Expansion of bird banding to other countries in Central and South America will not only provide more knowledge on the different migration routes and wintering habitats of birds, but also information on the distribution of avian diseases throughout the hemisphere.

After completion of this study, a new host for "Scaly-Leg" disease was found in our next vicinity (Guelph, Canada). These were 2 heavily infested specimens of the Yellow Warbler (*Dendroica petechia*) trapped in mist nets in June 1968 by the Zoology Department. The causing agent in all cases of Scaly-Leg was confirmed by Dr. A. Fain, as the mite *Knemidokoptes jamaicensis* Turk.

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RECENT LITERATURE

BANDING

(See also 16)

1. **Some Experiences With Larger-Mesh Nets.** Bruce Adams, 1968. *EBBA News*, 31: 203-205.—Use of a large-mesh net at the Island Beach Operation Recovery station: the Bleitz No. 11 net, 210 denier, 4″ mesh, 7 x 42′ (it resembles NEBBA type E: 210 denier, 121mm. mesh, 12 meters long, 2-shelf-recommended for grouse or the largest shorebirds such as curlew). The usefulness of most of the descriptions of catches with the larger-mesh net is limited by omission of nethours involved, or any direct comparison with nets of other meshes.

A comparison is available for one day in October, 1966, in which three of the large-mesh nets took 45 out of the 47 Yellow-shafted Flickers taken by the total of 32 nets in use. The mesh of the other 29 nets is not stated, but presumably a mixture of 36mm. and 30mm. nets. The comparison involved different net sites, within the same general area, for the different mesh sizes, rather than alternating different net types on the same sites to minimize the influence of site, as was done in the recent Powdermill study ("The Comparative Efficiency of 30 and 36 mm. Mesh in Mist Nets", by Mary A. Heimerdinger and Robert C. Leberman, *Bird-Banding*, 37: 280-285, October 1966).

The conclusion that this large-mesh net is the best choice for Flickers is misleading, in the absence of any consideration at all for the intermediate size net with 61 mm. mesh (such as NEBBA type C, with 110 denier thread). The 61 mm.-mesh net is widely used by the U. S. Fish and Wildlife Service (among others) for Woodcock and Mourning Doves, and it ought to do well for birds of the size of the Belted Kingfisher, Flickers, or meadowlarks. It is quite true that medium to large hawks and herons would be better taken in a 4" or 121mm. mesh net. The 1965 Powdermill results (in an area less likely to take Flickers than a coastal station such as Island Beach) showed that out of 1,345 birds taken, the 30 mm. mesh nets took no Flickers, but eight were taken in 36mm. nets.

It would be of interest to experiment with 61mm. vs. 121mm. nets, at a coastal station with plenty of Flickers, under controlled conditions like those at Powdermill. This would involve an equal number of the two net types, for the same net hours, with rotation to minimize bias of the exact site.

Adams found it desirable to cut meshes more freely than for small-mesh nets. partly because tangling was often more severe. He recommends a special technique for taking the bird out, departing from the classic rule to first determine from which side the bird hit the net. He starts from the head, with a tool such as a knitting needle to push the mesh down. He holds the bird by the body until at least one wing is free. Soon "the thumb of the left hand is over the bird's back, two, three or four fingers under the breast, and the bird's head resting on (or biting) the palm of the hand".

He also recommends heavier poles, such as wooden poles 1" in diameter and 14' long, with the net loops placed as high on the pole as the netter can easily reach.—E. Alexander Bergstrom.

2. Ringing in Nigeria and Ghana during 1960: Third annual report. R. F. Sharland and B. J. Harris. 1967. *Ostrich*, 38 (3): 186-188.—The delay in reporting is left unexplained. A total of 769 migrants and 3,981 residents was banded. A few "recaptures" and recoveries are tabulated, with no more than two recoveries for any species so that no patterns can be discerned. No Latin names of birds are used, so that tabular entries such as "Arctic Common Tern" necessitate some detective work.—Jack P. Hailman.

MIGRATION, ORIENTATION and HOMING

(See also 56, 61)

3. The Initial Flight Direction in Homing Experiments. L. A. Smogorzhevskii. 1967. *Vestnik zoologii, Zool. inst. Akad, Nauk Ukrainskoi SSR*, 1967 (3): 55-59. (In Russian. English summary.)—The initial or "nonsense" direction of Matthews (*Ibis*, 105, 1963)) the author regards as essential first, to establish migratory direction, and second, to make the necessary corrections towards "home". He would rather designate it "pseudomigratory".—Leon Kelso.

4. The role of competition in the evolution of migration. George W. Cox, 1968. *Evolution*, 22 (1): 180-192.—Cox attempts to account for the ecological basis of migratory patterns, feeling that explanations of migration to date have emphasized the relation between organism and climate to the partial or total exclusion of population factors. He suggests that intraspecific and interspecific competition act as primary selective agents in the evolution of migration and hypothesizes that such pressures initally will favor seasonal movements by individuals to and from temporarily favorable adjacent areas. However, he proposes no mechanism for the initial development of a migratory ability. Situations where no overlap in breeding and winter range occur may result from subsequent elimination of intermediate resident populations and migrants within the area of previous overlap, perhaps as a result of subsequent environmental change.

Migration in major taxa (subfamilies, families, and orders) of American land birds is found to be most pronounced in those groups characterized by small beak size, low actual variability of the beak, and low variability of this measure relative to that of tropical resident species of the same group. These conditions suggest to Cox an inability to undergo morphological differentiation of the feeding apparatus in response to selective pressure, with a substitute of migration acting instead in separating the species.—Douglass H. Morse.

5. An Experiment for Determining the Possibility of Magnetic Orientation in Birds. M. E. Shumakov. 1967. Problems in Bionics. (*Voprosy Bioniki.*): 519-523. This is an elaboration of the same experiment referred to briefly in Bird-Banding, **38**: 328, 1967, rev. no. 7. In 1964 23 individuals of 5 species of fringillids were conditioned in circular cages to the Rybachi station on the Courish Spit, Baltic Sea, and then taken to the center of the Courish magnetic anomaly (field intensity of 1000 Oersteds) where their migratory restlessness doubled or tripled in intensity of activity. It is stated that notwithstanding their susceptibility to the magnetic field the birds could not determine migratory direction by it.—Leon Kelso.

6. Some Correlations in the Dispersal of Albatrosses in the Northern Pacific. V. P. Shuntov. 1968. *Z. Zhurn.*, **47**: 1054- 1064. (In Russian, English summary.)—The migratory areas of albatrosses cover the temperate waters and part of the subtropical zone of the Pacific and far eastern seas, their distribution holding mainly to marine waters. The Laysan Albatross moves mainly over the paths of the cold currents—the Kurile, Kamchatkan and Aleutian. The Black-Footed Albatross travels mainly over the warm currents—Kuro-Siwo, North Pacific, and Californian, and in summer and early fall, in the zone of the Alaskan and Aleutian currents. Both species are more numerous over waters of high biological productivity.—Leon Kelso.

7. Analysis of Tracks of Single Homing Pigeons. Charles Walcott and Martin Michener. 1967. *Proc. XIV Intern. Ornith. Congr.*: 311-329.—Experienced trained homing pigeons were equipped with radio transmitters and followed at a discreet distance in a light aircraft. Evidence of various kinds suggested that the birds used compass-orientation to select their initial direction, true navigation to find the 10-mile circle containing their loft, and landmarks to find the loft itself.—I. C. T. Nisbet.

8. Wind Drift, Leading Lines, and Diurnal Migration. Helmut C. Mueller and Daniel D. Berger. 1967. *Wilson Bull.*, 79(1): 50-63.—This is a review of concepts developed in Europe, here applied to North American examples, especially the migration of the Sharp-shinned Hawk.—I. C. T. Nisbet.

9. Radar in Orientation Research. Frank Bellrose. 1967. *Proc. XIV Intern. Ornith. Congr.*: 281-310.—This is an important summary of radar studies by Bellrose & Graber during 1962, 1963 and 1964, mostly carried out at Havana, Illinois. Overcast skies had comparatively little effect on the density of migration, the temporal pattern of density changes during the night, the duration of flight on a single night, or the heights of flight. However, directions of flight were usually more widely dispersed on overcast nights than under clear skies. Migration is much denser in favorable winds: waterfowl generally select strong following winds, but passerines generally fly in light winds. Most birds correct for lateral drift by the wind. A new and surprising result was that the mean ground-speed of the tracked targets increased by only 4 knots when the wind-speed increased by 10 knots: this implies that individual birds adjust their air-speed so that their ground-speed is always more or less the same. Because birds evidently are able to determine the strength and direction of the wind, Bellrose puts forward a new hypothesis: that they use the wind to maintain orientation under overcast skies, detecting its direction by relating the structure of wind-gusts to reference points on the ground.—I. C. T. Nisbet.

10. The Present Status of our Knowledge about Pigeon Homing. Hans G. Wallraff. 1967. *Proc. XIV Intern. Ornith. Congr.*: 331-358.—A critical review which must be read in detail. Wallraff concludes that "none of the hypotheses put forward up to the present is able to explain satisfactorily all the phenomena of homing behavior which have been found in experimental studies."—I. C. T. Nisbet.

11. Autumn Movements and Orientation of Waders in Northeast England and Southern Scotland, studied by Radar. P. R. Evans. 1968. *Bird Study,* 68(2): 53-64.—Six types of evening movements of shorebirds were distinguished, all of which could be interpreted as overland movements from one important feeding-ground to another. Track directions were closely similar night after night, in spite of very different wind conditions: birds were compensating for drift by the wind.—I. C. T. Nisbet.

12. Nocturnal Migration in Illinois -- Different points of view. Richard R. Graber. 1968. *Wilson Bull.,* 80(1): 36-71.—This detailed summary contrasts information obtained from radar, counts of calls at night, observation of grounded migrants and kills at television towers; it complements the paper by Bellrose on orientation (see review number 9). There is reasonable agreement between the species composition of tower kills and that of counts of grounded migrants, but there are a few common species (notably the Robin, Brown Thrasher, Flicker, and White-throated Sparrow) which are rarely, if ever, killed at towers. The main direction of autumn migration in Illinois is markedly east of south, which agrees with the fact that most of the commoner species winter to the southeast. Many of these species have elliptical migration routes, passing in spring to the west of the area traversed in autumn. They thus take advantage of the prevailing winds (see *Bird-Banding,* 35: 270, October 1964, review no. 14), but Graber now questions that this is the main reason for their migration pattern. Pointing to a counter-example in the Nashville Warbler, he suggests that the migration route of a species is primarily determined by its "area of origin". The reviewer does not find this convincing: Graber's evidence that the Nashville Warbler migrates west in autumn, passing north of Illinois, is very flimsy—and even if it does, it seems to be only a single exception.—I. C. T. Nisbet.

13. Reorientation of Passerine Night Migrants after Displacement by the Wind. P. R. Evans. 1968. *Brit. Birds,* 61(7): 281-303.—Scandinavian night migrants which reach the northeast coast of Britain in autumn are displaced well to the northwest of a line running SSW along the Atlantic coast from Scandnavia to Iberia. Yet this paper shows that the recovery rate of birds (mostly juveniles) banded in northeast Britain is no less than that of birds banded in southeast England. This shows that the displaced birds must have corrected for their displacement in some way. Evans tested a number of displaced birds in Kramer-cages: although only a small proportion oriented, those that did so oriented to the SSE.

Evans interprets these results as demonstrating "reoriented headings to compensate for displacement", and discusses two theoretical mechanisms of reorientation, each of which involves a type of bi-coordinate navigation. This interpretation is open to two objections, however. Lack and Myres have reported reorientation of other Scandinavian species, and gave evidence that it did not reflect bi-coordinate navigation (see *Bird-Banding,* 35(4): 269-270, review no. 9). Moreover, there is still no good evidence that SSE is not the normal direction adopted by the Scandinavian birds: Evans himself discussed this question in an earlier paper (see *Bird-Banding,* 38(3): 239, review no. 3) and regarded its answer as "uncertain". Doubt remains because it is uncertain exactly how Evans's birds had been displaced: fortunately he is able to quote a Russian paper, which reported similar results from birds displaced experimentally.—I. C. T. Nisbet.

