its weight was very low for a bird that should have been about to resume migration. Only two others of this species banded between August 30 and September 22 weighed less; the average of 21 immatures was 32.2 grams and of 31 adults, 33.5 grams and of two unaged birds, 35.5 grams.

Instead of continuing migration with other members of its kind, 104-177591 repeated in the mist net on the morning of October 1. Observing the mistnetting were J. M. Potter, neurosurgeon from Oxford, England and J. W. Gerrard, Professor of Pediatrics at the University of Saskatchewan. A large multiloculated yellowish swelling in the left neck below the mandible aroused our medical interest. It had somewhat the appearance of a multiheaded carbuncle but felt "meaty." We could express no pus, but learned only later that birds do not form pus. The thrush was now very thin and we speculated as to whether it had a granuloma or a rapidly growing malignancy. The bird was submitted alive next morning to the junior author for examination.

After sacrifice, autopsy disclosed multiple small peritoneal nodules. A smear from the submandibular lesion disclosed the presence of acid-fast organisms but no parasites. On histological examination, there were numerous foci of a granulomatous nature with numerous giant cells; their centers had undergone caseous necrosis. The diagnosis was: Avian Tuberculosis.

Avian tuberculosis is rarely reported from wild birds, perhaps because they succumb to their disease and because few are examined by a Veterinary Pathologist. The definitive text on the subject (Feldman 1938) cites the occurrence of avian tuberculosis in a great variety of captive wild birds but in free-living wild birds of only the following North American species: Common Crow, *Corvus brachyrhynchos*; Common Raven, *Corvus corax*; Barn Owl, *Strix pratincola*; Cowbird, *Molothrus ater*, and Sparrow Hawk, *Falco sparverius*. There are more recent reports of the disease in a Ruffed Grouse, *Bonasa umbellus* (Snoeyenbos 1966) and in a Starling, *Sturnus vulgaris* (Yates and Miller 1966).

Bird banders may make a contribution to our knowledge of avian disease by submitting diseased birds or fresh specimen to a Veterinary Pathologist.

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C. Stuart Houston, M.D., 863 University Drive, Saskatoon, Sask., Canada, and Leander Tryphonas, D.V.M., Ph.D., Engeriedweg 2A, Bern, Switzerland (on sabbatical leave from University of Saskatchewan College of Veterinary Medicine).

RECENT LITERATURE

BANDING AND LONGEVITY

(See also 16, 68)

1. An interpretation of the age structure and breeding status of an Adelie Penguin population. Brian Reid. 1968. *Notornis,* **15**(3): 193-197.—This should frighten even the hardest of hearts: "Banding and close observation during seven summers caused the breeding population in six colonies at Cape Hallett to decrease by more than 90%." The effect seems to have been brought about by at least four factors: (1) high chick mortality due to checking nests; (2) scaring off of birds returning to breed for the first time; (3) abandoning of good nest sites due to disturbance in favor of poorer ones with less disturbance; and (4) low breeding rates in birds that did return to the colony. The species holds its own when undisturbed, and may even be increasing slightly.—Jack P. Hailman.

2. On the use of salt licks for trapping birds. E. I. Gavrilov. 1968. *Ornitologiya,* **9:** 343, 344. (In Russian.)—To trap Scarlet Grosbeaks (*Carpodacus erythrinus*) at Lake Marka-Kul in western Kazakhstan for banding it was found most efficient to make use of their appetite for salt. An artificial salt-lick was made by working "several" kilograms of table salt into a patch of mud. A mist net set at this patch (dimensions of net and salt-lick not stated) caught as many as 254 of these finches in a day. The abandonment and persistence with which they sought the salted soil was amazing. Individuals merely knocked to the ground by the net would walk under it and partake of the salt. Of 863 trapped 27 May to 25 July, 1966, 45% were adult males in nuptial plumage; 30% females with incubation patches; and 25% were immature birds of the year. They arrived at the net from dawn to darkness without interruption, more numerously in the early morning hours.—Leon Kelso.

3. The ABC of crow catching. Ian Rowley. 1968. *Australian Bird Bander,* **6**(3): 47-55.—A basic crow trap consists of a netting box with a top opening through which the birds enter and a door on one side through which the operator gains access. Rowley describes and illustrates different designs of crow traps that have been used in Australia. The suggested dimensions are predicated on cost, portability, strength, resources available, likelihood of interference from large domestic stock, and intervals between visits by the trap operator. Rowley treats the operation of crow traps in reference to baits used, sites, decoys, water supply, perches, and shelter. The author defines Hood's escape-proof trap as a successful crow-catching device. This trap is a basic cube model with an entrance compartment centrally placed on the roof. A crow enters the compartment to take the bait, and his weight is sufficient to lower the balanced compartment and him into the trap proper. However, crows often foil this trap by turning around and jumping out of the compartment as soon as it starts to descend, thereby rendering this model unreliable.

Rowley advises that gloves are necessary while handling crows during banding. Crows can break the skin with their beaks. As they are vectors of disease, it is advisable to use thin, leather gloves while handling crows.

Finally, the author describes banding of nestling crows. This approach should be carefully monitored before it is practiced extensively in Australia. Common crows (*Corvus brachyrhynchos*) often peck banded nestlings to death before dropping them out of the nest.—Dwight R. Chamberlain.

4. The sparrow that lived for 19 years. Mary B. Huxford. 1968. *Audubon Bull.* (Illinois), No. **148:** 28-30.—A White-throated Sparrow (*Zonotrichia albicollis*) was banded by Miss Grace Stewart of Wilmette, Ill., on May 4, 1948 when apparently nearly a year old. This bird was reported to the Fish and Wildlife Service from Pennsville, New Jersey, in February 1966, as "found one terrible snowy day lying on top of the snow"; it was barely alive and died in half an hour. A most remarkable instance of longevity in a small passerine in the wild.—Margaret M. Nice.

5. Bird banding in Ontario: an analysis of five years' records, 1960-64. D. H. Baldwin. 1968. *Ontario Bird Banding,* **4**(3): 89-132.—The entire September issue is devoted to this report, which includes: introductory material, an analysis of permits issued, birds banded by various kinds of banders, a geographic analysis of banding by major species-groups, a bibliography of articles published concerning banding in Ontario, maps of game and non-game bird banding sites in Ontario, a section on the Ontario Bird Banding Association (including bird observatories and banding stations), a discussion of the values of various data (repeats, weights, measures, etc.), and an appendix of birds banded and recovered, by individual species. Some of the conclusions of the report are: permits issued to gamebird-banders increased 25%, whereas those to nongame bird-banders decreased slightly; "amongst the non-game banders there was a substantial increase in the number of individuals co-operating in joint research projects of both an amateur and professional nature"; non-game banders work increasingly on a specific research project because the Canadian Wildlife Service now insists on a project outline before issuing a permit; and game birds have a far higher recovery rate than non-game birds. As an example of the last point, the appendix shows that of 562 Canada Geese banded, 157 were recovered (27.9%); of 7543 Mallards, 1178 (15.6%) were recovered; whereas, of 1270 Sharp-shinned Hawks, only 24 (1.9%) were recovered; and out of 23,748 Common Terns, only 231 (1.0%) were recovered. Among non-game passerines the recovery rate is even lower by another order of magnitude: 8 recoveries from 10,981 White-throated Sparrows (less than 0.1%); 4 recoveries from 6362 Slate-colored Juncos (0.1%); and 5 recoveries from 6215 Myrtle Warblers (less than 0.1%). Even the much-banded Evening Grosbeak yielded only 3.6% (which is good for a passerine, but discouraging for anyone hoping to discover something about migration and longevity). The highest recovery rate from a passerine banded in any numbers was 35 recoveries from 615 Cardinals (5.7%). The warblers constitute a particular frustration, since 2456 Magnolias and 2160 Blackpolls have yet to yield a recovery, and no warbler species breaks the "one percent barrier." All in all this is a useful report, with something to interest nearly anyone who bands birds.—Jack P. Hailman.

6. **Report on bird-ringing for 1967.** Robert Spencer. 1968. *Brit. Birds*, **61**(11): 477-523.—This is another fine annual summary of bird ringing in Great Britain. The total number of birds ringed in 1967 was the highest ever attained—574,329; the total recovered 12,408. As to the longest time lapse since ringing, among non-passerines they were 18 years for Widgeon, 17 for Black-headed Gull, 15 for Oystercatcher, and 14 for Pink-footed Goose. Among passerines we find 15 years for Rook, 11 for Jay, 10 for Starling and House Sparrow, and 9 for Blue Tit and Chaffinch.

