and histogram form. Among other things, these data document the irruptive movements of species such as jays (*Garrulus glandarius*) waxwings (*Bombycilla garrulus*), and crossbills (*Loxia curvirostra*). Most species, however, show remarkable year-to-year similarities in numbers, and the data will be valuable baseline information against which future populations can be gauged. (2) Seasonal patterns for each species based on combined data for all 10 years, summed over 10-day intervals. The numerical data are tabled, and histograms (percent of total) for each species are presented. At a glance one can compare species, some of which have very rapid passages whereas others are protracted over many weeks. Many of the histograms are surprisingly symmetrical. Edelstam gives several pages of discussion about the causes of some of the temporal patterns. (3) Daily totals for all days and all species are presented graphically. These are the data from which the other compilations were made and this section comprises a little over one half the book. Coupled with the weather information given later in the book, they could be used to examine weather influences on the migration from day to day, although the conversion to digital data would be very laborious. (4) Hour-to-hour variations based on 10-day groupings with counts from all years combined. Most species show one or two marked peaks of movement during the day. The commonest pattern is a sharp morning peak and a lower amplitude afternoon peak. Only curlews and godwits showed a more or less even distribution throughout the day. There are some interesting seasonal changes in these patterns, the most frequent being a shift from a strongly bimodal pattern to one with movement spread more evenly through the day. (5) A table of reverse migration data is given, listing all species with northward/southward ratios of 0.01 or more. The species involved are so diverse that no general trend is apparent, although a simple correlation with opposed winds definitely does not exist, even for passerines. (6) Surface weather data collected at 07:00 at Ottenby for all 10 years are presented in tabular form.

Whether or not one subscribes to the basic philosophy of the book, the station undertook a formidable task, and they have assembled a vast quantity of valuable data. Hopefully their full potential will be realized through careful analysis by qualified workers.—Kenneth P. Able.

34. Adventures in Birding. J. Piatt. 1973. New York. Alfred A. Knopf, 265 p. Hard cloth, $7.95.

Birding from a Tractor Seat. C. T. Flugum. 1973. St. Paul, Minnesota, published by the author. 435 p. Hard Cloth, $8.95.—These two titles are part of a new literature of personalized narratives by birdwatchers. They represent interesting extremes: Piatt reviews his vigorous pursuit of North American species for a "life list," whereas Flugum presents an intimate life of observing birds on his Minnesota farm. Both are deeply immersed in their outdoor avocations.

In reality Flugum's book is an assemblage of 137 monthly newspaper columns that appeared between 1952 and 1964. In a general pattern each account focuses on a given species with four obvious contributions: (a) a brief introduction to the bird from general knowledge, (b) a major discussion of Flugum's experiences with the species at the farm, often with childhood remembrances, (c) a few relevant ornithological "facts," and (d) a concluding paragraph praising the species and urging its conservation. The narratives show a man that has a remarkable appreciation for birdlife; he has watched midwestern birds for 40 years. The observations reflect an alert amateur who is otherwise quite busy with his livelihood. Most of the life history discoveries were by serendipity, or at least opportunistic, providing accounts that would be most interesting for novice birdwatchers. Personally, I found the 400 pages of "birds and barns" to be somewhat too long in spite of the informative sidelights. The only diversions are modest Minnesota trips with the ever present Albert Lea Audubon Society.

In strange contrast, Piatt writes of his exhausting pursuits of "new species." His hobby is life-listing as a jet-set birder. He and his wife, Marybelle, have used considerable time, effort, and expense in reaching their high rank among listers with 666 North American species. The book presents their adventures in well written narratives. Throughout, the accounts are richly descriptive and often humorous. Some efforts to obtain the brief glimpse of a life bird are all but unbelievable, if not incomprehensible. Nevertheless, from heat stroke to broken bones, the Piatts continue . . . Colima Warbler (check) . . . Green Kingfisher (check) . . . and Emperor Goose (check)! In all there is little information about any birds except actual sightings because it is a personalized account of intense birding. Curiously, Piatt has reservations about the recently formed American Birding Association that promotes bird listing, his own sport. He suggests that the Association's success with large membership may reduce the "brotherhood."

A review of differences between the authors provides a useful summary. Flugum has apparently seen fewer than 250 species, but many are known well (e.g., with 26 pairs of Bluebirds nesting on the farm). Piatt's life-list and book are necessarily swelled with ephemeral acquaintances of birds. Flugum writes with a simple active style. Piatt's pen reflects a Professor of Anatomy with time for a hobby and a penchant for writing. Both authors are chronic name-droppers, claiming friendships with all. I found Piatt's book to be far more entertaining, but Flugum's accounts were certainly more informative. Worlds apart, yet both men have a hobby of birdwatching.—Charles F. Leck.

35. Civilized Man's Eight Deadly Sins. Konrad Lorenz. 1974. Harcourt Brace Jovanovich, Inc. New York. Transl. by M. Wilson. 107 p. $4.95.—"Overpopulation," "Devastation of the Environment," "Man's Race Against Himself," "Entropy of Feeling," "Genetic Decay," "The Break with Tradition," "Indoctrinability," and "Nuclear Weapons" are the deadly eight according to this ornithologist and Nobel Prize winner. "Lively, popular, challenging, and controversial" is the evaluation of the book on the cover advertisement. *One deadly bore,* is its evaluation in one newspaper review (*Washington Star,* 7 April 1974). "The German edition sold well over 200,000 copies," the flyleaf would retort. In any case, one can read what the author calls a "kind of sermon," which covers many points being discussed in the editorial pages of the daily newspapers. Of interest here he recognizes the works of Heinroth, Rachel Carson, W. Vogt, and Wynne-Edwards. Many ideas he discusses in parallel with McLuhan's "Understanding media.": The loss of confidence in right to assign guilt; special groups, as the child, the woman, the cripple, the negro, appearing as perpetual victims of injustice, as expressed by the latter author, is recalled by Lorenz's "Our sympathy with the asocial defective . . . endangers the security of the non-defective. "In speaking of human beings even the words 'inferior' or 'valuable' cannot be used without arousing the suspicion that one is advocating the gas chamber" (p. 51.) And so on; much more as lively as this.—Leon Kelso.

36. Urban Ecology (In search of an Asphalt Rose). C. George and D. McKinley. 1974. New York, McGraw-Hill, Inc. 181 p. $4.95, paperback.—Strangely this book might be compared with Lorenz's recent book "Civilized Man's Eight Deadly Sins" for their similarity in objective and in timing, but they are wider apart than the intervening ocean in treatment. The Lorenz book is briefer, more expensive, less rich in details, in reasoning, and in arguments, and has no topical index. The present book comprises five parts, including 26 chapters and a bibliography. Part one, Definitions and perspectives (ecology defined, a magic word); Two, The gathering of the clan (the birth of cities); Three, The potter and the pot (city diseases in man and agriculture); Four, Why cities grow gray (new names, old problems, why have we lost ground?); Five, Curing mis-education (what has gone wrong with learning?, education for real, the tyranny of time). This book reflects the inevitable concern of all involved in any biological specialty with the environmental and survival imperatives. Its value as reading is strongly recommended, along with that of the ample bibliography provided.—Leon Kelso.