14. The Starling as a Passage Migrant in Holland. A. C. Perdeck. 1967. *Bird Study,* 14(3): 129-152.—Two thousand recoveries were obtained from 94,000 Starlings banded on autumn migration. Eighty-eight percent of the birds caught were juveniles, the large ratio being attributed to the greater tendency of juveniles to migrate by day and to follow leading-lines. Considering recoveries in the first year after banding, birds caught early in the season were mostly recovered in winter in the British Isles and in summer in Holland; those caught late in the season were mostly recovered in winter in Holland or Belgium and in summer far to the east (Poland, Finland and Russia). This correlation disappeared, however, in recoveries in the second and subsequent years after banding. Perdeck suggests that the wintering area is related not only to the area of breeding but also to the date of migration: birds that are delayed in migration do not migrate so far as earlier migrants from the same population.—I. C. T. Nisbet.

15. Strong homing instinct in a Pukeko. R. R. Sutton. 1967. *Notornis,* 14 (4): 221.—A banded *Porphyrio melanotus* returned from a 60 mile displacement in 8 days. Reference to similar homing in other New Zealand rails is made.—Jack P. Hailman.

16. Banded Fairy Prion -- first overseas recovery. C. J. R. Robertson. 1968. *Notornis,* 15 (2): 122.—Since 1951, some 12,500 *Pachyptula turtur* have been banded in New Zealand. This one, banded as an adult in July 1966 at Stephens Island in Cook Strait, was recovered the following January on Montagu Island, 180 miles south of Sydney, Australia. Thus, the species may be migratory. —Jack P. Hailman.

POPULATION DYNAMICS

(See also 20, 43, 44, 46, 48, 59)

17. The distribution and status of the Black Stork in southern Africa. W. R. Siegfried. 1967. *Ostrich,* 38 (3): 179-185.—*Ciconia nigra,* which is becoming rarer in Europe, breeds more commonly in southern Africa than was formerly thought.—Jack P. Hailman.

18. The Dipper in Östergötland, northeastern province of southern Sweden. (Strömstaren (*Cinclus cinclus*) i Östergötland.) Jan-Åke Holmbring and Härold Kjedemar. 1968. *Vår Fågelvärld,* 27-97-121. (English summary.)—This five-year study showed that the winter populations of the Dipper in this region south of its main breeding grounds were larger than surmised. In the peak winter 1966-67, 140 individuals were observed in 64 localities and in the severe winter 1962-63 17 Dippers were counted along two kilometers of open stream. The birds, usually found singly or in pairs, were in general stationary. Ice formation and, in particular, waterlevels affected their numbers and movements. The Dipper prefers localities with clear unpolluted water and stony shores. From November to March it maintains a defended territory. Singing begins in January and pair formation in March, so that most of the birds arrive on the breeding grounds paired. The omission of captions of the three tables is confusing.—Louise de K. Lawrence.

19. The Distribution of the Quail and the Corncrake in Närke, central Sweden. (Förekomsten av vaktel (*Coturnix coturnix*) och kornknarren (*Crex crex*) i Närke.) Kent Larsson. 1968. *Vår Fågelvärld,* 27: 122-135. (English summary.)— Since the 19th century the populations of both species have shown strong fluctuations. The influencing factors were evidently less correlated to climatic changes than to man's impact upon the environment. Thus intensive netting of the Quail in the latter part of the 19th century and the first decades of the 20th produced a corresponding population decline in Sweden, that lasted until the 1940s. The slow recovery now discernible in the notrhernmost parts of its breeding range is probably chiefly due to prolonged migration.

Originally a dweller of wet meadows near swamps and marshlands, the draining of the wetlands turned the Corncrake willy-nilly into a field inhabitant. All authorities unanimously blame the sharp decline of Corncrake during the 1950s on changed agricultural methods, especially the advanced haying season for better yield and modern machinery, which have destroyed virtually all the bird's chances of reproduction in the fields. As the field populations became successively annihilated, a small residue of the stock that persisted in the original habitats has now begun to show a slow increase by way of replacement.—Louise de K. Lawrence.

NIDIFICATION AND REPRODUCTION

(See also 34, 42, 46, 69)

20. The Breeding Success of the Whitethroat in Pesticide-treated Environment. (Något om törnsångarens (*Sylvia communis*) häckningsresultat i biocidbehandlad miljö.) Berith Persson. 1968. *Vår Fågelvärld* 27: 231-243. (English summary.)—Inconclusive results gave in 1956 a nesting success of 82 percent of 21 nests and in 1967, 86 percent of 18 nests. In seven nests, instead of the normal four to six eggs, clutches of two and three were thought to be caused possibly by the spraying.—Louise de K. Lawrence.

21. Expulsion of Young from the Nest by Adult Birds. V. V. Strokov. 1968. *Zool. Zhurn.*, **47**: 951, 952. (In Russian. English summary.)—Eight accounts of this behavior in Russian literature are reviewed. In 7 summers of personal observation no instances of voluntary departure of starved, retarded or weak young were seen, but 17 instances of expulsion of living young by adults were observed, viz.: Starling, 2; Great Tit, 2; European Redstart, 3; Europ. Yellowhammer, 1; Tree Pipit, 1; Wood Warbler, 1; Pied Flycatcher, 2; Chaffinch, 1; Redwing thrush, 2; and Song Thrush, 2. Instances of the first 3 species are described in detail. The author's explanation: The violation of certain behavior stereotypes of the brood as a whole. The pose of the young, and the manner of begging food from the parents, and taking it are specific for each species, and change along with age and development of young. Corresponding changes occur synchronously in the adult. Violation of this synchrony by individual young alienates the parents. In observed cases, behavior of retarded young deviated to the early post-embryonal level, i.e. was unresponsive to the changed behavior of other young of the brood, and that of the adults feeding the brood. This discrepancy increased literally by the hour. Adult reactions to living young became similar to those toward a foreign body or dead young. Therefore adults expel motionless or nearly motionless young as deviates from the stereotype. Reduced feeding of weak or retarded (or underprivileged) young and expulsion of them from the nest by parents, in the author's opinion, maintains the health of populations.—Leon Kelso.

22. The Breeding of the Blacknecked Wheatear in Mangyshlak. O. V. Mitropolskii. 1968. *Trudy Inst. Zool., Akad. Nauk Kazakh. SSR.*, 29: 67-70. (In Russian.)—This article, based on field work carried on from 1962 to 1966 in western Kazakhstan, supplies many new details on the life history of *Oenanthe finschii*. Seemingly the most remarkable and puzzling habit is the providing of the nest, which is located as deep as 80 cm within earth or rock recesses in slopes, banks or cliffs, or within mammal burrows, with an approach, porch or platform of flattened pebbles as large as 32-47 mm, up to 240 in number, and even covering the margin of the nest, rendering it nearly invisible from the outside. A similar habit has been described for *Oenanthe leucura*. This is reminiscent of the platform or embankment of small stones made by the *Eremophila alpestris* races of the same general region. As in the latter, there are two clutches per year, the earlier being the larger.—Leon Kelso.

23. Observations on the Behavior of Kittlitz's Sandplovers at the New York Zoological Park. William G. Conway and Joseph Bell. 1968. *Living Bird*, 7:57-70.—At least six pairs of *Charadrius pecuarius*, a small plover from Africa and Madagascar, nested and renested in the Bronx Zoo from January 1965 through January 1968. The parent birds "kicked sand" over the eggs when leaving the nest after disturbance from a man, but not from another bird. Incubation of the two eggs is shared by the parents; after 24 days hatching occurs. The chicks are not fed by the parents but are brooded by them until they can fly—in one case at the age of 29 days.

Seventeen photographs show the nesting behavior of these birds with special emphasis on the egg-covering. A fine example of the excellent uses to which the modern Zoo can be put.—Margaret M. Nice.

24. Eastern Wood Pewees Help Parents Mold a Nest. Dorothy (Hobson) Luther. 1967. *Indiana Audubon Quart.*, 45(3): 88-92.—Two fledgling *Contopus virens*, at least three days out of the nest, were watched as they molded their mother's new nest, shortly after having been fed by her. Mrs. Luther explored the literature and could not find any other instance of "a helper at a new nest being fed by its parent."—Margaret M. Nice.

25. Studies of the Diederik Cuckoo *Chrysococcyx caprius* in the Transvaal. R. A. Reed. 1968. *Ibis*, 110(3): 321-331.—This small emerald green cuckoo parasitizes three abundant ploceids: Cape Sparrow (*Passer melanurus*), Masked Weaver (*Ploceus velatus*) and Red Bishop (*Euplectes orix*). The cuckoo eggs differ in coloring according to the host species. The chicks normally evict their host's offspring on the second or third day after hatching. Fledging appears to last 19-20 days; after which post-fledging care may last between 17 and 38 days, "during which time the chicks are fed different foods by different host species (grass seeds [regurgitated] by bishops; insects of different sizes by weavers and sparrows)." "The fact that the eggs and the calls of the chicks vary according to their host species suggests the existence of three separate host-specific strains in this area." A very interesting paper.—Margaret M. Nice.

26. A Review of Parental Carrying of Young by Waterfowl. Paul A. Johnsgard and Janet Kear. 1968. *The Living Bird*, 7: 89-102.—"Parental carrying on the back while swimming has been reliably seen in three species of swans, two sheldgeese, and at least seven species of ducks." It has also been recorded in flight for parents of at least 16 species of waterfowl; in these cases the bill was customarily used. There is a two and a half page bibliography, besides nine photographs—Margaret M. Nice.

27. Some Notes on the Chick-carrying Behavior of the African Jacana. John B. D. Hopcraft. 1968. *The Living Bird*, 7: 85-88.—Observations on *Actophilornis africanus* in Kenya with three photographs. The author approached in a rowboat a parent with two five-day young; the adult called the chicks, which ran under its wings; with these tightly pressed to its sides it walked with two pairs of little legs dangling down on either side of the parent's body. Mr. Hopcraft has seen one Jaçana carrying three chicks at one time, two under one wing, one under the other.—Margaret M. Nice.

BEHAVIOR

(See also 21, 23, 25, 26, 27, 49, 51, 54, 57, 58, 66, 68, 69, 70, 71, 73, 74)

28. Some possible functions of sun-bathing in birds. D. Goodwin. 1967. *Brit. Birds*, 60 (9): 363-364.—This is a sort of appendix to Teager's photographs (review 70). Goodwin cites some previous literature, and discusses some hypotheses about the functional significance of sunbathing: (a) that the sun's irradiation of preen-gland oil on the feathers creates vitamin D that is ingested when the bird swallows feathers during preening; (b) heat makes ectoparasites more active, so that they can be removed more readily; and (c) "those workers who consider sun-bathing to be a simple temperature response, are, I think, wrong in most instances" (but no convincing argument is given as to *why* they are wrong). This paper overlooks the important observations and review of sunbathing by Hauser (*Wilson Bull.*), and the subject is critically taken up again in a later issue of *British Birds* (see review 49).—Jack P. Hailman.

29. Bower "painting" by Lauterbach's Bowerbird. H. L. Bell. 1967. *Emu*, 66 (4): 353-355.—The first observations of the shy *Chlamydera lauterbachi* "painting" its avenue bower with some "whitish material" which later dried and "flaked off into powder."—Jack P. Hailman.