"It is an impressive testimony to the fundamental resilience of birds that by 1967 the ringing totals for many of the species worst hit by the icy winter of 1963—some of them additionally weakened by toxic chemicals—were already back to or even well above the 1962 levels." (It is evident that Great Britain is not so madly addicted to the use of pesticides as is North America.) "Generally speaking, the ringing figures for ducks, birds of prey and waders . . . were up, as were those for finches and sparrows." An impressive report.—Margaret M. Nice.

MIGRATION, ORIENTATION AND HOMING

(See also 69, 82, 83, 85)

7. **Species-specific patterns of migratory restlessness in European warblers and their possible significance for the ending of migration in the winter quarters.** (Artspezifische Muster der Zugunruhe bei Laubsängern und ihre möglichr Bedeutung fur die Beendigung des Zuges im Winterquartier.) Eberhard Gwinner. 1968. *Z. Tierpsychol.*, **25**(7): 843-853. (Summary in English.) —The Willow Warbler (*Phylloscopus trochilus*) and Chiffchaff (*P. collybita*) are similar in size and appearance, and both nest throughout the northern palaearctic, yet the former winters in southern Africa, the latter in southern Europe and northern Africa. The Willow Warbler spends three to four months on its fall migration, the Chiffchaff a month.

For the experiments 21 Willow Warblers and 14 Chiffchaffs were taken from their nests in southern Germany and raised by hand. When grown, each was kept in a separate cage that registered their movements. All subjects developed migratory restlessness, the Willow Warblers on the average date of 1 August, the Chiffchaffs 23 September, corresponding to their conspecifics in the wild. Interestingly enough, seven Willow Warblers flown to the Congo continued their migratory activity regardless of having arrived so early on their wintering grounds (p. 546). Charts and tables show that "The Willow Warblers stayed longer in migratory condition and altogether developed more restlessness than the Chiffchaff." An illuminating and convincing paper.—Margaret M. Nice.

8. **The moult migration.** Finn Salomonsen. 1968. *Wildfowl*, **19**: 5-24.—Waterfowl, auks, loons, rails and some other birds shed the wing and tail feathers simultaneously, and thus must seek safe places to molt. Salomonsen reviews the highly developed "molt migrations" of ducks, geese and swans. This is a massive, unpublicized and sometimes complex phenomenon which here receives a thorough, careful review. The occurrence of molt migration in different age and sex groups

differs among the tribes of waterfowl, and thus provides a useful additional taxonomic character. Perhaps this review article will spark further studies of this little-known phenomenon.—Jack P. Hailman.

9. Waterfowl migration corridors east of the Rocky Mountains in the United States. Frank C. Bellrose. 1968. *Illinois Nat. Hist. Survey, Biol. Notes,* **61**: 24 pp.—This is a survey on the grand scale of the routes of migration and areas of concentration of ducks and geese throughout the United States east of the Rockies. Information from band recoveries, visual and radar observation and winter censuses were combined to plot not only the routes of migration of groups of species, but their relative numerical importance. The maps were originally prepared to indicate regions of hazard to aircraft in the so-called "Mississippi Flyway", and Bellrose warns that the material is less sound for the Atlantic and Central "flyways". Nevertheless it is surprising and regrettable that the Greater Snow Goose and Whistling Swan are not even mentioned in the paper, because the swan has already caused one fatal air crash, and the (Lesser) Snow Goose another. Eiders and other marine ducks are also omitted.

Bellrose introduces a most important new distinction between what he calls "flight corridors" and "routes". He believes "a route represents a path only a mile or two wide which waterfowl follow consistently from year to year. Each corridor, on the other hand, consists of a web of routes, some of which may cross or crisscross within a single flight corridor. The corridors do not have sharp boundaries; rather there may be gradual changes from the center of a flight corridor to its margins in the numbers of waterfowl using it". He discusses the wide scatter of band recoveries, across the boundaries of corridors and frequently of flyways, but believes that the birds involved "have indeed migrated along well travelled routes for the species. It seems apparent that the transfer of individuals from one flight route to another within a flyway or to routes in other flyways occurs because they are carried along by larger assemblages of migrating waterfowl". He could have added that some waterfowl appear to form pairs in winter quarters and then migrate along their mates' routes.

Bellrose's interpretation is valuable because it reconciles the lore of waterfowl enthusiasts (both hunters and scientists) that waterfowl follow narrow traditional routes, with the broader front movements of radar echoes and the still wider scatter of bands. As he restrainedly points out, it will permit management of waterfowl populations in the future on a more refined and biological basis than the present flyway system. It is still more important for the prediction of aircraft strikes (and the siting of new airports). The limitation of the paper is that no evidence is given for routes "only a mile or two wide". Detailed evidence would have been impossible and inappropriate in this concise survey, but it is to be hoped that it can be provided (at least for one species or one area) in a technical paper, to convince critical readers—both ornithologists and traffic planners.—I. C. T. Nisbet.

10. Migration of game birds in the northern Semipalatinsk Region S. G. Panchenko. 1968. *Trudy, Zool. Inst. Akad, Nauk Kazakh. SSR.,* **29**: 212-215.—From observations made in 1956-1963 the times of earliest and latest occurrence, and the peaks of flight for spring and fall migrations of 16 waterfowl and 10 shorebird species are given.—Leon Kelso.

11. Does the Greater Shearwater reach the southwest Pacific? John Jenkins. 1968. *Notornis,* **15** (3): 214-215.—The author thinks so. *Puffinus gravis* is supposed to be an Atlantic bird, but four sight records between Fiji and the North Island of New Zealand, plus a sight record between North and South Islands, suggest otherwise.—Jack P. Hailman.

12. Anatid migration along the Ob River. A. D. Dubovik. 1967. *Problemy ekologii,* **1**: 197-203. (In Russian, with English summary.)—In observations during 1964, the spring flight of the Bean Goose occurred 28 April-4 May, five days before ice breakup. The peak of the river-ducks' flight was 5 May, consisting of: pintail, 60%; Wigeon, 20%; teals, 15%; Shoveller, 5%. The peak of the diving-ducks' flight was in late May. In 163 hours of observation, during the period 26 Apr.-18 May, 11,000 were seen. The fall flight occurred 20 Sept.-15, Oct. with 7600 birds, including all species seen. Only Pintail and Wigeon were in same numbers in both spring and fall. Two routes were followed: along the Ob channel, and the meridional or straight north (the latter by populations nesting farthest north). [Translated and adapted from the review by A. Romashov, in Russian, *Referativnyi Zhurnal*, birds' section, **1968**(9): 50, in absence of original.]—Leon Kelso.

13. Flights of Pallas's Sandgrouse (Syrrhaptes paradoxus) to the Far East. L. V. Kuleshova, et al. 1968. *Ornitologiya*, **9**: 354, 355. (In Russian.)—Previous flights of the species to Primor were recorded in 1907, 1913, 1922-1923, 1933-1934 (*Birds of the Soviet Union*, **5**, 1951) in late fall or winter. In early 1966, flocks of 6 - 200 or more were observed at seven widely separate localities in Primor, chiefly in March and April, most of them coming from the south and departing northward. The few individuals collected were moderately to very fat. An explanation offered is that the Mongolian steppes in early March suffered a heavy snowfall, which, following a slight thaw, was frozen solidly enough to cut off the food supply, thus prompting the sandgrouse flight eastward.—Leon Kelso.

14. Homing Pigeon races at Moscow. V. F. Larionov and A. R. Sakayan. 1968. *Ornitologiya*, **9**: 384, 385. (In Russian).—In the 1966 competitions points of release included Belgorod, 580 km south, and Kiev, 800 km southwest of Moscow. Pigeons homing from Belgorod had to cross a zone of marked magnetic anomaly, but apparently they were not delayed or disoriented thereby, a fact regarded as discrediting the "magnetic hypothesis".—Leon Kelso.

POPULATION DYNAMICS

(See also 1, 5, 40, 71, 84)

15. Population density as a factor in population dynamics. V. N. Burov. 1968. *Zool. Zhurn.*, **47**(10): 1445-1461. (In Russian. English summary.)—There are limits of optimal population density for each species, deviations from which negatively affect the population growth rate. Examples of density influence on fertility, viability of offspring, morphology, behavior, and population structure are reviewed. Elimination mechanisms are discussed, as is the stress role in interactions. Population density is a constantly effective ecological factor, exerting both direct influence on numbers, and indirect influence on the physiological state of individuals.—Leon Kelso.

16. Pairing and breeding of Mute Swans. C. D. T. Minton. 1968. *Wildfowl*, **19**: 41-60.—The fact that most persons consider Mute Swans to be a domestic species not worthy of study did not deter the author. The report has immensely valuable data on swan populations, age, structure, breeding success, and so on. What caught my eye was the dispelling of the myth that these birds mate for life. Divorce rates are low (less than 5% per annum for breeding pairs and less than 10% for nonbreeding pairs), but widowed swans take on new mates rather than wither away in mourning. "During the seven years of the study, 22 birds, 14 males and 8 females have been known to have had at least three different mates. Three birds have even had four different mates."—Jack P. Hailman.

17. Experiments on population control by territorial behaviour in Red Grouse. Adam Watson and David Jenkins. 1968. *J. Anim. Ecol.*, **37** (3): 595-614.—Experiments on factors important in regulating territoriality were performed upon male Red Grouse in Scotland. Groups of various numbers of birds were shot off at different seasons, and recolonization of the areas studied. In late summer and early fall replacement of removed birds is rapid, while later in the fall, winter, or spring, it may be very slow and even incomplete. Females accompany the males and if the latter are removed, they usually associate with new ones. However, if no new males appear the females will not continue to live in their original area and often will pair up with a neighboring cock. Territories are maintained by males over the winter and normally only part of the males are able to secure one, with a large percentage of nonterritorial birds being young ones. Mortality is low among territorial individuals, but very high in nonterritorial ones during the winter.

By mid-autumn, nonterritorial individuals were showing a markedly reduced tendency to become territorial when the opportunity presented itself. While populations were being shot off, remaining individuals would temporarily enlarge their territories, but their size decreased during repopulation to about the original area. This information suggests that nonterritorial individuals are biologically capable of maintaining territories and that the number and size of territories is a function of other birds' presence. In late summer if adult males were removed, young would soon show territorial behavior, even though this did not appear until later in the presence of adult males, suggesting that the presence of adults temporarily inhibited their young.

Since different territories were rather constant in their size, some undisclosed feature of the habitat is probably responsible for its regulation. Only territory holders bred in the spring, and thus territoriality acts to regulate the size of the breeding stock.—Douglass H. Morse.

NIDIFICATION AND REPRODUCTION

(See also 16, 27, 36, 66, 71, 82)

19. On the biology of the Lapidary Rosefinch (Pyrrhospiza punicea Hodgs.). E. I. Gavrilov and A. F. Kovshar. 1968. *Trudy Inst. Zoologii, Akad. Nauk Kazakh SSR,* **29:** 41-49.—The described details of the nest, eggs and adults (collected) of this comparatively large stout finch species—taken in rock declivities of high alpine Zailiisk Alatau, Kazakhstan (nest of rootlets; eggs whitish)—render doubtful the identity of the purported nest and eggs of this species (of twigs, in shrubbery; eggs bright blue and smaller) described by Stuart Baker (*The Nidification of Birds of the Indian Empire,* 3). The male fed the female from grassy slopes far below the nest site, carrying the food in the crop, the species not having sublingual pouches as in *Leucosticte* and *Rhodopechys*.—Leon Kelso.

20. Avian reproduction in mountains and on plains. R. L. Beme. 1968. *Ornitologiya,* **9:** 27-48. (In Russian).—In a study of about 100 species at numerous localities throughout Russia it is found that the nidification of plains and mountain dwellers is essentially the same with regard to time of year and clutch size.—Leon Kelso.

21. Observations on the breeding habits of Pycroft's Petrel. J. A. Bartle. 1969. *Notornis,* **15**(2): 70-99.—The distribution of *Pterodroma pycrofti* is restricted to three groups of islands off the east coast of northern New Zealand with no records to the north of New Zealand, nor any to the south of its breeding grounds. On the nesting grounds 81 per cent of the population are non-breeding birds; these are very noisy in contrast to the nesting pairs. The average weight of the species is 159 grams. "Incubating birds lose 3-4 gm per day." Desertion of the egg occurred commonly in the author's investigations. A full page of references is given.—Margaret M. Nice.

22. The breeding biology of the parasitic Black-headed Duck. Milton W. Weller, 1968. *Living Bird,* **7:** 169-207.—Dr. Weller made an important contribution (1959) to the subject of the partially parasitic duck, the Redhead (*Aythia americana*); here he gives the results of 11 months of study in eastern Argentina on the totally parasitic *Heteronetta atricapilla*. This species has a distinctive courtship and forms temporary pairs, but does not nest, laying its eggs in nests of birds in dense marsh—chiefly Red-fronted Coot (*Fulica rufifrons*), Rosybills (*Netta peposaca*), Red-gartered Coot (*Fulica armillata*), and White-faced Ibis (*Plegadis falcinellus*).The duckling hatches in 24-25 days, then leaves its foster parent in its first 24 to 36 hours and raises itself without any further parental care of brooding.

"The Black-headed Duck has achieved success . . . by the random placement of eggs in nests containing eggs of any color. Survival of the young is possible because the young rear themselves . . . Because it is the least damaging to the host, it may be considered the most perfect of avian parasites."

Two of the excellent photographs are especially striking: one shows a newly hatched *Heteronetta* duckling looking twice as big as the chick of its host,the Red-fronted Coot; while the other presents a duckling resting beside its host, a young White-faced Ibis that appears four times as large as the parasite.

Dr. Weller is to be congratulated on this notable contribution to the biology of this unique species.—Margaret M. Nice.

23. The breeding of some raptors in captivity. (Ueber die Fortpflanzung einiger Greifvogelarten in Gefangenschaft.) Amélie Koehler. 1968. *Der Falkner,* **18:** 28-33.—Thanks to the gift from Dr. and Mrs. Hamerstrom of five American Sparrow Hawks (*Falco sparverius*) caught in Wisconsin on fall migration in August 12, 1960, (two young of each sex and an older male), Frau Koehler bred two pairs of these birds with signal success. They have nested each year from 1961 through 1968, laying in the 16 first broods a total of 75 eggs and raising 48 young; in the seven second broods laying 31 eggs and raising 13 young. Two males and four females of the second generation also bred; in their 11 sets 48 eggs were laid of which nine hatched and six were raised. The lessened success of these birds is due in part to less light and less adequate nest boxes than the original birds enjoyed. In all cases the first sets of the yearling birds were sterile.

The author says that in breeding this species the birds must be neither too tame nor too shy, the setup must be favorable and the spring bright and sunny. She emphasizes the necessity of a rich and varied diet and discusses other features of the complicated technique or raising these falcons.

The literature is reviewed. Attempts to raise "hawks" and falcons in captivity are described and no fully successful instances found except those of Frau Koehler's own with two pairs of Kestrels (*Falco tinnunculus*).

In *Science* (Sept. 27, p. 851, 1968) Susan Gray writes that so far as she knows no hawk has ever bred in captivity. The brilliant experiments of Amélie Koehler in Freiburg, Germany, show that this psychologist was mistaken.—Margaret M. Nice.

[As a highly personal footnote to this extraordinary achievement, I would point out that in 1964, Frau Koehler showed me her Sparrow Hawks, which then looked marvelously healthy and in perfect condition.—Rev. Ed.]

24. Field studies on the Sandgrouse of the Kalahari Desert. Gordon L. Maclean. 1968. *Living Bird,* **7:** 209-235.—Sandgrouse (Pteroclidae) are not grouse nor are they closely related to pigeons as previously thought, but rather to the Charadriiformes (see review #20, *Bird-Banding,* **39:** 67, January 1968). As many as 1,000 *Pterocles namaqua* may gather for their morning drink; some of them must have had to fly for 50 miles. The food of the birds of all ages consists solely of hard, dry seeds. The pair bond is strong; if one is caught in a net, its mate will swing back and wait for its partner's release. The normal clutch size is three; males incubate by day, females by night. Incubation lasts 21 days. Out of 69 eggs of this sandgrouse 47 (68%) hatched. The father soaks his abdomen thoroughly at the water-hole; then flies home to his chicks that strip the water from his feathers, until at the age of six weeks they can fly themselves to the source of water. An excellent contribution to the biology of the Namaqua Sandgrouse.—Margaret M. Nice.