30. The use of tools by Brown-headed Nuthatches. D. H. Morse. 1968. *Wilson Bull.*, 80(2): 220-224.—During 1963 and 1964 individuals of *Sitta pusilla* in Tangipahoa Parish, Louisiana were seen to use the bark scales of longleaf pine trees to pry off other scales in order to get food items in the bark. The nuthatches carry around the tools in their beaks, may fly short distances with them, and may use them as many as three or four times before letting them drop. Tool-using occurs mainly outside of the time of heavy seed crops; birds do not use the available scales of loblolly pine and spruce pine, which separate from the tree less easily then scales from longleaf pine.

Tool-using by birds has been reported in only a few species, briefly cited in this report. Tool-using may be more widespread among birds than reported, since it is liable to be overlooked when the motor patterns of tool-using resemble other movements. In the case of nuthatches, prying with bark scales resembles seed-cracking.—Jack P. Hailman.

31. Ecological Aspects of Food Transportation and Storage in the Corvidae. Frantisek J. Turçek and Leon Kelso. 1968. *Communications in Behavioral Biology*, part A, 1, 277-297.—The paper's main purpose is to draw attention to this little known behavior in the Corvidae. But it is more than that. The section that deals with the Eurasian Nutcracker (*Nucifraga caryocatactes*) contains data gathered over a period of 10 years mostly in the course of straight fieldwork and in detail not before presented, indicating a patience and a singleness of purpose in this research of the highest order. Thus information is given on places of storage, the nature of concealment of the caches, numbers of items per cache, and distances that seeds are transported. Further there is information on the proportion of seeds taken by the nutcrackers, the proportion stored and recovered by them and the proportion recovered by other animals. The revelation that up to 60,000 seeds per hectare may sprout and propagate pines must be of special interest to the forester, "Cluster sowing" (in the caches) works to better advantage from a forestry point-of-view than solitary seed storage in that "the survivors of intra-cluster conflict grow into stronger trees."

Behavior and movements during the act of storage is fully described. The discussion on memory and the ability to retrieve hidden stores centers upon a remarkable discovery by Krushinskaja. Experimenting with wild trapped as well as captive nutcrackers, she found that the exision of the hippocampal or archeocortex totally deprived them of the capacity to find and to retrive stored food because of loss of visual memory.

Various physiological as well as ecological and geographical adaptations are discussed. The evolution of the storage transportation habits and the effects thereof are also dealt with at some length to form a scholarly contribution of unusual interest. Indidentally it also points to a wide area of much-needed investigation that remains to be done into the hoarding behavior of many North American Corvids and other species.—Louise de K. Lawrence.

32. Food passing by breeding harriers. R. R. Sutton. 1967. *Notornis*, 13 (3): 161.—One *Circus approximans* dropped a morsel to another flying 150 feet below, which rolled over in flight to catch the presumed food. Jack P. Hailman.

33. Defense of feeding areas by adult Herring Gulls and intrusion by young. William H. Drury and W. John Smith. 1968. *Evolution*, 22(1): 193-201.—During late summer, fall, and winter adult Herring Gulls in the northeastern United States defend feeding areas, into which they permit intrusion of some young birds. The authors believe that tolerated intruders are the young of the defending adults. This behavior is thought to be of survival value, as it initally results in the young being fed and potentially allows them to learn what food to eat. During the winter season adults often appear to be more permissive to invasion of their territories by young, allegedly unrelated, individuals than to other adults. No evidence is presented to preclude conclusively the possibility of the immature birds in winter being the young of the adults trespassed upon, however. The potential survival value for the young in winter is clear, as it permits them access to more food than would otherwise be available. However, the selective basis for the permissiveness of the adult is obscure, and no firm conclusion for its existence is reached.—Douglass H. Morse.

34. The juvenile food-begging call of some fledgling cuckoos -- vocal mimicry or vocal duplication by natural selection? J. Courtney. 1967. *Emu,* 67 (1): 154-157.— The author's observations, as well as those in the literature, demonstrate that the begging call of the young parasitic cuckoos (*Cuculus*) in Australia always seem to match the normal begging call of the young of the species they parasitize. Yet each species of cuckoo parasitizes many different passerine species. Are there strain-specific cuckoos that specialize in parasitizing certain species, or can the young cuckoos learn to mimic the begging call of their foster species in a very short time?—Jack P. Hailman.

35. Goldfinch's method of obtaining dandelion seeds. C. W. Craig. 1968. *Brit. Birds,* 61 (8): 375.—Several times, a female *C. carduelis* climbed the stem half-way; bit the stem, reached to the seed head (pulling it back to her and thus bending it at the bite), and then grasped the reflexed outer stem and lower stem together in order to eat. The male did not perform this complex maneuver. This is similar to feeding behavior I have seen in the Song Sparrow, *Melospiza melodia* (Auk, 77: 349-350, 1960), and the editors of *British Birds* remark that "the pulling in and holding of seed heads by finches is normal in other contexts . . .".—Jack P. Hailman.

36. Some cases of allopreening. P. Steyn. 1968. *Ostrich,* 39 (1): 36-38.—When a bird preens another individual the act is called "allopreening" (see C. J. O. Harrison, *Behaviour,* 24: 161-209, 1965). Allopreening is here reported for five unrelated species, the highlight being a photograph of a Cape Gannet (*Sula bassana capensis*) preening the neck of its chick while the chick was preening the throat of its other parent, and (believe it or not) that parent was simultaneously preening the head of the first parent!—Jack P. Hailman.

37. Feeding methods of Rook with malformed bill. B. King and J. C. Rolls. 1968. *Brit. Birds,* 61 (9): 417-418.—The ingenious feeding methods of a *Corvus frugilegus* with an extraordinarily long upper mandible are illustrated and described, thus demonstrating the amazingly adaptive behavior of which certain birds are capable.—Jack P. Hailman.

38. Unusual feeding technique of Bald Coot. I. Rowley. 1968. *Emu,* 67 (4): 295-296.—Many *Porphyrio melanotus* were seen by two observers to pick up the small figs of *Ficus rubiginosa* with their bills, bring one foot up to the bill, wedge the fruit between two toes, place the foot on the ground, peck the fruit open, and eat it.—Jack P. Hailman.

39. Behavior of Hand-raised Kirtland's Warblers. Andrew J. Berger. 1968. *The Living Bird,* 7: 103-116.—From 1956-1963 Dr. Berger raised nine *Dendroica kirtlandii* from nestling or fledgling stage to beyond their first year. In this paper he describes in detail the development of various features of their behavior. Two adult call notes appeared by 34 days, but the first song was heard at 40 days: "a low hoarse warble unlike any song given by adult male on breeding ground." The same was true of all songs heard from these captive warblers. No nest-building was ever seen. "It is impossible to say whether this was a dietary matter, inappropriate vegetation, the absence of adult territorial song, or other factors." The paper is illustrated with a drawing and painting by George Sutton—both delightful—Margeret M. Nice.

ECOLOGY

(See also 4, 6, 18, 31, 33, 64, 65, 71, 75)

40. Diurnal Raptors and Owls in central Sweden during the winters 1954/55 through 1966/67. Report No. 11 from Kvismare Bird Station. (Dagrovfåglar och ugglor i Kvismaredalen vintrarna 1954/55-1966/67.) Roger Gyllin, Håkan Johannesson and Kent Larsson. 1968. *Vår Fågelvärld,* 27: 196-219. (English summary.)—The study was conducted in an area of fields and lowlands of about 100 square kilometers. In addition to natural foods carrion and slaughterhouse waste were also available. Ten species of raptors and five owls were recorded. Of these only four species were observed regularly, five were present irregularly about every other year, while the remainder were rare. During December and January more birds were present than in February owing to migratory movements either southwards or to the breeding grounds. The abundance of prey animals and the depth of the snow rather than the temperature were the main factors influencing the number of raptors and owls observed.—Louise de K. Lawrence.

41. The Vomb Lake Area in Southern Scania as Stopover and Wintering Grounds of the Bean Geese. (Vombområdet som rast- och övervintringslokal för sädgäss (*Anser fabilis*).) Hannes Mellquist and Björn Nilsson. 1968. *Vår Fågelvärld*, 27: 220-230. (English summary.)—The probability of the army taking over large parts of the area prompted the study. Special attention was given the birds' preference for the various grain and rootcrop cultivations and the pastures. The geese, from 145 to 7,000 in number, fed mostly in the potato and wheat fields. When snow covered the feeding areas, the geese moved to bare ground.—Louise de K. Lawrence.

42. Notes on Habitat Preferences in the Little Bunting. (Anteckningar om dvärgsparvens (*Emberiza pusilla*) biotopval.) Gunnar Anderson, Rune Gerell, Hans Källander, Torsten Larsson. 1968. *Vår Fågelvärld*, 27: 136-141. (English summary.)—Although the bird's choice of nesting habitat in the Lapland highlands varied considerably in 1967, the main requirements, forest edges and humid places with rich ground vegetation of *Betula nana* and *Salix* species, were clearly discernible.—Louise de K. Lawrence.

WILDLIFE MANAGEMENT

(See also 73)

43. Seasonal Fluctuations in the Numbers of Swedish Winter Ducks. (Report No. 3 of Wildfowl Counts in Sweden.) Leif Nilsson. 1968. *Vår Fågelvärld*, 27: 142-171.—This census of waterfowl, not including swans and geese, was carried out from September to May 1959-1965. Mallards (*Anas platyrhynchos*) was the most numerous species. During cold spells these ducks moved from inland to the rivers, urban and coastal waters, and back inland again as mild weather returned. During the cold winter 1962-63 a large proportion of the Mallards left Sweden. The Tufted Duck (*Aythya fuligula*) dominated in the coastal waters. In November 1961, a mild winter, a peak number of 22,100, all species combined, was obtained, most of these in inland waters. The article, written in English, contains numerous tables and diagrams.—Louise de K. Lawrence.

44. The Results of a Midwinter Waterfowl Census in USSR (January, 1967). Yu. A. Isakov. 1968. *Byull. Moskovskogo obshch. isp. prirody, otdel. biol.*, 73(4): 92-114. (In Russian. English summary.)—In January, 1967 a wintering waterfowl census covering all USSR was taken. All major wintering grounds were surveyed simultaneously for the first time, along with other sites totaling over 1,000 localities. Over 800 persons participated, the counts being made from shore, from boats, planes and helicopters. The thoroughness of coverage varied regionally. The total count was about 3,455,200, which, revised to compensate for local lack of coverage, gave an estimated 4,229,000 total for USSR.

The species' distribution (in thousands) was as follows: Mallard, 1080.1; Gadwall 91.4; Shoveller 77.2; Pintail 213.6; Teal species 508.5; Wigeon 394.7; Ruddy Shelduck 6.2; Shelduck 19.6; Pochard 289.7; Ferruginous Duck 37.5; Tufted Duck 197.1; Scaup 76.8; Redcrested Pochard 341.0; Goldeneye 21.9; Velvet & Whitewinged Scoters 0.2; Common & King Eiders 105.1; Long-tailed Duck 6.6; Goosander 17.0; Red-breasted Merganser 44.0; Smew 33.5; Harlequin 4.1; Whiteheaded Duck 0.8; Graylag Goose 38.0; Whitefronted and Lesser Wf. 8.1; Red-breasted Goose 25.1; Bean Goose 1.4; Whooper Swan 26.7; Mute Swan 5.0; Flamingo 23.6; Coot 534.7. Regarded of special note was the low number of wintering geese. It is emphasized that creation of more game reserves would decidedly increase wintering waterfowl totals.—Leon Kelso.

CONSERVATION

(See also 17, 19, 59, 76)

45. Purposes and Ways of Development of USSR Reserves. A. A. Nasimovich. 1968. *Byull. Moskovskogo obshch. isp. prirody, otdel. biol.*, 73 (4): 148-151. (In Russian. English summary.)—The 80 designated reserves in the USSR, not counting game management tracts, occupy about 6,500,000 hectares, or about 3 percent of the national territory. Actually their total area is somewhat smaller because in many reserves serious exceptions to the conservation regime are permitted, e. g. grazing, timber cutting, and hunting. Control of these reserves is shared by 19 different organizations and departments. The author finds the resulting situation critical in many respects.—Leon Kelso.

46. Chlorinated Hydrocarbons and Eggshell Changes in Raptorial and Fish-Eating Birds. J. J. Hickey and Daniel W. Anderson. *Science*, 162 (3850): 271-273.—A report on eggshell thickness in 1729 blown eggs of raptorial birds in 39 museums and private collections in this country. While eggshell weight remained stationary with those species whose populations have held up—Golden Eagle, Red-tailed Hawk and Great Horned Owl—, on the contrary those species whose populations have recently shown catastrophic crashes—Bald Eagle, Osprey and Peregrine Falcon—eggshell weight has dropped 18 to 26 per cent! The decline began in 1947, one year after the chlorinated hydrocarbons came into general usage here and in western Europe. As did the population crash of the Peregrine in Britain with its breakage of eggs. "These persisting compounds are having a serious insidious effect on certain species of birds at the tops of contaminated ecosystems." A most important study.—Margeret M. Nice.

47. The Gyrfalcon and Falconry. Tom J. Cade. 1968. *Living Bird*, 7: 237-240.—"Largest of the long-winged hunting hawks (*Falco rusticola*)," is a bird of circumpolar distribution. It was highly prized by falconers, and from Iceland from the 13th through the 18th centuries large numbers of young Gyrfalcons—sometimes as many as 200 a year—were shipped to Denmark. Living in the far north and feeding chiefly on ptarmigan, an herbivorous food species largely free from pesticide residues, Gyrfalcons appear to be relatively secure.—Margaret M. Nice.

PARASITES AND DISEASES

(See also 28, 46)

48. Exceptional mortality of Shags and other seabirds caused by paralytic shellfish poison. J. C. Coulson, G. R. Potts, I. R. Deans and S. M. Fraser. 1968. *Brit. Birds*, 61 (9): 381-404.—A catastrophic decline in *Phalacrocorax aristotelis* coincided with 78 cases of paralytic shellfish poisoning among human beings and with widespread deaths in homing pigeons. About 80 percent of the Shags on the Farne Islands died of a neurotoxin, along with several species of terns. Apparently the toxin is produced by unicellular dinoflagellates, which are then eaten by filter feeders such as mussels and cockles, and by zooplankton filter feeders such as some crustaceans. The shell fish may be eaten directly by the birds, or else fish eat the filter feeders, and the birds eat the fish. At the time of the mortality, organochlorine pesticide residues were at a low level, and thus probably contributed little to the deaths, even though their poisons act similarly. Mortality was not age-specific, but since young, non-breeding Shags are dispersed over the coasts of England and Scotland, it is hoped that the population will recover over the years.—Jack P. Hailman.

PHYSIOLOGY AND PSYCHOLOGY

(See also 28, 31, 58)

49. The role of sunbathing in birds. R. J. Kennedy. 1968. *Brit. Birds,* 61 (7): 320-322.—In response to Goodwin's analysis (review 28) of Teager's photographic study (review 70), Kennedy "sets the record straight" with regard to the vitamin D hypothesis. First, it was H. C. Hou who provided the bulk of the evidence for this hypothesis in a series of papers in the *Chinese Journal of Physiology.* When a group of chicks whose preen glands had been surgically removed were kept in the absence of sunlight, along with non-operated controls, all developed rickets. When exposed to ultraviolet radiation, the controls with glands improved, but the others did not. Feathers from normal birds fed to rachitic rats produced a cure. And analysis of cholesterol content in the preen glands of fowls, domestic ducks, pigeons, and domestic geese, as well as in normal feathers, were "invariably strongly positive." (Cholesterol is a biochemical precursor of vitamin D.) Similar evidence is cited from authors other than Hou.

"The evidence against the presence of provitamin D in the preen gland is much greater, however." This evidence is cited specifically, and consists mainly of negative findings in studies essentially similar to those of Hou. One is never sure how much confidence to place in negative findings, unless the opposing positive results of similar experiments can be explained satisfactorily as artefacts. It has been found, however, that ultraviolet exposure of bare legs alone effects a recovery from rickets that is just as rapid as total body irradiation of the same exposure, suggesting that feathers are not involved at all. If soft parts are critical in the vitamin D story, sunbathing probably has some other function, since the birds' legs are invariably shaded during sunbathing.

This is an important paper, in that it reviews a great deal of literature liable to be overlooked by ornithologists. Citations are marred by the universal omission of years of publication, although volume numbers are given.—Jack P. Hailman.

50. Radiant solar energy and the function of black homeotherm pigmentation: an hypothesis. Wm. J. Hamilton, III and Frank Heppner. 1967. *Science,* 155 (3759): 196-197.—When electromagnetic energy such as ultraviolet rays, light or infrared rays is absorbed, it is ordinarily converted into heat (unless it triggers a chemical reaction, such as in vision). The most efficient absorber is an entirely black object, which absorbs all wavelengths of energy nonselectively. However, such black bodies will also radiate energy more readily. The authors reasoned that the black coloration of some desert birds could serve to gain body heat, thus reducing food energy needed to regulate body temperature. To test this they measured oxygen consumption of four domesticated Zebra Finches (*Poephila castanotis*) in their usual non-pigmented plumage, and again after being dyed black. The birds were placed in a container within a waterbath, continually monitored so that the temperature of the birds' environment was kept within 0.5° of 10°C. When a sungun lamp was on, black birds used a mean of only 7.17 ml 0^2/gm body wt./hour (table 1 of the published version erronously states per minute, but reprints are corrected by hand). With the lamp off, these birds used a mean of 9.87 ml 0^2 (significantly higher). Data from these four birds before being dyed, plus a fifth bird, with the lamp off showed a mean of 9.90 ml; and those five birds plus a sixth with the lamp on showed a mean of 9.30. Thus, black birds used less metabolic energy when the lamp was on then did any other birds.

This is a significant contribution to our understanding of energy balance in homeothermic animals. However, a few unanswered questions remain. For instance, do all the birds maintain the *same* body temperature under these conditions? Would the results be similar at other environmental temperatures? The temperature (equivalent to 50°F) seems like a low environmental temperature for stimulating a daytime desert environment, yet it is the black coloration of desert homeotherms to which the study is addressed. At night, when the temperature is this low in the desert, the sunlight is not available as a heat source, and indeed, experimental black birds use as much oxygen when the lamp is off as do white birds. Measurements with a pyrheliometer placed in the cage showed a total energy absorption of 1.23 cal/cm_2/min from the lamp, and outside on an August afternoon 1.31, so that the *total* energy of the sun-lamp was similar to real environmental conditions. The sun's emission spectrum of wavelengths closely approximates a blackbody radiator emitting at a temperature of over 6000° K. Significant portions of this spectrum reaching the earth are filtered through absorption by ozone and other materials in the atmosphere, and by Raleigh scattering. The sun-gun lamp used in the experiment approximates a blackbody radiator at only 3400 °K, thus having a quite different radiation spectrum of wavelengths from the sun, and with no atmospheric filtering. Furthermore, the lamp rays were filtered by ground glass, the spectral transmission characteristics of which are not stated. Thus significant differences in wavelength composition between the experimental illumination and sunlight may occur, and the pyrheliometer cannot distinguish these when all incoming radiation is summed. It thus becomes critical to know how closely the black birds themselves approximate a true blackbody absorber. Spectral reflectance curves of their dyed plumage would have been valuable, since dark soft-part coloration of some birds actually reflects rather than absorbs most of the long wavelengths in the infrared (Hailman, *Science,* 162: 139-140, 1968). This paper's title indicates that the authors consider their contribution as merely raising an hypothesis, and it is hoped that they will continue in this important work.—Jack P. Hailman.

51. Central patterning of a vocalization in fowl. R. K. Murphy and R. E. Philips. 1967. *Nature,* 216 (5120): 1125-1126.—Electrical brain stimulation of the lateral tegmental gray in chickens produces rhythmic clucking, which is an alarm call functionally analogous to that elicited from Red-winged Blackbirds stimulated at the same brain site. The electrical activity of the motor nerves that send contraction signals to the abdominal walls to produce clucking was recorded while stimulating the calling site. Since curarized birds that could not cluck had the same pattern of motor impulses as controls, the patterning of clucking does not depend upon proprioceptive feedback from the muscles or auditory feedback from the sound produced.

The paper is too short. No sonograms of the sounds elicited by stimulation are presented for comparison with normal chicken sounds. I have heard tapes of the Red-wing calls elicited by brain stimulation (different worker from present authors), and such calls are highly abnormal. Furthermore, no quantitative comparison of the patterning in the motor nerve impulses is given between curarized and other birds, so that the study must in general be taken on faith. It is hoped that a more complete report of this significant work will be published soon.—Jack P. Hailman.

52. Ecological Aspects of the Homoiothermy Evolution Problem. I. A. Shilov. 1968. *Z. Zhurn.,* 47 (9): 1285-1290. (In Russian. English summary.) —It is believed that the first stage in the evolution of homoiothermy was the development of various thermoregulatory responses some of which may be observed in modern poikilotherm animals. Homoiothermy could have originated as a complex of such reactions, which stabilized heat maintenance in thermally unstable environments. In birds this complex formed parallel to development of flight, elaborating adaptations which would reduce rate of energy expenditure.—Leon Kelso.

53. Temperature variation in the Cattle Egret. W. R. Siegfried. 1968. *Ostrich,* 39 (2): 150-154.—There are only a few studies of body temperature of birds. In the first part of this one rectal temperatures were taken within five to 20 seconds after collecting 55 *Ardeola ibis* (one hopes the birds were taken for other purposes as well). The data are plotted against time since sunrise, and body temperature is still increasing at 8.5 hrs after that time. One straight line through the variable data is labeled as "mean body temperatures for each hourly interval." but a quick check shows that whatever the line is, it is not *that.* Below this graph the environmental temperature at the time of collection is shown along the same abcissa of time since sunrise, but since many birds were collected at identical times, it is impossible to match up environmental temperatures with the birds' body temperatures.

In the second part rectal temperatures were taken on one captive male and one captive female hourly over one 24 hour period (actually, the plotted data on the female go only for 19 hours, despite the assertion in the text). Body temperatures are maximum at 16:00 in the afternoon, and minimum at about 04:00 in early morning (about 41 °C and 36 °C, respectively). The text asserts that "in both figures 1 and 2, maximum body temperatures were recorded at about the same time, viz, some eight to nine hours after local sunrise." But, in fact, figure 1 has no data points past about 8.5 hours post-sunrise, and the average curve is still ascending at this time, so that figure 1 shows no true peak in body temperature at all. The Cattle Egret is said to conform to a theoretical equation given, although the equation contains two unlabeled variables (I take "Tb" to mean "temperature of the body" and "W" to mean body-weight—but in what units? It makes a difference!).

The data reported are valuable, but the presentation lacks clarity.—Jack P. Hailman.

54. White-breasted Cormorant swallows pebbles on land. G. F. van Tets. 1968. *Emu,* 67 (3): 224.—A *Phalacrocorax fuscescens* ate four smooth pebples of about 10 mm diameter. The author believes the perviousness of the cormorant's feathers to water (cf., review # 58) is an adaptation for lower buoyancy, and hence better locomotion under water; swallowing pebbles may be another adaptation for lowering buoyancy. Such behavior is also known from the Nile crocodile (H. B. Cott, *Trans Zool. Soc. London,* 29 (4): 211-356, 1961), so I suggest it should be looked for in other birds, such as dippers.—Jack P. Hailman.