25. The Long-toed Stint (Calidris subminuta Midd.) in Transbaikal. G. K. Borovitskaya and I. V. Izmailov. 1968. *Ornitologiya,* **9:** 338. (In Russian.)—Known previously as a rare breeding species of the alpine zone of northeastern Siberia, the finding of its nest east of Lake Baikal, in the Bogoi steppes of the Buryat Autonomous Sov. Soc. Republic, 25 June 1966, extends its breeding range 700 km southward from southern Yakutiya. The nest, diameter 83.0, depth 44.0 mm, sheltered by overhanging green grass, in a boggy meadow near Borgoi Lake, contained 4 dull whitish, brown spotted eggs, of measurements averaging 30.0 x 21.0 mm. The female was incubating.—Leon Kelso.

26. The ecology of the Horned Lark (Eremophila alpestris albigula Bp.) in the Kharzhantau Mountains (western Tyan-Shan). Yu. S. Lobachev and V. I. Kapitonov. 1968. *Byull. Moskovskogo isp., otdel. biol.,* **73**(3): 17-25. (In Russian, with English summary.)—A concise account of a study of 23 nests located above timber line, at an altitude of 2400-2700 m. (above this, the slopes are too steep; below, vegetation too dense). Certain of the many details elaborated are in marked contrast to those found in the American form on alpine tundra of Park Co., Wyoming by Verbeek (*Wilson Bull.*, **79**(2): 208-218). In contrast to no "pavement" at the side of the nest (per Verbeek), and a small pavement (reported by DuBois and Pickwell), an embankment 12-16 x 15-23 cm., 2-8 cm. deep supporting the nests on the downhill side (slope gradients of 10-35°), of 30 to 43 pebbles, of 2-9 gms wt. each is described and figured for the Tyan-Shan form. The pebbles were carried, by the female, as far as 5-9 m. The population density was 4-7 pairs per hectare, as compared to 1 per 1.5 ha; distance between nests as little as 15 m; 2 egg clutches per breeding season (1 only in Wyoming); the early clutch was smaller, 2-4 eggs; the second, 3-4 eggs, and this is true for some other passerine species of that region; incubation, by female, lasts 10 days, nest feeding, 10-11 days. Breeding success was about 50%. There are numerous other details of comparative interest.—Leon Kelso.

BEHAVIOR

(See also 17, 24, 39, 40, 41, 43, 45, 63, 71, 72, 79)

27. Some aspects of the behaviour of the Wattled Plover Afribyx senegallus (Linnaeus). Jeanne de V. Little. 1967. *Ostrich*, **38**(40): 259-280.—A detailed study, pursued for three seasons in the Transvaal on this migratory species, carried out from the author's car as a hide. Close co-operation between male and female was observed in all nesting attempts: the male performs the "scrape" ceremony, and the female selects one of his scrapes; incubation during the day is shared equally; "incubating birds consistently mob and harry intruding dogs and mongooses but usually leave the nest quietly in the presence of human intruders." Both parents guard and brood the chicks but never try to feed them. Information is given on voice, maintenance behavior, threat and fighting behavior, and the development of the chicks.—Margaret M. Nice.

28. The construct of race and the innate differential. Peter Kilham and Peter H. Klopfer. 1968. In: *Science and the Concept of Race*, Columbia Univ. Press, pp. 16-25.—The annual meeting of the American Association for the Advancement of Science in 1966 contained a symposium on race, in which Klopfer presented the results contained in this paper concerning the black and yellow "races" of domestic chicks. The authors' conclusions are that newly-hatched chicks of either kind associate with either color of chick indiscriminately. If reared only with their own kind, they preferentially choose their own kind, but if reared with individuals of the opposite color, no social preference is manifest. Not mentioned in their summary is the experiment that shows that chicks reared with both kinds prefer their own kind!

Some comments on the results are in order. In the experiment in which chicks were socialized with their own kind, a quarter of the yellow chicks and a third of the black chicks failed to make any choice at all; however, chicks manifesting a preference went overwhelmingly to chicks of their own color. Likewise, in the experiment where chicks were socialized with mixed groups, more than half of the yellow chicks made no choice while about two-thirds of the black chicks made no choice. Again, when they did show a preference, it was to their own color. One cannot conclude from any of these experiments that feather color is the relevant clue being used, since movements, calls and other differences between the strains may also occur.

The present need is great for investigation of behavioral interactions among races or other genetically distinct groups within a single species, but the social climate is against such research (as illustrated by a series of exchanges in *Science* a few years ago). Klopfer is one of the few distinguished ethologists with a publicly demonstrated social conscience, he having recently won a Supreme Court case arising from an attempt to integrate public facilities in North Carolina. Perhaps his championing of civil rights causes will subdue attempts of the uninitiate to brand his research on chicks as "racist". Would we have accepted his experiments had they been reported from an unknown investigator in the deep south? Let us hope that other honest scientists will follow Klopfer's brave example. We need desperately to know more about social behavior and racial differences in all kinds of animals.—Jack P. Hailman.

29. Displacement activities and arousal. Juan Delius. 1967. *Nature,* **214** (5094): 1259-1260.—This paper is a good example of how neurophysiological studies may help to explain behavior. Punctate brain stimulation in the diencephalon and telencephalon of Herring and Lesser Black-backed Gulls (*Larus argentatus* and *L. fuscus*) yielded two general classes of responses: preening and not-preening. Associated with preening were staring down, pecking, yawning, squating, relaxing (operationally defined), and sleeping, but these rarely occurred as a result of stimulating sites that did not elicit preening. Preening, and to a lesser extent the rest of these behavior patterns, classically occurs as a "displacement activity"—out of context behavior occurring when two motivations are in conflict with one another (e.g., fleeing and attacking) or when one motivation is blocked or thwarted in some way. Grooming in cats and rats is similarly elicited by brain stimulation, and similarly is correlated with "de-arousal" behavior patterns such as yawning, relaxing and sleeping. Furthermore, these behavior patterns have also been described as displacement activities in these mammalian species as well.

Delius suggests, then, that when the nervous system is highly aroused but unable to "de-arouse" through performance of normal behavior, "de-arousing" homeostatic mechanisms suppress the arousal. The result is that behavior patterns associated with general "de-arousal" (e.g., preening) then are activated as a by-product of the homeostatic compensation, and in extreme cases of overcompensation even sleeping occurs. This is a sensible, modern, cybernetic approach to behavior demonstrating the originality and creativity of the author.—Jack P. Hailman.

30. Reinforcing properties of conspicuous objects before imprinting has occurred. P. P. J. Bateson and E. P. Reese. 1968. *Psychon. Sci.,* **10** (11): 379-380.—It was known previously that a young duckling or chick that had been imprinted to a visual stimulus would work (press a pedal or peck a key) in order to keep the imprinted stimulus in view. This study shows that domestic chicks and ducklings will also press a pedal to light a flickering light *before* they have been imprinted to it. (When the stimulus is on, they attempt to approach it.) Thus, viewing this stimulus that elicits approach is, by definition, reinforcing (rewarding) in psychological terms.

Although the results of this study would probably be expected by any naturalist who has studied imprinting in birds, they have a more general implication for behavioral theory. The results lend new, more functional evidence for the validity of Premack's (*Science,* **139**: 1062-1063, 1963) hypothesis that a *more probable* behavior pattern will always be reinforcing to a *less probable* one, if the more probable behavior is contigent upon performing the less probable one. Viewing and following a good stimulus for imprinting is highly probable, and it thus reinforces the improbable behavior of pedal-pressing upon which it is made contingent. Perhaps behavioral theory is finally escaping the tautological trappings of "reward" concepts in animal learning.—Jack P. Hailman.