55. Histochemical Studies of the Avian Sacculus, at Rest and Under Certain Stimulation. R. A. Abramyan. 1968. *Zhurn. evolyutsionnoi biokhimii i fiziologii,* 4: 376-383. (In Russian. English summary.)—Histochemical studies of the receptor epithelium of the domestic fowl and pigeon (*Columba livia*) at relative rest show the presence of biochemically active substances: nucleic acids, "total" proteins, and functional groups of carboxyl and thiol molecules in the resting cells. After application of vibrations (50 hertz, for 15 min.) to the whole animal there was a decrease of cytoplasmic ribonucleic acid, with escape of nucleolic RNA into the cytoplasma; and a change in concentration and distribution of total protein, carboxyl and thiol groups were observed; a 15 min. exposure increased, 2 hrs exposure decreased, the volume of receptor cell nuclei. All this led to the conclusion that one of the functions of the avian sacculus is the reception of mechanical vibration effects.—Leon Kelso.

56. The Role of Fat Deposition in the Regulation of Avian Metabolism and Behavior During Migration. V. R. Dolnik. 1968. *Zool. Zhurn.,* 47: 1205-1216. (In Russian. English summary.)—The development of the migratory state in birds has two successive stages: first, the regulatory stage, when hyperphagy, fat deposition, and migratory restlessness develop in response to changes in the "tunung" of higher regulators (premigratory period); the second, the metabolic stage, when, during the migratory period, fat reserves are stabilized at a definite level, when regulation of appetite and migratory behavior occur along with changes in the bird's metabolism. Injection of lipids into lean birds showed that fat deposits serve as a basic regulatory center of these processes during the migratory period, and that these deposits regulate lipolysis, lipogenesis, glycolysis, and glycogenesis throughout the second period.—Leon Kelso.

57. Black Shags flying with bills agape. J. M. Cummingham. 1968. *Notornis,* 15 (2): 65.—Two *Phalacrocorax carbo* (also called European Cormorant) are apparently the only birds ever seen doing it. The author speculates that increased evaporation while in flight may make this an efficient cooling mechanism. —Jack P. Hailman.

PLUMAGES AND MOLTS

(See also 28, 36, 50)

58. The water repellency and feather structure of cormorants, Phalacrocoracidae. A. M. Rijke. 1967. *Ostrich,* 38 (3): 163-165.—This short, remarkable paper attempts to explain why cormorants must "dry" their wings in the air. When a drop of water is placed on a smooth surface, it either spreads out into a thin film, or contracts into part of a ball. If the latter, then the more ball-like, the greater the water-repellency of the material. The portion of the sphere formed on the surface is measured by the angle that the edge (tangent) of the ball forms with the surface at the place of contact; i.e., if a half-sphere is formed, the angle is 90°. As the ball becomes more sphere-like the angle increases (becoming 180° for a perfect sphere sitting on the surface), so the greater this angle, the more water-repellent is the smooth surface. Basically, if the characteristic angle described above forms while adding water to the surface, it is called an "advancing" contact angle; if it forms while withdrawing the water (such as an evaporation), it is the "receding" contact angle. The latter determines the lasting effect of repellency.

Now, for porous surfaces, some allowance has to be made for the air-water interface on the bottom of the drop (i.e., where the material has "holes"), and this allowance is made by extending some equations (not given) for rough surfaces to porous surfaces: $\cos A_e = f_1 \cos A - f_2$, where A is the contact angle and A_e is the "effective" contact angle for a porous surface, which is determined by the two "fudge-factors" (f_1 and f_2) representing characteristics of the porous surface (I have substituted notations for clarity). It is now the *effective* angle that determines repellency of the porous surface, and f_1 and f_2 are obviously critical in determining this angle. As an angle increases, its cosine decreases, so that greater repellency means a smaller $\cos A_e$; this, in turn, is caused by making f_2 relatively large and f_1 relatively small (except, as we shall see, as one increases, so does the other.) The factor f_2 is the area of air-water interface on the porous surface, (A_e will be greater than A whenever f_2 is positive—that is, porous surfaces are more water repellent than rough ones, apparently). The other factor, f_1, is the area of solid-liquid interface.

Equations are given for the f_1 and f_2, and it is at this critical juncture that the paper becomes confusing. In the equation for f_1 an "end parenthesis" has been omitted, and the setting of type leaves some residual doubt about the evaluation of the last expression in the equation. The equations are: $f_1 = [\pi r / (r + d)] (1 - A/180°)$ and $f_2 = 1 - r \sin A / (r + d)$. Here's the rub: "d" is never defined! In fact, as I read it, these equations are not really general, but, rather refer to a specific set of physical experiments (more on that below). The author points out that values of both f_1 and f_2 are really only dependent upon the ratio $r/(r + d)$, which he inverts, presumably so the ratio will always be at least 1 (if the mysterious d is not a negative number). At any rate, the author asserts that "when $(r + d) / r = 3$, a contact angle of 90° gives an effective contact angle" of 130° and if $A = 60°$, then $A_e = 115°$). I took the trouble of checking out these answers by substitution into the equation and I got 131° 50′ and 111° 10′, which I suppose are the correct answers that have been loosely "rounded off" in the paper.

Back to the meaning of d. Apparently, the equations for f_1 and f_2 refer to physical experiments in which parallel circular wires of radius r were strung "with their axes $2(r + d)$ apart." Thus d cannot refer to the distance between wires, so it presumably refers to the diameter (2r) of the wires; if so, why is the distance between wires not expressed as 6r? At any rate, if "$2(r + d)$" is the distance between wires, then the "$(r + d)$" of the equations is one-half the distance between wires.

If the "wires" become the barbs of a feather, then their size and their distance apart can be measured; Rijke made the measurements on a Mallard feather, finding the *diameter* to be 46 μm and the distance between barbs 270 μm (there being 1000 micrometers in a millimeter). Thus the radius is 23 μm and half the distance between the barbs is 135 μm, the ratio of the second to the first is 5.88, which checks well against Rijke's 5.9. Presumably, then, I have guessed the meaning of d correctly.

Rijke then notes that the barbules have a diameter of 8 μm and their axes are 38 μm apart, given a distance/diameter or half-distance/radius ratio of 4.7 (I get 4.75; check). Rijke then says, without a break, that for observed contact angles of 90° (advancing) and 60° (receding) on the Mallard rachis, the effective contact angles are 150° and 143°, respectively. But are these computed using the data from the barbules, or from the previously discussed barbs? I used both the values for barbs and barbules, and computed the receding contact angles for each: 146° 40′ (barbs) and 126° 20′ (barbules). Thus Rijke must have used the barbs. But why?

At any rate, this high effective contact angle causes water to pearl up constantly and roll off a duck's back. *Anhinga rufa,* on the other hand, has a distance/diameter ratio of 4.5 for the *barbs* (just slightly smaller than the ratio for the Mallard's barbules). Rikje notes that if the real contact angles are the same (and there is no evidence for this), then the receding contact angle for the Anhinga is 121° (I get 117° 10′), which he asserts is "certainly too small to effectuate (sic) indefinite pearling off the breast feathers" (yet this is about the same as the effective angle for the Mallard *barbules*). Hence, the Anhinga must periodically leave the water and dry its wings.

A table is given of the diameters of barbs and the interbarb distance plus the ratio of these two values for two ducks, three cormorants and the Anhinga. The duck ratios are 5.9 and 5.8, whereas the others fall between 4.3 and 4.8. The data, then, suggest a fundamental difference between the water repellency of waterfowl and cormorant feathers. This suggestion deserves a serious test in as many other species as possible.

This short paper is of great importance to ornithology. There is no excuse for the sloppy way in which it was written; both author and editors should hang their heads in shame.—Jack P. Hailman.

ZOOGEOGRAPHY

(See also 17, 47)

59. A report on the resident birds of the Territory of Christmas Island. G. F. van Tets and P. A. van Tets. 1967. *Emu,* 66 (4): 309-317.—The Austrialian Territory of Christmas Island lies in the Indian Ocean 220 miles south of Java Head. Its 55 square miles contain an airfield, one paved road and numerous phosphate mines on a plateau about 700 feet above sea. It happens also to be the only known nesting locality for several species and subspecies of birds. The authors visited the island for a week and a half in June 1965 and report that the status of breeding birds is not substantially different from that outlined by previous visitors as early as 1937. The authors hope that phosphate mining "will be slow enough to allow the jungle to regenerate over the old quarries before the virgin jungles become too small to provide adequate nesting and roosting space for the seabirds." So far, so good.—Jack P. Hailman.

60. The occurrence of Sabine's Gull *Xema sabini* off the Cape Peninsula. P. Zoutendk. 1968. *Ostrich,* 39 (1): 9-11.—Whereas this species was unrecorded in South African waters prior to 1957, flocks of up to 300 may now be seen within a mile of shore. Over a seven year period of sampling, peaks of occurrence centered in February, with extreme sightings being December and May. The mean culmen of five adults collected was 28.4 (shortest 26.0), which seems unusually long compared with a mean of 25.26 mm I measured for 25 adult specimens collected in the northern hemisphere (*Behav. Suppl.,* 15: 156, Appendix C, Table 1, 1967).—Jack P. Hailman.

61. The origins of European swallows "wintering" in South Africa. M. K. Rowan, 1968. *Ostrich,* 39 (2): 76-84.—Recoveries of 164 *Hirundo rustica,* of about 64,000 banded in South Africa, show that the birds come from all across the palaearctic range. Those wintering in the eastern part come more from Russia than elsewhere, and it is suspected that those wintering in the central and western parts come from Britain. Individuals move only within about 50 miles in their wintering range. "Two records of birds found breeding 34 days after ringing in South Africa, suggest that the northward journey may be completed at average rates of up to 200 miles per day."—Jack P. Hailman.

SYSTEMATICS

(See also 64, 66)

62. Australian pigeons: their affinities and status. D. Goodwin. 1967. *Emu,* 66 (4): 319-336.—This is another of Derek Goodwin's papers attempting to clarify the relationships among pigeons and doves of the world, partly based upon their behavior. Some of his conclusions are: "All of the fruit pigeons, except *Lopholaimus* are conspecific with or members of the same superspecies as extralimital forms." And: "The author is in favour of making *Histriophpaps* a synonym of *Phaps*, and *Geophaps* and *Lophophaps* synonyms of *Petrophassa.*" *Geopelia* and *Streptopelia* are thought to be convergent. Other relationships, not involving name changes, are discussed.—Jack P. Hailman.

63. Let's make bird names helpful. E. C. Fritz. 1968. *BioScience*, 18(6): 492-494.—The argument goes as follows: beginning birdwatchers might become confused by misleading common names, such as common egret (many egrets are common, depending upon where you are), hairy woodpecker (one cannot see anything hairy about the bird), and blue jay (several jays are blue). Let's then toss out the A. O. U. Checklist and begin anew. The birds mentioned above will become "dark-legged yellow-billed egret," "large white-backed woodpecker" and "black-necklaced blue jay", not to mention the "buff-chassied white-browed wren" (carolina) and the "gray-nostril-bridged shrike" (northern). Aside from the barbarousness of the proposed names, consider their length. Of the 66 suggested changes, 66 of the new names are longer. If ornithological journals should stop printing common names due to their length, a valuable means of communication between professional and amateur students of birds will be severed. Should the journals print the longer names, we'd all pay for the added cost. And the experienced eye shows that many of the proposed names are fully as ambiguous as the old ones. Let's leave bird names alone.—Jack P. Hailman.

EVOLUTION

(See also 4, 21, 25, 34)

64. The Population Structure of the Species. S. S. Schwartz. 1967. *Zool. Zhurn.*, 46: 1456-1469. (In Russian; English summary.)—The species population concept is defined as the smallest unit of the species which can function as an integrated ecological system capable of maintaining its independent existence for an indefinite period of time. Micropopulations are subunits incapable of long sustained independent existence; they function as a unified system for stabilization of its genetic fund and evolutionary progress as a whole. Groups of adjacent populations, maintained by ecological similarity and exchange of genetic information, comprise a geographic form. Temporary independent development of geographic forms, followed by subsequent reintegration of their genetic fund, promotes adaptation of the species as a whole to varied conditions in different parts of its range; this is regarded as a special mechanism of the microevolution process.—Leon Kelso.