31. Erratic display as a device against predators. D. A. Humphries and P. M. Driver. 1967. *Science,* **156** (3783): 1767-1768.—The phenomenon of erratic displays and movements by potential prey in the presence of predators is cited from Tinbergen's *Study of Instinct* and other works with the comment that "this phenomenon is often briefly noted in the literature, but with no explanation of its significance." The assertion is patently false, as consultation of the cited references immediately shows. Yet, the authors raise one new possibility of the function of erratic displays (which they call "protean behavior"): it arouses motivational conflict in the would-be predator, and this "conflict" lengthens his reaction time. Indeed, the literature overlooked by the authors shows that prey may act aggressively to the predator (e.g., Hailman, *Condor,* **61**: 369,1959); such aggressive behavior may indeed forstall the predator's attack, as suggested by others. Is the vague concept of "motivational conflict" needed? No evidence is given that "conflict" slows reaction-time in hunting predators, and, indeed, no operational definition of "conflict" is offered. Data are needed, not new intervening variables arising from armchair speculation.—Jack P. Hailman.

32. Prehatching motility and hatching behavior in the chick. V. Hamburger and R. Oppenheim. 1967. *J. Exp. Zool.*, **166**(2): 171-204.—"It is surprising . . . that an event as common and as interesting as the hatching of a bird has been paid no more than cursory attention in the past. . . . nobody . . . seems to have devoted his efforts to a thorough study of this remarkable avian achievement." This magnificent study by one of the eminent embryologists of our time and his behaviorally-sophisticated student have laid the past to rest. This study follows Hamburger's previously published, detailed studies of embryonic behavior of domestic chicks up to the 17th day of incubation, during which period the embryos show random, uncoordinated movements. This contribution describes in detail the coordinated movements prior to hatching.

On day 17 of incubation an abrupt switch occurs, with coordinated movements appearing *de novo:* lifting of the head from the yolk sac, tucking the head under the right wing (which had been noted by Aristotle), penetrating of the membrane, and finally, pipping. Membrane-penetration does not require coordinated movements, but tucking and pipping are complex coordinations having characteristics in common with hatching. The shell is then cracked by strong thrusts of the head up and back, aided by bracing of the tarsi against the shell. Body-wriggles rotate the animal within the egg, and the whole process is continued in short bursts until the shell breaks open. The earlier random movements of embryos continue until hatching, but are suspended during coordinated actions, and do not grade into them.

The scant literature on hatching is reviewed, although the authors note that they may have missed papers "buried in the ornithological literature." (They did miss Kirkman's description of hatching in the Black-headed Gull chick—*British Birds*, **24**: 283-291, 1931—for example.)

This study should go a long way in putting to rest interpretations of Zing Yang Zuo's observations (*eg., J. Exp. Zool.*, **61** and **62**, 1932; *J. Comp. Psychol.*, **14,** 1932) which some workers have interpreted as demonstrating a gradual continuity of behavior patterns developing from one another during ontogeny. The relation of embryonic behavior patterns to post-hatching patterns such as pecking is still an open question, but it seems extremely unlikely now that passive head movements stimulated by embryonic heart beat could have any appreciable effect on later pecking movements.

This paper, which does away with much previously published nonsense, should be read by every student of ornithology. Let us hope more embryologists become interested in the behavior of birds.—Jack P. Hailman.

33. Light responsivity in chick and duck embryos just prior to hatching. Ronald W. Oppenheim. 1968. *Anim. Behav.*, **16:** 276-280.—With increased emphasis on the ontogenetic roots of behavior, it has become important to know whether birds in the egg are able to sense potential stimuli such as the mother's vocalization, day-night cycles of light, etc. In this study, Oppenheim took chick embryos of about 20 days, 4 hrs. and duck embryos of about 26 days, 8 hrs., broke open a window in their shells, and attached recording apparatus to their beaks in order to measure beak-clapping in response to light. After 30 minutes in the dark, recordings were taken for a ten-minute period of dark, then for a minute of illumination from a microscope lamp, and then for five minutes of darkness again.

In a sample of 25 birds of each species, the mean beak-clapping rate increased during illumination and decreased again when the light was extinguished. For chicks, the reported mean rates for the three periods are: 19.6, 39.1 and 22.5 claps/min; for ducks, 37.9, 66.1 and 34.5 claps/min. "Standard deviations" are reported for each chick and duck during the two dark periods, but, curiously, not for the important period in the light. Furthermore, it is not at all clear what these could be standard deviations of, since nothing is mentioned about them in the text. My bet is that each minute of measurement yielded a data point, so that the ten- and five-minute dark periods yielded ten and five data points for each chick, and these constitute the sets of data for which standard deviations were calculated. The text states that 20 of the 25 chicks increased clapping rates when the light was turned on, but my count from the table is 21 of the 25; 18 decreased their rates when the light was shut off. The comparable figures for ducks are 20 and 19 out of 25.

The author suggests that activation may carry over into the second dark period, thus accounting for occurrence of higher rates in dark than light, but this argument is not convincing. Chick 1, for instance, has rates of 5.8, 5.0, 7.8 for the dark-light-dark sequence; chick 5 showed 7.6, 3.0, 8.9; chick 11, 17.5, 9.0, 21.0. Such data suggest to me that light could also act to *suppress* ongoing bill-clapping in some chicks while activating it above baseline in other individuals. Why embryos should show any influence of light on bill-clapping is a question not dealt with in the paper.—Jack P. Hailman.

34. Experiments with young nidifugous birds on a visual cliff. J. Kear. 1967. *Wildfowl Trust 18th Ann. Rept.*, pp. 122-124.—The precocial chicks, all less than a day old, of 12 species were placed singly on a visual cliff apparatus to test depth-avoidance. The visual cliff is an apparatus with a central runway between a large dropoff on one side and a shallow dropoff on the other, with the entire surface covered by glass in the plane of the runway. Of ten chicks of each of three ground-nesting species tested, nine of each species went to the shallow side. Chicks of six species that nest either on the ground or above it in holes went to the deep side of the cliff slightly more often. Obligatory hole nesters of three species went equally to the shallow and deep sides of the cliff. Subsequent tests of the same birds gave consistent results.

Thus, in the ducks, pheasant, moorhen, and partridge tested, avoidance of heights is pronounced in ground-nesters, and less so in species that sometimes nest off the ground, while birds that nest above ground have no particular avoidance of heights. The situation appears to be different among semi-precocial gulls (Emlen, *Behavior* **22**: 1-15, 1963; Hailman, *Ibis*, **101**: 197-200, 1968), where newly hatched cliff-nesters and ground-nesters alike go to the shallow side, as do newly-hatched domestic chicks.—Jack P. Hailman.

35. Comparative ethology of the Ciconiidae: Part I. The Marabou Stork, *Leptoptilos crumeniferus* (Lesson). M. P. Kahl. 1966. *Behaviour*, **27** (1-2): 76-106.—There appears to be developing a laudable habit among descriptive ethologists to study one species in detail (perhaps as a doctoral dissertation project), and then go on to survey behavior of that species' relatives. Kahl, whose excellent work on the American Wood Stork is well known, has now turned his attention to Marabou Storks in Kenya. This paper presents his observations on locomotion, feeding, comfort movements, and displays of adults, as well as notes on these behavior patterns in young storks. This is the first major study of behavior in the genus *Leptoptilos*, and although it presents no surprises, it is a valuable link in the chain of studies that will help to trace the evolution of behavior in a fascinating avian family.—Jack P. Hailman.

36. Nest-building movements performed by male ducks. F. McKinney. 1968. *Wildfowl*, **19**: 64-66.—A review of observations on 11 species and two hybrids in which the male ordinarily takes no part in nest-building. Such observations suggest that the neural circuitry for all the species' behavior patterns is present or latent, but differentially activated in the sexes; or that such male behavior is evolutionarily "vestigial", appearing sporadically due to genetic recombination.—Jack P. Hailman.

37. Foot-paddling in four American gulls, with comments on its possible function and stimulation. P. A. Buckley. 1966. *Z. Tierpsychol.*, **23** (4): 395-402.—The paper provides observations of foot-paddling in four American gulls, of which only the Laughing Gull (*Larus atricilla*) among American species had previously been reported to do this. (The author thinks it is probably common in this species, an opinion that I can easily confirm from having watched Laughing Gulls over the last ten years. My captive young birds even foot-paddle on the cement floors of their cages.) Foot-paddling probably uncovers small invertebrates in shallow water (which is where I always see the behavior). It may also be a ritualized or unritualized "displacement behavior" as sometimes suggested, but there is no strong evidence for this viewpoint. The development of foot-paddling probably involves experience.—Jack P. Hailman.

38. The hatching and nest-exodus behaviour of mallard. A. Bjärvall. *Wildfowl,* **19**: 70-79.—Despite the fact that laboratory studies have identified the age of 13-16 hours post-hatch as the peak of the sensitive period for imprinting, mallard ducklings actually leave ground nests after this time (on the average), and leave hole-nests very much later. However, they spend enough time out from under the mother to imprint to her visually before leaving the nest.—Jack P. Hailman.

39. Ecology and behaviour of African and Australian Grass Finches. Klaus Immelmann. 1966. *Ostrich Suppl.,* **6**: 371-379.—First we have to get straight just what these birds are. Basically they are the African, south Asian and Australian passerines often called "estrillids" because they have been considered to constitute a subfamily (Estrilidinae) of the family of true weaver finches (Ploceidae). However, recently the tendency is to give the group family rank (Estrilididae). Immelmann prefers the alternative family name, Spermestidae, which means "seedeater", to the Latinized version of the common African name. Sometimes they are called Weaver Finches, but since they are no longer thought to be true weavers, Immelmann prefers Grass Finches as the common name.

There are many genera and species of Grass Finches. Immelmann has studied many, and in doing so has probably become the world's expert on this fascinating group. Here he summarizes differences between the African and Australian species, with regard to food supply, feeding habits, bill size and shape, flock formation, nomadism, social breeding, social communication, nest site, nesting material and drinking habits. The most primitive are probably edge dwellers, giving rise to deep forest and open grassland forms via a number of different radiations in both Africa and Australia.

An interesting phenomenon arises in Australian forms: they drink water by sucking it up through the lowered bill, in the manner of doves, and they are the only known birds outside of doves to drink thusly. The habit probably evolved from sucking dew from leaves, and enables them to utilize small water sources, as well as to drink quickly at water holes where they are quite vulnerable to predation. The habit has evolved a number of times among the arid species down under.

In general, the behavioral adaptations of the grass finches are similar to those found in the true weavers by Crook. For instance, grassland birds communicate visually, while woodland relatives use vocalizations more readily. The bibliography includes a number of references to Immelmann's fine papers on these fascinating birds.—Jack P. Hailman.

ECOLOGY

(See also 17, 31, 73, 80)

40. Sizes of feeding territories among birds. T. W. Schoener. 1968. *Ecology,* **49** (1): 123-141.—Factors responsible for regulating the size of feeding territories during the breeding season are investigated in this extensive assembly of the literature. Those considered are all maintained intraspecifically during the breeding cycle, both parents obtain all or most of their and their young's food there, and the majority of food is obtained on or over terrestrial areas.

The relation of body weight to size of territory (strong positive relation) and comparison of territory size in predators and omnivores-herbivores (larger terretories for predators, presumably as a result of less dense food supply) are investigated. Clutch size is not significantly correlated with territory size in any group, nor is the number of individuals defending one.

Calculations are made predicting that heavier predators take fewer individuals of prey per unit time than lighter ones. In certain situations, the collective biomass increases as the omnivore biomass increases and predator biomass decreases. For predators the biomass of usable food per unit area decreases as their weight increases. Probably because of the last statement territory or home range increases more rapidly with body weight for predators than for omnivores or herbivores.

Since the areas of territories vary predictably with the size of the occupants, density of acceptable and available food, and density of preferred habitat, Schoener believes that they function in limiting the number of individuals using a food source in an area.—Douglass H. Morse.

41. The pattern of distribution of prey and predation in Tawny Owl territories. H. N. Southern and V. P. W. Lowe. 1968. *J. Anim. Ecol.*, **37** (1): 75-97. Territories in Tawny Owls are very stable, and evidence from banding makes it appear likely that once a territory is possessed, it may be held 6-10 years. Trespassing is rare. Territories average 20-30 acres in size. Observational data on territorial boundaries were checked by trapping and marking with metal leg-rings the two main prey species, the wood mouse and bank vole. Pellets of the owls were subsequently collected. Since the home ranges of the prey species were small, the distribution of rings from pellets delimit fairly closely the areas utilized by the owls. Previously gathered evidence suggests that the great majority of distance between the trapping area and recovered owl pellet is the result of the owls' movement, rather than the rodent's. These data match observational data on territorial boundaries closely.

The pattern of distribution of ground cover is important to the owls in hunting. They capture proportionately many more wood mice than the traps on open ground and less than the traps in areas of dense vegetation. Voles were captured in both dense and open areas with about the same frequency as in the traps. Hence, if wood mice are abundant, areas with considerable openings are favorable; if bank voles are abundant more densely foliaged areas will be preferred.

The availability of prey in the spring appears to regulate closely the tendency of the owls to attempt to breed. In 1955, both prey species were scarce, and only two pair (of the 11) in the study area attempted to nest; in 1956 when voles had increased, seven pairs attempted.—Douglass H. Morse.

42. Description and analysis of breeding habitats of the chickadees, Parus atricapillus and P. rufescens. W. A. Sturman. 1968. *Ecology*, **49** (3): 418-431.—Black-capped and Chestnut-backed chickadees are two quite similar species that are found together in many parts of the northwest. Sturman attempts to analyze and quantify the bases for their coexistence during the breeding season. He finds that most of the variation in abundance of the Chestnut-backed Chickadee is dependent upon two factors—the percentage of upper-story canopy volume that is coniferous and the average height of upper-story conifers. Abundance of Black-capped Chickadees could largely be accounted for by the total canopy volume of all trees, bushes, and middle-story trees. These characters match well with the usual description of Chestnut-backed Chickadees as birds of coniferous forests and Black-capped Chickadees as ones of mixed forests. On the San Juan Islands Black-capped Chickadees are absent, and Chestnut-backed Chickadees have been found nesting in broadleafed habitats. This situation would allow analysis of the roles of habitat selection and interspecific interactions in determining the local distribution of the two species.—Douglass H. Morse.

43. Conditions of competition between Redwings and Yellow-headed Blackbirds. Richard S. Miller. 1968. *J. Anim. Ecol.*, **37** (1): 43-62.—Redwings and Yellowheaded Blackbirds both nest in marshes, and where they are present together, the Yellowheaded Blackbird actively excludes the Redwing from certain parts. Yellowheaded Blackbirds will nest only in vegetation situated over standing water, in rich marshes, while Redwings are catholic in these regards, not infrequently nesting even outside marshes. They will also nest in sites similar to those occupied by Yellowheaded Blackbirds, if the latter is absent. Within that limited area, Miller believes there is total competition for space, with the Yellowheaded Blackbird winning out where present, and the adaptable Redwing existing in sub-optimal areas.

The type of competition existing is what Miller refers to as interspecific interference; that is, preventing or interfering with access to a limited resource. The specific behavioral patterns of these species are territorial advertisement, display, and chase. He believes that interference is a superior mechanism to what he considers an alternative type of competition, interspecific exploitation, where the issue at stake is the ability to exploit and utilize a resource once access to it has been achieved. In interspecific interference the outcome of a competitive interaction may be decided in a relatively short period, and it is little influenced by physical factors such as temperature.

For species exhibiting this sort of competition, it is advantageous for similar hostile behavioral actions to exist, allowing them to be utilized in both interspecific and intraspecific interactions. They are believed to have evolved as intraspecific mechanisms. This situation exists in the two species.—Douglass H. Morse.

WILDLIFE MANAGEMENT

(See also 10, 12, 16, 22, 46, 86)

44. Ten Year Index, 1957-1966, to the Journal of Wildlife Management. Thomas G. Scott, Marthanne B. Norgren and W. Scott Overton. 1967. The Wildlife Society, Washington, D.C., vi +234 pp. $4.00.—This index, available from the Society at 3900 Wisconsin Avenue, N. W., covers volumes 21 through 30, inclusive. It was published with financial assistance from the National Science Foundation. In this age of the "information explosion," such use of public funds to promote efficient scientific endeavor seems very appropriate. Most of the volume is one large alphabetical index, with both common and scientific names of organisms listed and cross-referenced (if one or the other of the names is missing in the index, then it did not appear in the original journal article). Plants are primarily listed by Latin name, animals by common name. Besides organisms, the index includes authors, geographic locations of investigations and subject categories. In the principal index a number of items are listed in boldface type; the explanation says these are subject categories, but this does not seem to be true. In boldface appear "Asia, southeast," "Bahamas" and other place-names, including all of the states. The place-names are in boldface lower case with initial capitals. Also in boldface lower case with initial capitals are certain subject categories, e.g., "Age criteria," "Handling live animals", etc. In all such cases I could find, the entry refers one to "Techniques" (also listed in such boldface in the entry). Turning to "TECHNIQUES" we find the word listed in boldface caps, with the word that referred one to TECHNIQUES listed under it in lower case boldface. Many other such subject headings are also listed in boldface caps.