65. Competition and character displacement in two sympatric pine-dwelling warblers (Dendroica, Paruliae). R. W. Ficken, M. S. Ficken and D. H. Morse. 1968. *Evolution*, 22(2): 307-314.—Yellow-throated and Pine Warblers (*D. dominica* and *pinus*) coexist and compete strongly in pine habitats on the large peninsula east of the Chesapeake Bay. In allopatric parts of the ranges of these species their bills are the same length, but on the DelMarVa peninsula *dominica* has a very long bill, apparently adapted to probing the cones of loblolly pines. *Pinus* is very aggressive toward *dominica.* The authors suggest that the aggression gives *pinus* enough of an advantage that it does not have to exhibit character displacement in bill length. This interpretation seems to take a narrow view of character displacement, which is usually taken to be the divergence of two species in sympatric areas. In this particular case, one species does all the morphological "diverging", but the end result is the same: the species differ in the area of overlap. The combination of behavioral, ecological and morphological data shown by this paper illustrates the value of such a joint approach in studying evolutionary relationships.—Jack P. Hailman.

66. Reproductive isolating mechanisms in the Blue-winged Warbler-Golden-winged Warbler complex. Millicent S. Ficken & Robert W. Ficken. 1968. *Evolution*, 22(1): 166-179.—This paper discusses and evaluates factors influencing gene flow among Blue-winged and Golden-winged Warblers and their hybrids. An extensive survey of the literature and field work by the authors forms the basis for this contribution. Each individual is identified according to its appearance in the field.

Currently the two species are meeting along an extensive line of sympatry, and here interbreeding is occurring with the production of fertile offspring and some sign of introgression. It is concluded that the integrity of the two species is nevertheless being maintained, and that their separate nomenclatural status should be retained. Several factors appear to prevent breakdown; these include species differences in the releasers involved in pair formation, different arrival times on the breeding grounds, and reduced mating success of hybrids. They are counteracted to some extent by the similarity of habitat requirements and courtship, unbalanced sex ratios, and fertility of hybrids. The extremely short period and relatively simple nature of courtship also probably contribute to the frequency of mixed pairings. It is suggested that most mixed pairings occur where one species is much rarer than the other.—Douglass H. Morse.

FOOD AND FEEDING

(See also 25, 30, 31, 32, 33, 35, 37, 38, 40, 41, 48, 54, 75)

67. Food Selection of the Long-eared Owl in Scania. (Hornugglans (*Asio otus*) näringsval på en skånsk slättlokal.) Rune Gerell. 1968. *Vår Fågelvärld,* 27: 193-195. (English summary.)—The study area was a spruce plantation surrounded by meadows. A pair of owls with five young provided the data mainly through collected pellets during one nesting and wintering season. Together *Microtus agrestis* and *Apodemus sylvaticus* made up 98.5 percent of the food items. With respect to the weight difference between these two species, *Microtus agrestis* emerged as the most important prey animal.—Louise de K. Lawrence.

68. Food Storage by the Nuthatch (Sitta europaea). P. A. Sviridenko. 1968. *Vestnik Zoologii,* 1968 (1): 89, 90.—There are many fragmentary notes in literature on food storage by this species, but a special study finds the habit more highly developed than anticipated. It engages in this activity at all seasons of the year, and at all hours of the waking day. In storing sunflower seeds they carried 2-4 seeds on each trip from the food plants, caching them in furrows of tree bark, in mosses clinging to trees, in forest floor litter, and in soft ground. In the latter, the density of seed sprouts resulting therefrom was as high as 50 per square meter. —Leon Kelso.

SONG

(See also 51, 72, 74, 77)

69. The Singing Assemblies of Little Hermits. D. W. Snow. 1968. *Living Bird,* 7: 47-56.—In four species of forest hummingbirds of the genus *Phaethornis* singing assemblies of males have been described. These appear to be *leks* to attract females. The Snows studied such *leks* of *P. longuemarius* during six seasons in the Northern Range of Trinidad.

This bird is extremely small, averaging just over three grams in weight; the sexes are similar in plumage and inconspicuous. The *leks* are traditional; the Snows studied the same bird (recognized by the spetrograms of his song) on the very same perch where they had studied him three years earlier. "The song is a brief, high-pitched, chittering phrase, usually lasting from 1 to 1.5 seconds." This bird, watched all of one day, sang for 400 of the 444 minutes he was on his perch, giving songs "at an average rate of one every two seconds, a total of about 12,000 songs in a day."

The *leks* are attended from December to July when the post-breeding molt occurs. "At one singing ground the distribution of the song-types persisted largely unchanged over a period of three years," indicating that males must learn their songs from their neighbors. Two plates of spectrograms are given and also a splendid color photograph of a Little Hermit feeding at a flower. A very interesting study.—Margaret M. Nice.

PHOTOGRAPHY

(See also 36, 73)

70. Birds sunbathing. C. W. Teager. 1967. *Brit. Birds*, 60 (9): 361-363 plus plates 42-47.—The best of a 17-year photographic study of sunbathing during July and August. Photos include *Turdus philomelos, T. merula, Erithacus rubecula, Prunella modularis, Sturnus vulgaris* and *Passer domesticus;* such pictures are extremely difficult to obtain. It is interesting that the species mentioned are mainly quite dark and that sunbathing occurs during midday during months when the sun is most directly over-head and the ambient temperature is highest. All these factors suggest that sunbathing is a response to excessive heat load in birds (see reviews 28 and 49).—Jack P. Hailman.

71. Photographing with radio-operated Camera. (Fotografering med radiostyrd kamera.) Jan Rietz. *Vår Fågelvärld*, 27: 244-248.—By using radio equipment 50 percent of the photographers' subjectivity disappears. It has a range of up to three kilometers. Hides become unnecessary and the undisturbed environment, especially near nests, is an additional advantage. Winter temperatures and varying light intensities are difficulties to be overcome.—Louise de K. Lawrence.

RECORDINGS

72. Common Bird Songs. D. J. Borror. 1967. Dover, N. Y. Long play 33-1/3 speed, 12 inch monaural record plus 27 page illustrated booklet. $2.50.—Donald Borror, whose superb record of warbler songs is widely known, now offers an annotated record of the vocalizations of 60 common bird species of eastern United States, recorded primarily in Maine and Ohio. The bands on the record are grouped by similarity in songs, and the booklet describes characteristics of the sounds of each species in the same order, with a tabular appendix giving the state and month of each recording and a second appendix showing a few selected sonograms of various species.

The species are well chosen, although the omission of the Starling seems curious. Many variants of a given species are exemplified, and this feature is the primary strength of the record. The recordings are of the excellent technical quality one has come to expect from Borror, although the calls of the Crow and Blue Jay that begin the record seem "flat". There is little background noise.

The accompanying booklet is weaker than the record. The calls (as opposed to songs) of the first few species are explained away by the assertion that calls and songs are difficult to distinguish. The text is sometimes less than helpful: "One learns to recognize species of birds by their songs not only on the basis of the particular song or song pattern they sing, but by the *kind* of song they sing, and by the general quality of the song" (emphasis author's). Statements like that do not help the beginner. The illustrations, which come from many previously published sources, are simply bad throughout. The best are from the familiar pen of Earl Poole and the worst should go unidentified. The two Indigo Buntings look like birds from different families, and the Chestnut-sided Warbler with the upturned bill is especially intriguing. The shapes of warblers are particular variable: from the very "necky" Blue-winged to the large, fat Yellow. The beginner requires another book for the pictures.

One test of such a record is whether all the species from it could be correctly identified in a given area. I have heard all but one or two of these 60 species sing in Maryland, and with one exception the record is more than adequate in representing the Maryland representatives. The typical song of the Maryland Parula Warbler, a distinct rising trill spilling over the top of the scale, might not be recognized from the record. The Parulas on the record are much more Cerulean-like. It turns out that all the Parula recordings were made in Maine, which is north of the cerulean warbler's range; this suggests to me that a character displacement in song may occur, the Parula singing a less-Cerulean-like song where the two species overlap.

There are now many such records for beginners—the Cornell Laboratory of Ornithology record and the recording keyed to the Peterson Field Guides, for example. Borror's new record is the best of the lot for beginners, because it does present the most common species, groups them by aural similarity rather than taxonomic relationships, and gives sufficient intraspecific variation for the listener to develop an auditory *Gestalt* of the species. The record is a fine companion to any good bird guide.—Jack P. Hailman.

BOOKS AND MONOGRAPHS

73. Waterfowl: Their Biology and Natural History. Paul A. Johnsgard. 1968. Univ. Nebraska Press, Lincoln. xviii + 138 pp. $8.95.—Paul Johnsgard is probably the world's expert on waterfowl behavior. Besides numerous papers, he has written a book on waterfowl display behavior, one on behavior in general, and, now, one on waterfowl in general. This is avowedly a nontechnical book, written for the layman. Johnsgard acknowledges the "risk of oversimplification" and asks knowledgeable readers to "be charitable."

However, it is not oversimplification that haunts the text of this book: it is occasional poor English and other straightforward faults. The book gets off on the wrong foot, so to speak, in the dedication! The three recipients are "an American, H. A. Hochbaum; and an Englishman, Peter Scott; and a German, Konrad Lorenz." Perhaps the grand old Austrian doesn't really care (after all, I don't know whether Johnsgard is an American or a Canadian, and I suppose it doesn't matter). Johnsgard appears to be a "liberal" with language. He obliterates the distinction between "that" and "which", and he uses "people" instead of "persons" as the plural of "person." Sometimes the English is just sloppy, as in "the Madagascan White-eye occurs on only a few lakes of that large island" What large island?—why, I suppose it is the island of "Madagascan" At one point, the text refers to "the unfeathered tarsus or lower leg." This seems to indicate that part of the tarsus is feathered and part is unfeathered, the latter being the "lower leg." (Presumably here "tarsus" refers to the tibotarsus, not the tarsometatarsus.) But later, reference is made to the "lower tarsus". Is this a whole new part of the anatomy, is it the same as "lower leg" (i.e., "tarsus"), or is it merely the lower part of the lower leg? If such cases are what Johnsgard meant by "oversimplification" then his professional readers may tend to be more "charitable" than his confused layman.

The text is at its worst in critical passages of explanation or definition, and here are some examples worthy of reflection. Of the Hawaiian Goose it is writ "Furthermore, mating occurs on land, and so the need for having water nearby to insure successful fertilization is absent." First, and most obviously, the fact that copulation occurs on land does not lead to the conclusion that "successful fertilization" takes place. Nor can one conclude that this proves "having water nearby" is unnecessary. Somehow, one supposes, some of the facts were slipped into the conclusion. Given this, one then wonders if having water nearby *is* necessary for successful fertilization in all other waterfowl. And if it is, in what way is it necessary? Alas, putting the sentence into context does not help. So one says to one's self, maybe I can find it elsewhere; but flipping to the index one fails to find "fertilization" listed and so gives up in frustration.

Or consider the assertion that "All species of waterfowl thus have feet that are at least partially webbed . . . downy-covered young . . . and have bills of various shapes and differential development of lamellae . . ." The sentence literally means that there is a great deal of *intra*specific variation in bill shape and lamellar differentiation. Surely, Johnsgard meant to indicate *inter*specific variation; but how is the layman to know this? Sometimes, the general statements are too general: "Variations in the general biology and behavior of waterfowl are primarily correlated with their evolutionary relationships within the family Anatidae." The text that follows shows that assessments of the relationships are based largely on such variations. Hence the reader readily draws the conclusion that the correlation exists merely as an inevitable outcome of the method of assessing relationships, and nowhere does the text point out that this conclusion is wrong. To cite another example, after showing that the northern hemisphere supports a larger variety of waterfowl, as well as the greatest number of species, the text asserts "it would appear that the waterfowl may have had their early origins in tropical or southern regions" (but are more successful in northern ones). The conclusion certainly does not follow from either the previous text nor from the facts presented. At this point both professional and layman will be confused.