Turning to the front section entitled "to the user' we find two additional lists called "inventories". The inventories refer to pages in the index. The second inventory lists all those subsections of TECHNIQUES that are printed in boldface: 29 titles spread over only seven pages (was this inventory necessary?). The other inventory is entitled "MAIN SUBJECT-CATEGORY ENTRIES." Now, one would guess that this is a listing of everything that appears in boldface type in the principal index, but it is not. For instance, ANATOMY in the main index is in boldface caps, but does not appear in the inventory. Everything in the inventory, however, appears in boldface caps in the main index.

I like several features of this index that are often missing from others: separate listings for all authors, whether junior or senior; Latin names in italics; journal numbers, as well as volumes and pages; and liberal cross-referencing. No doubt minor typographic errors occur, but amazingly I did not come across any (but then reading indices is not my kind of relaxation).

This is a well-prepared, thorough index that could serve as a model for other journals. One only wishes that the boldface listings and inventories had been given a few more words of explanation so that the user might be maximally efficient without having to spend valuable time just figuring out the system. Compiling indices is a thankless job; to authors Scott, Norgren and Overton: thanks!—Jack P. Hailman

45. A trial to investigate the reactions of sheep to goose droppings on grass. J. B. A. Rochard and J. Kear. 1968. *Wildfowl*, **19:** 117-119.—This is real. Four sheep were given untreated turf, turf with imitiation droppings, with real goose droppings, and smeared with goose droppings. The sheep avoid the latter two, either by taste or smell. Now, what is the effect of sheep-droppings on geese?—Jack P. Hailman.

CONSERVATION

(See also 1, 9, 64, 80, 84, 86)

46. The attempted rehabilitation of oiled sea birds. J. V. Beer. 1968. *Wildfowl,* **19:** 120-124.—Sadly, ". . . it is better to kill humanely all but the lightly oiled birds . . .". The price of our gasoline is measured not only in dollars.—Jack P. Hailman.

PARASITES AND DISEASES

(See also 71)

47. Pluminidal sinus (epidermoid cyst) on the back of a male Hazel Grouse (*Tetrastes bonasia* L.). Erkki Pulliainen and Eero Tanhuanpää. 1968. *Ann. Zool. Fenn.,* **5** (3): 270-272.—This is apparently the first report of such a cyst in a bird. It seemed not to be caused by parasites, but to be developmental in origin.—Jack P. Hailman.

48. Salmonella in wild birds, especially small passerines in the region of Lausanne. (La salmonellose chez les oiseaux sauvages, notamment chez les petits passereaus des environs de Lausanne.) G. Bouvier. 1968. *Nos Oiseaux,* **29** (320): 293-295. (In French.)—The bacterium *Salmonella typhi-murium* was known previously in birds from a few cases in pigeons. In 1967-1968, the author found three cases in the House Sparrow (*Passer domesticus*), 14 cases in the Greenfinch (*C. chloris*), one in the Grasshopper Warbler (*Locustella naevia*), six in the Brambling (*Fringilla montifringilla*), and three in the Bullfinch (*pyrrhula*). The infection is described, and it is speculated that the disease was transmitted readily during the bitter winter of 1967-1968, when large groups of feeding flocks gathered. Although the bacterium also infects man, there seems to be little danger of transmittal.—Elizabeth D. Hailman and Jack P. Hailman.

PHYSIOLOGY AND PSYCHOLOGY

(See also 2, 29, 30, 32, 33, 34, 38, 57, 58, 59, 60, 61, 62, 67, 82)

49. Physiological and biochemical characteristics of the blood of the Penguin, Eudyptes cristatus. P. A. Korzhuev, et al. 1968. *Zhurnal evolyutsionnoi biokhimii i fiziologii,* **4**(5): 461-463. (In Russian. English summary.)—Distinctive features are high concentration of hemoglobin (13.93%; 18.92 g. per kg. body weight), greater volume of blood (14.30%), low erythrocyte content (1.41 million per cubic mm; 1.61 in ostriches; 3.0 mill. in most birds), larger erythrocytes (362 per cubic mm; 150 in most birds), and higher hemoglobin content per erythrocyte (100 units; 40 units in birds as a group). Additional facts are detailed and discussed.—Leon Kelso.

50. Energy metabolism and animal evolution. V. R. Dolnik. 1968. *Uspekhi Sovremennoi Biologii* (Advances in Modern Biology), **66**(2): 276-293.—The doctrine of evolution was conceived largely as the result of studies of animal morphology. But almost all evolutionary theoreticians emphasize the dominant role of rise of energy levels during the course of morphophysiological progress (aromorphosis). After extensive researches and publications on avian bioenergetics this author turns to that for animals in general, finding the metabolic level approximately uniform for all species within a major taxon (Class, in this case). With rise in the evolutionary scale standard metabolic rate increases, evolving provisions for yet more energy productivity. The Brody principles are found to apply to poikilothermic animals. Data are provided on the metabolism of the various animal classes. There is a bibliography of 37 titles.—Leon Kelso.

51. The electroretinogram: its components and their origins. Kenneth T. Brown. 1968. *Vision Res.,* **8:** 633-677.—The electroretinogram (ERG) of vertebrates is similar in the many species tested (see review **52** for a study of the

ERG in the pigeon and a general explanation of the ERG response). The present paper, reviewing exciting and careful studies of the author over the last few years, does not deal directly with birds, but its conclusions may be applicable since the ERG is basically similar in birds and mammals.

Brown's studies on several species of monkeys and on other vertebrates lead him to propose the following general scheme. At the onset of light, the receptor cells (after very rapid small potential changes called early receptor potentials occur) generate a negative component of the ERG called the late receptor potential, which reaches a negative peak and remains at that level until the illumination is shut off. However, soon after this potential generated by the rod or cone receptor cells, two positive potentials begin to be generated from the middle part of the retina called the inner nuclear layer; these are the b-wave component and the direct-current (dc) component. Anatomically, the receptor cells are connected to the bipolar cells, and the bipolars to the ganglion cells, these latter sending processes from the eye to the brain. However, there are other neural components connecting nerve cells within one level, and also non-neural cells that might show electrical activity, so that the exact kind of cells generating the b-wave and the dc components cannot be positively identified at the present time.

The positive b-wave component peaks rapidly and declines rapidly, whereas the smaller dc component reaches a positive peak at which it remains until the light is shut off. Since the on-going late receptor potential component is a larger negative potential than the on-going dc component is positive potential, the eye would remain slightly negative until the light is shut off. Thus the sum total of these separate waves upon onset of the light would yield this sequence of events: a rapid negativity (due to the late receptor potential component) which is immediately reversed (by generation of the positive b-wave and dc components) to a large positive peak, which then falls off rapidly (due to decay of the b-wave component). The initial negative peak is the a-wave and the following positive peak is the b-wave of the ERG.

At this point, the overall potential of the cornea of the eye should be a non-going slightly negative potential due to effects of the small positive dc component and the larger negative late receptor potential component. However, this is not the case, because another positive potential is generated during or soon after the generation of the b-wave component, and this on-going potential which increases slowly is known as the c-wave of the ERG. Brown believes the c-wave to be generated not by the retina itself, but by the pigment epithelial cells that line the back of the eye. This c-wave is not evident in the ERGs of some animals, e.g., birds.

Disregarding the c-wave component, which might be nonretinal, the remainder of the ERG waveform is caused by the timing of events when the light flash goes off. In nearly pure-rod eyes, which are typical of nocturnal animals, the positive dc component shuts off soon after the cessation of light, whereas the negative late receptor potential component decays very slowly. This means that at the termination of light the ERG becomes suddenly more negative, and then slowly decays to the neutral level.

In predominantly cone eyes, such as is typical of diurnal animals like many birds, the dc component also shuts off soon after cessation of the light. But before this happens, the cone late receptor potential (unlike the rod LRP) shuts off even sooner. This means that the slightly negative ERG suddenly becomes positive at termination of the light, and then returns to neutral, giving an "off" peak known as the d-wave.