Such faults are more than merely trivial; they cause repeated stumbling by the reader. However, the faults do not completely cripple the text, either; they just render it a bit lame. I think it needs to be said time and again that writing for the layman is a much more difficult job than is generally supposed. It is more difficult than writing for just one's colleagues, whose prejudices, questions and quandaries can be anticipated; the layman can go astray anywhere.

The text is a masterful gathering and sifting of the relevant facts about waterfowl biology. There are chapters on distribution and migration, ecology and general behavior, calls, social behavior, breeding biology, plumages and evolution, as well as two final chapters (almost appendices) on identification and a list of species.

The highlight of the book is certainly the plates. Johnsgard states in the introduction that "of the 142 living species of waterfowl, I have been able to observe 136 in life, either in captivity or in the wild. Photographs of essentially all these species are included here." Some of these photographs are magnificent! I particularly like the Mute Swan preening; the pair of Ross's geese, each bird standing on the leg closest to its mate, and each with its head turned away from the other; and the pair of Red-billed Whistling Ducks.

As with *National Geographic,* if you buy the work for the photographs alone you still have a bargain. However, even the text of *Waterfowl* has brilliant moments; after all, where else can one learn that the ruddy shelduck has been observed eating the remains of human bodies thrown into the Ganges?—Jack P. Hailman.

74. Animal Communication: Techniques of Study and Results of Research. T. A. Sebeok (editor) Indiana University Press, Bloomington, xviii + 686 pp., $20.—A large part of this huge volume deals with birds or with topics directly applicable to avian communication. The text is in five parts: an introduction by the editor; four chapters on "techniques"; four chapters on "mechanisms" of communication; nine chapters reviewing communication in selected animal groups, including a full chapter on birds; and six remaining chapters including a potpourri of subjects under the rubric of "implications and applications." The book reflects the mutual interests of ethology and communication analysis, and is, as one would expect, quite uneven in level, quality and presentation. No short critique can do justice to such a volume that is destined to become the major reference in its field for at least the next decade, but some of its highlights can be mentioned, in sequence.

PARTS I AND II.—Sebeok, who may be thought of as a linguistic anthropologist interested in animal behavior, begins the volume with an historical overview of the problem of communication among organisms, including man. J. P. Scott's chapter on "Observation" is full of such gems as "one of the best methods for general preliminary observation of animal behavior is to write a verbal description of the behavior as soon as possible after it is observed." By contrast, the next chapter by P. H. Klopfer and J. J. Hatch is full of ideas, if a bit disjunct. They reserve the term communication to situations entailing "the existence of a code shared between two or more individuals . . . . whose use is mutually beneficial . . .", thus placing aggregation of slime molds under a more general rubric of "interactions" (of which "communication" is a subset) and echolocation under "perception." I would rather that they would call their category "social communication" or "animal communication," since "communication theory" has come to mean the study of any process by which information is transmitted—but at least they have drawn attention to some important distinctions. One must wait three chapters (until this one) to discover the theme of the book, but then the theme is squarely pegged: "the ultimate criterion for . . . communication is . . . a resultant change . . . in the probability of subsequent behavior of the other communicant." The implications of this insightful definition are subtle. Note that *behavior* need not change after communication: in fact a change in behavior may become less likely—the point is that a reshuffling of priorities in the recipient's behavior occurs after receipt of a signal. The problems of "context" and "meaning" of a signal are then briefly tackled. Klopfer and Hatch then raise disturbing questions of how systems of communication arise during evolution, citing the problems of altruism, but not resolving the issues. Finally, they consider the problem of the ontogeny of communication. The rest of the book is narrow by comparison with this chapter, and most of the problems raised here are never squarely dealt with elsewhere.

W. J. Smith sets the scene with the next chapter on "message-meaning analysis" in which he faces up to the problems of defining terms and creating concepts that have truly wide applicability to signalling systems. Much of this discussion draws upon two classics of communication theory: Cherry's *On Human Communication* and Morris's *Signs, Language and Behavior*; mathematical information theory (a la Shannon and Wiener) is ignored. Smith follows Marler's earlier lead in trying to apply concepts of linguistic analysis to animal communication, and his viewpoint may be summarized as follows. At the "syntatic" (signal) level of analysis, the evolution of communicative behavior from intention movements, autonomic responses and comfort movements is mentioned, and communication is defined much as in the previous chapter. At the "semantic" (message) and "pragmatic" (meaning) levels three broad meanings of social signals are postulated: identification of the sender (species, sex, individual etc.), monitoring of the sender's behavior and his position in space, and prediction of the sender's subsequent behavior (some might restate the last as analysis of the sender's current motivational tendencies). Smith falls back upon a group-selection argument to explain the evolution of avian alarm calls and similar communication, also mentioning benefits to close relatives carrying his genes, but the argument seems strained. It is much easier to see that an alarm call benefits both the caller and his responders by creating a mass flight reaction so confusing that the potential predator nabs no one at all; this alternative explanation would put the evolution of communication back into the mainstream of thinking concerning direct natural selection. Smith then shows how his analysis of Kingbird vocalizations indicates that a given signal has different meanings in different contexts—a most important point. The "kittering" call (signal or syntactic) is always given by a bird "experiencing some internal conflict with a tendency to locomote (sic)," which is taken as the message (semantic) of the display; however, the meaning (pragmatic) of the signal to another bird varies with the context in which the call is given. This is a provocative chapter.

In the next chapter C. F. Hockett and S. A. Altmann combine forces to supercede their previous (and independent) views on the characteristics (design features) of a communication system by developing a series of "frameworks": (A) features relating to the communication channel; (B) features of the social setting; (C) features related to behavioral antecedents and consequences of communicative acts; (D) continuity and change in communication systems; (E) features of repertoire and of messages for a single system. There is not space here to evaluate these frameworks, except to say that they show a striking convergence with Smith's levels of analysis (previous chapter, above), suggesting that a universally accepted theory of social communication is drawing slightly closer. The concept of "metacommunication" (communication about communication, such as "you know what I mean") is one of the important notions that Hocket and Altmann try to apply to animal signalling. There are many such important ideas contained in this chapter.

PART III — Part III of the book contains chapters on chemical systems (E. O. Wilson), visual systems (P. Marler), acoustic communication (R. Busnel) and echolocation (D. R. Griffin). The first is a rehash of previously published, but exciting papers, and does not anywhere concern birds. The second is a reprint of a paper in *Science*, but is very much about birds, which are such visually-oriented animals. Marler used the term "true communication" for the phenomena recognized in previous chapters, and further stipulates that at least one participant tries to maximize information exchange, the other being at least neutral, but never trying to minimize communication (as in predator-prey relationships). Marler is the first author to consider signal-to-noise problems in signalling, goes on to consider signal-identification and finally consequences of reception (thus following the same framework as Smith). He then considers visual signals by functional categories: alarm, aggression, submission, and sex, repeating in the process the "classical" and doubtful explanation of the white posterior patches on furred and feathered creatures. If these white areas that become so conspicuous during fleeing are really to warn conspecific companions, why are they prevalent in basically non-social species such as cottontails and flickers? A unitary explanation seems most unlikely. Marler asserts that "the investigator's only clue that the signal has in fact been received will be a change in the behavior of the respondent" thus disagreeing with Klopfer and Hatch who offered a more subtle and sensitive criterion. Marler reiterates ethological discoveries that confusion is reduced by making aggressive and submissive displays as different and opposite as possible, a fact that Darwin discovered (principle of antithesis) but did not understand. This chapter will be of especial interest to ornithologists, as most of the examples are avian, but it tends to be a string of empiricisms rather than an attempt at a synthetic theory of visual communication.

Busnel's chapter on acoustic communication gives short shrift to birds and assumes a rather rigid view of the innate-learned dichotomy into which behavior patterns are sometimes crammed. Like Marler, he is quick to point out the problems of signal-and-noise in communication, and then reviews sound-producing mechanisms (virtually nothing is said about the fantastic apparatus of birds). The analysis of the information-carrying properties of acoustic signals is quite helpful; following is a discussion of message content with ample reference to birds. Thus the framework is similar to that of Smith and Marler. The curious "food-finding" call of gulls is cited without comment, so that now Smith, Marler and Busnel all realize the fears raised by Klopfer and Hatch in their discussion of altruism. Griffin's chapter on echolocation does not deal with birds.

PART V. — Chapter 15 by a graduate student named B. I. Hooker is the one on birds, others being devoted to arthropods, bees, other invertebrates, fishes, amphibians and reptiles, land mammals, marine mammals and primates. Hooker's chapter unfortunately is entirely about acoustic communication in birds, although Marler's chapter on vision (above) balances this somewhat. Hooker's chapter is primarily about the ontogenetic development of songs, reviewing the work of Thorpe, Marler and Konishi in particular, and thus is primarily a syntactic analysis.

PART VI. — The initial chapter in this section is an attempt to cast human communication into a more general framework, and J. Bastian's chapter that follows in entitled "Psychological Perspectives." Bastian asserts that psychologists turned to studying animals not out of an interest in them, but because, with regard to work on human beings, ". . . by the first few decades of this century large amounts of frustration had accumulated as the most prominent achievement of the efforts of psychologists . . .". In general, the chapter is an essay attempting to tie certain psychological studies to the analysis of animal communication. Lenneberg's following chapter is on psycholinguistics from an evolutionary viewpoint.

The last three chapters return to general considerations of animal communication. Bateson begins his chapter by giving an intuitive definition of the concept of "redundancy" as created by theoreticians of mathematical information, communication at the syntactic level. Bateson argues that redundancy exists in a message if the whole message can be reconstructed with an accuracy greater than chance when part of it is omitted. He believes that the message thus carries a recognizable meaning, although this usage of the term seems to differ from Smith's pragmatic "meaning" (above). When the communicator wishes to disguise the meaning of his signal, he reduces the signal-to-noise ratio, breaks up patterns of redundancy, and introduces noise that resembles the signal. These principles work amazingly well in human charlatanism and in concealing coloration of birds. This is a provocative chapter, brimming with ideas.

The penultimate chapter, by A. A. Moles, is entitled, "perspectives for communication theory" and contains bits of both cybernetics and history. First the author defines communication theory by saying it is not linguistics nor Shannon's formula for measuring information mathematically, but is a set of terms, a body of doctrines and an attitude of mind (are not all sciences?). Specifically, the terms are those from Cherry, Shannon and others: precisely defined notions of message, information, etc. The doctrines arise independently and suggest the existence of levels of complexity in communication and messages communicated. Two attitudes of mind are distinguished: the analytic approach of first breaking messages into components and then working toward a resynthesis of final meaning; and the past emphasis on statistical aspects of communication (Moles believes this to be changing).

Moles then, all too quickly, considers how communication theory is applied in practice. He briefly recounts the elements in a communication system, using an updated version of the familiar diagram in Shannon's *Mathematical Theory of Communication.* Moles then asks that we compare the complexity of signal possibilities with the complexity of situations to be signaled about—a most provocative idea. We need, he feels, a three-dimensional diagram to relate three important variables of communication by a given species: the complexity of its signals, the structural complexity of the animal, and the ratio of tolerable error rate in the signal to the redundancy in structure. These considerations as a whole could constitute a system of taxonomy of communication for zoologists.

During development of his taxonomy, Moles questions whether the degree of sociality of a species might not be a determining variable for the parameters of its communication system. Therefore, he next considers sociological meshes, and then the hierarchies of integration. But before signing off, Moles manages to show us Athanasius Kircher's 17th century figures concerning the calls of birds and other subjects in animal communication. Of all the chapters in the book, Moles's was the newest and most original to this reviewer; perhaps those who read the French literature more avidly will find it all "old hat."

The last chapter by Hubert and Mable Fringes is on practical uses of our knowledge about animal communication, 19 pages out of nearly 700. The first sentence is a summary: "Except for control of bird depredations, practical uses of recorded communication signals are potentialities, not actualities." But even the few actualities seem to give more problems than answers, since the attempts to frighten birds from airplane runways has been, in the main, a tale of frustration.

Risking gross understatement, I assert that this book will be the most important statement of its subject for many years to come. No serious, balanced contribution to avian communication seems possible by someone who is not familiar with the substance of this book—if for no other reason than to tell the world why it is wrong.—Jack P. Hailman.

75. Comparative Feeding Ecology of Sea Birds of a Tropical Oceanic Island. N. P. & M. J. Ashmole. 1967. *Occasional Papers of the Peabody Museum at Yale University,* No. 24. 131 pp.

Anyone bold or reckless enough to attempt systematic studies of the food habits of sea-birds will recognize this as an important and impressive document. Having read this bulletin several times, I am impressed at its approach, careful consideration of the many problems involved, and the fortitude that such a study must have taken.

This bulletin discusses and compares the food habits of birds nesting on Christmas Island in the Central Pacific Ocean. It is divided into nine parts—Introduction, Techniques, Species Accounts (Food samples from eight species in three orders are examined), Comparison and Summary of the Diets of the Birds, Food of Surface—Caught Yellowfin Tuna, The Birds in their Marine Environment, Seasonal Considerations, Discussion and Summary. I found this organization somewhat peculiar for two reasons. First, the reader is given no indication that food habits of the Yellowfin Tuna (*Neothunnus macropterus*) are a part of this study from the paper's title. Secondly, it seems more appropriate to place background information on the marine environment and seasonality in the introduction or discussion. Actually, section 6, "The Birds in their Marine Environment" is simply mis-titled. This section deals as much with oceanographic features which concentrate food near Christmas Island making this location attractive to birds as with the birds themselves. However, these are minor matters that do not detract from the text and comparisons as others do.

The central difficulty preventing meaningful judgment of the data presented in this study is simply that standard sampling methods were not used in collection of the food samples. (My own work with sea-birds can be similarly criticized: Ludwig, *Proc. Great Lakes Res. Div. Univ. Mich,* 15: 80-89, 1966) Apparently, most samples used in this study were regurgitations of adults or chicks, taken at any hour of the day, in a more or less random fashion, except when the authors made "special efforts to catch individuals of certain species at times when they were likely to provide samples" (p. 11). This bias is clearly unjudgable. There is no way of knowing whether these samples represent an accurate estimate of a random catch of 24 hours by the species studied, or whether these samples were hopelessly biased in an unknown fashion by the manner in which they were collected.

Simply said, there are no time-dependent systematically-taken samples analyzed in this paper. When the well-known migrations of oceanic food species are considered, this oversight in the first step of the study limits the utility of the data considerably. It would have been preferable had the authors sampled a set number of individuals at regular intervals, controlling the time, place, and method of sampling rigorously. We could then make accurate judgments on the comparisons made in the discussion and elsewhere in this paper. Sample size also varies greatly from the maximum of 243 from Sooty Terns (*Sterna fuscata*) to the Blue-grey Noddy (*Procelsterna cerulea*) represented by 34. Can these be compared? It is doubtful if the comparisons mean a great deal quantitatively, without rigorous statistical testing to bolster the conclusions. Statistical tests are conspicuous by their absence.

The Ashmoles are to be congratulated on their cogent discussion of methods of analysis. They show correctly that the results of the analyses depend upon the method chosen (i.e., abundance, volume, and frequency of appearance of a food item). In most of their paper they avoid depending on any one method exclusively, which is both safe and wise. However, they skirt the problem of actual caloric value of the foods completely. The real crux of food studies (for ecologists) is to determine accurately how much biomass (calories) of a food item is converted into biomass (calories) of the consumer. This method, usually involving some sort of bomb calorimetry, was not used in this study, and probably could not have been adapted to their study in any case. Lacking a better method, this reviewer would accept analyses that depend on volume as the nearest approximation to a calorimetry study. These data are presented in this paper.

I found some of the graphical representations difficult to interpret, owing to too much information in one place (Figure 3 and particularly Figure 5). The presentation of the data in the species accounts is a strong point in the organization of this paper. The status of each bird species is presented, followed by a *description* and *condition* of foods in the samples, quantification of samples, size of items, and identification of items. Because these constraints would influence the analyses (e.g., it was far easier to quantify estimates of fish from terns who carry their foods back in their bills, than from the shearwaters who usually arrived at the island with stomachs full of a half-digested mess), this situation ought to be presented to the reader. Unfortunately, this implies that ornithologists may never be able to analyze food samples entirely from all sea-bird species. Part of this problem was overcome in this study by grading the condition of the items in each sample. However, another sampling problem then arose where some species retain certain hard items such as squid beaks in their stomachs for apparently a very long time (e.g., 1 Christmas Island Shearwater (*Puffinus nativitatius*) with 230 beaks!) Although the Ashmoles recognize the problem, I do not find where they have successfully dealt with it. Do these beaks represent last week's, month's, or year's feedings?

However, for all of these problems, this study remains an important one for many reasons. Wide differences in food habits are noted, discussed, and compared. And, the data are simply fascinating. Blue-grey Noddy Terns apparently subsist largely on tiny animals gleaned only from the surface, while the Fairy Tern (*Gygis alba*), a bird of very nearly the same size, fed largely on fish (of 22 different families), some squid, and showed virtually no overlap in food habits with the Noddy. Mostly, I found the comparisons to be fascinating, but within the context of doubts concerning sampling methods, I am not able to judge the accuracy and utility of many correlations and conclusions presented here.

I am impressed, curious, and a little disappointed to find the Ashmoles doggedly riding the horse of David Lack's belief (or dogma) that "It is highly probable that the populations of the various species are ultimately limited by the availability of food (Ashmole, 1963a), although certain species may have recently been adversely affected by man's activities." (p. 8). The data presented here suggest that the situation is far more complicated than simply food. What of the Fairy Tern that needs trees to nest in, or the Blue-grey Noddy which may have an unlimited food supply to judge from the data the Ashmoles have presented? Must all sea-bird species be regulated by the same mechanism? What about availability of land? I have serious doubts. I find the presentation of this dogma on page 8 of this publication disturbing as it comes before any data are presented, analyzed, or methods mentioned. Can this indicate a bias of significance to the entire study? One can certainly find cause to wonder.

However, for all of these problems, and potential hidden biases, this is a most valuable and complete document. Out of a rather small number of food samples (801 for birds, 191 for the Yellowfin Tuna) there is generated an excellent basis of comparison for other studies that are in progress, such as the Pacific Project. (One can hope that this will stimulate the project to complete the analysis of their far larger number of samples.) Many, many fascinating lines of research are suggested for the future, and any student of sea-bird ecology who does not obtain this volume, analyze it for himself, and pursue controlled sampling in his own area of interest is not careful or wise. We should welcome this addition to our literature, and recognize the exceptional effort which produced it.—James Pinson Ludwig.

76. A Sand Country Almanac. A. Leopold. 1968. Oxford Univ. Press, N. Y. 226 pp. $1.75 paperback.—I cherish my original hardback copy of this volume like no other book in my library. With emotion but not sentimentality, Aldo Leopold's twenty-year old nature classic is now reproduced in paperback to influence another generation. "There are some who can live without wild things and some who cannot," the book begins. Leopold, who died fighting a grass fire on a neighbor's farm in 1948 before the first publication of his almanac (the following year), was one who could *not* live without wild things. My words are inadequate: join Leopold yourself at his weekend place in Wisconsin and you will enrich your view of life. It is just possible that history will judge Aldo Leopold as standing higher and stronger than Henry David Thoreau, John Muir or any other American philosopher of nature.—Jack P. Hailman.

77. Field Book of Wild Birds and Their Music. F. S. Mathews. 1967. Dover, N. Y. xlix 325 pp. With a new introduction by D. J. Borror. Paperback reprint. $2.75.—Billed by the publisher as a "companion volume to *Common Bird Songs*" (see review no. 72), it is nothing of the sort. It is a reprint of the 1927 enlarged and revised edition of F. Schuyler Mathews's 1904 classic book on representing bird songs by musical notation—a sensitive, wordy labor of love by a man who knew both music and birds very well.

First, let us put on record its delightful faults so we may forget them. The plates, mostly color in the original, are reproduced only moderately well in black and white. But even the originals have faults: the female Scarlet Tanager scowls at you menacingly, no Blue Jay had a shape like this one, the crow looks like a dead specimen tossed into the air, and the length of the Downy Woodpecker's beak makes him the smallest Hairy Woodpecker around. Still, there is a certain charm to the author's paintings. Along with each species' account is its length: Mathew's musical ability outstripped his mathematical common sense, since the Yellow-billed Cuckoo is given as 12.10 inches long, whereas the Black-billed is only 11.75 inches. Sometimes the second decimal place is dropped, but the 56.0 inch Canada Warbler is surely a record. And what book written at the turn of the century is not wordy?

The book's assets are many. For those of us who read sonograms more easily than musical notation, Mathews anticipated our quandary and provided a chapter entitled "A musical key: extremely important to those who do not read music." One who does read music, however, will receive greater satisfaction from the Song Sparrow that sings "La Donna e mobile" from Verdi's *Rigoletto*. And where else can one learn that a song of the Vesper Sparrow is in reality the nursery melody of Lord Bateman?

Mathews meant for us to identify bird songs with his book, but the book was written when music in the home was the familiar family pastime. Today a combination of high quality recordings, sonogram representations and mnemonic devices provide an easier path. Yet bird song remains the primary source of natural music, so that this book remains timeless.

Or does it? Borror points out in the new introduction that White-throated Sparrows and Yellowthroats in New England sing differently today than in Mathews's day: the common songs of his day are rarer variants now, and vice versa. And thus this delightful book provides us with the historical dimension in avian vocalizations; it is, in fact, a valuable scientific document.

The book ends with the death of a wood warbler: "At twilight I found him hanging head down from a spruce root, his feet clinched in a hold that would never loosen, his bill just touching the life-giving water . . . he had fallen asleep there, in peace." But warbler music, and the music of Mathews' words, live on for a new generation.—Jack P. Hailman

78. I Live with Birds. H. Roy Ivor. 1968. Ryerson Press, Toronto, Can. 172 pp. $5.95 at Follet Pub. Co., Chicago, Ill. 60606.—For 40 years Mr. Ivor has been studying a great array of birds ranging from Indigo Buntings to Blue Jays. In Windinglane Bird Sanctuary near Erindale, Ontario, he lives surrounded by his beloved birds, most of them hand-raised and most of them exceedingly tame. In the introduction to his fascinating book, he briefly describes the winter and summer aviaries where some hundred birds pass their lives. Nesting pairs are allowed liberty after the young hatch, so as to be able to gather natural food; at evening Mr. Ivor calls each by its particular name to come in to safety for the night.

The book tells of the marked differences in character and behavior of birds of different species, and of the same species, even of brothers of the same nesting. We read with delight of nesting Rose-breasted Grosbeaks, Evening Grosbeaks, Wood Thrushes; of aggressive Robins, faithful pairs of Blue Jays, and—most charming of all—Bluebirds that were utterly devoted to the author. In passing, he mentions his pioneer and extended studies of "anting," (published in the *Auk* in 1941 and 1943, and the *National Geographic* in 1956), but nowhere do we learn of his important, detailed study of Rose-breasted Grosbeaks nesting in his aviary (*Wilson Bull.* 1944).

Mr. Ivor with infinite patience and his deep sympathy with his charges, has ammassed a wealth of knowledge on bird behavior and one wishes he had told more of his experiences. *I Live with Birds* is lavishly illustrated with splendid photographs of the birds and the author, mostly taken by Hugh Halliday and Bernard Corby.—Margaret M. Nice.