In the pigeon (see review **52**) there are small wavelets superimposed on both the b-wave and the d-wave of the ERG. There are other minor components of the vertebrate ERG, and Brown discusses some of these.

The importance of this work, as seen by this reviewer, is that it enables analysis of the electrical activity of cell types in the eye without the necessity of recording electrically from individual cells—a task which has proved nearly impossible in vertebrate eyes having large cells (and birds have tiny retinal cells!). If we are ever to understand how the eye analyzes color, brightness, form or other aspects of visual stimuli, it is now clear that the electroretinogram will play a major role. Brown's studies represent a true breakthrough in the study of vision, and thus should be of fundamental interest to anyone attempting to understand the behavior of so visual an animal as a bird.—Jack P. Hailman.

52. An examination of the electroretinogram of the pigeon in response to stimuli of different intensity and wavelength and following intense chromatic adaptation. Patrick W. Nye. 1968. *Vision Res.*, **8:** 679-696. —When an electrical potential difference is measured between the cornea of an animal's eye and some indifferent place on the animal's body, a complex waveform is generated upon illumination of the eye. This sequence of potential changes is called the electroretinogram (ERG), and it is rather similar in form among all of the vertebrates that have been studied (see review **51**). The two principal components are a rapid negative potential (a-wave) followed by a usually large positive potential (b-wave); events after the b-wave tend to vary among species. The magnitude or amplitude of the b-wave peak is a trusty measure of the eye's sensitivity to light, correlating well with behavioral thresholds, visual pigment absorption spectra and other measures of spectral sensitivity. In the pigeon, the b-wave is composed of or has superimposed over it many small oscillations of potential, sometimes called b-wavelets. There exists evidence that in man b-wavelets of the ERG reflect electrical activity in different kinds of receptors (cone cells), but the evidence is not conclusive. This study attempted to get at the problem of the b-wavelets by studying the pigeon (*Columba livia*), which has prominent b-wavelets, in hopes that the analysis would reveal aspects of the color-analyzing mechanisms of the pigeons, and of vertebrate eyes in general.

The present study did not confirm the predictions about the latencies and amplitudes of the b-wavelets made from the receptor hypothesis. The experiments do indicate that these small oscillations originate in the retina itself, a point which had been in doubt since nerve fibers run from the brain back into the eye as well as vice versa. However, when these centrifugal fibers are cut, the b-wavelets are not abolished, so that they must come from somewhere in the retina itself. The exact origin and significance of these electrical responses in the pigeon's eye still remain a mystery.—Jack P. Hailman.

53. The effect of ultrahigh frequency electromagnetic fields on regulation of heart rate and respiration in birds. I. M. Yakoleva. 1968. *Zhurnal evolyutsionnoi biokhimii i fiziologii*, 4(5): 437-442. (In Russian. English summary.)—Experiments on 11 hens, 30 chicks, and 25 pigeons showed that in hens UHF fields caused about 3% deviation from original levels. The effect was decidedly more pronounced in pigeons, especially when applied to the head. Atropine injections increased heart and respiration reactions to UHF by 15-17% in hens and by 100-120% in pigeons. Removal of cerebral hemispheres increased heart beat in UHF by 125-130% in both hens and pigeons. A number of facts are discussed relative to natural environmental magnetism.—Leon Kelso.

54. A multi-channel transmitter for physiological study of birds in flight. O. Z. Ray and J. S. Hart. 1966. *Med. and Biol. Engineer.* **4**(5): 457-466.—There is a description of apparatus and operation. Experiments with pigeons showed that: respiration is synchronized with wing action; heartbeat at rest averaged 166 per min., in flight, 540; restoration to original rate after flight was slow, showing oxygen deprivation; respiration rate at rest is 26, in flight, 487, falling to 150 immediately on alighting; respiration volume in flight is 4.8 ml., increasing threefold after alighting; respiration current in flight is 20 times that at rest; loss of heat in flight by evaporation is 20% of total, so that 80% is by convection and radiation; body temperature at rest is 42.6, in flight, 44.1; subcutaneous temperature at rest is 41.5, in flight 41.0 and on alighting, 42.8°C. [Taken from Russian review in *Referativny Journal,* no. 5, biol. ser., 1968.]—Leon Kelso.

55. Water Economy and Salt Balance in White-winged and Inca Doves. Richard E. MacMillen and Charles H. Trost. 1966. *Auk,* **83** (3): 441-456.—The White-winged Dove (*Zenaida asiatica*) and the Inca Dove (*Scardafella inca*) are common summer birds in the Sonoran desert regions of southern Arizona and northern Mexico, where the latter species is apparently a permanent resident. They face a physical environment in which the risk of death due to dehydration is serious. The questions asked are: do they have special adaptations that allow desert living, and do the two doves of different size (about 140 and 40 grams, respectively) have different kinds of water economy? Some of their findings are: the White-winged Doves have lower *ad lib* and minimal water requirements than the Inca Dove; the larger White-winged is more resistant to water deprivation and more effective at rehydration when provided again with water; and the larger species can maintain body weight on saltier water than the smaller. Both species maintain constant plasma osmotic concentrations and chloride levels when drinking tolerable saline solutions, and both utilize succulent fruit as a water source (field observations showing that the White-winged Dove may rely on saguaro cactus fruit as an important water source). Neither species shows unique adaptations to the desert environment, but these experiments confirm the theory of Bartholomew and Cade (*Auk*, **80**: 504-539, 1963) that body size is inversely correlated with evaporative water loss. An important contribution.—Jack P. Hailman.

56. Water Economy of the White-crowned Sparrow and its use of Saline Water. Richard E. MacMillen and John C. Snelling. 1966. *Condor*, **68** (4): 388-395. —*Zonontrichia leucophrys gambelii* winters partly in the xeric environments between the Mojave Desert and the Colorado Desert in California, where it faces serious chances of death by dehydration. This study attempts to discover facts about the water balance of White-crowns, and to see if they can utilize the salt springs of the desert (or sea water in other parts of their range) to maintain water balance. Some of their findings are: Gambel's White-crowns have a high voluntary water intake which increases directly with concentration of salt up to about half seawater; they maintain weight or gain weight on hypotonic solutions up to 25 percent seawater, but lose weight on hypertonic solutions of 37.5 and 50 percent seawater (i.e., they apparently cannot rid themselves of excess salt); they take less salty water preferentially; when deprived of water, they lose about 9 percent of body weight per day, and survive to a maximum of seven days; they appear to have no special physiological adaptations to combat dehydration, and thus must rely on free water and on succulent foods. For conservation purposes, it would seem valuable to know that water may be a limiting factor for populations of this species.—Jack P. Hailman.

Special section on

PROFESSIONAL ETHICS

(See also 55, 56)

57. Correspondence. W. H. Thorpe, Peter Scott, Bessborough, Stanley Cramp, W. J. Eggeling, Norfolk. 1968. *Auk*, **85** (4): 728.—This letter by some prestigious English ornithologists presents briefly a criticism of some experiments on water balance in birds. W. H. Thorpe, author of several well known books on ethology and an expert on avian song, writes as Chairman of the British Section of the International Council for Bird Preservation. Peter Scott, an authority on waterfowl and the man chiefly responsible for the world-renowned Wildfowl Trust at Slimbridge, writes as Chairman of the Fauna Preservation Society. The other authors write, in order, as Vice-President of the Ornamental Pheasant Trust, Chairman of the Royal Society for the Protection of Birds, President of the Scottish Ornithologists' Club and President of the Wildfowl Trust. It is by no means clear from the letter whether this august body is communicating decisions made by their respective organizations, or whether they are merely parading titles.

The letter criticizes two papers: one by MacMillen and Trost (see review **55**) and one by MacMillen and Snelling (see review **56**). Apparently, this letter has also been published elsewhere (see review **59**). The papers under attack concern investigations to elucidate water and salt balance in birds.

The critics assert that both papers "are marred by the presence of accounts of experiments of very questionable scientific relevance and of undoubted cruelty." These are among the strongest criticisms that can be raised against a scientist. The letter goes on "We refer to . . . seeing how long it takes captive birds to die of thirst." (Remember the words "cruelty" and "thirst" when reading review **60**, below.) The letter goes on "We protest most strongly against these experiments which show an indifference to suffering almost more horrifying than its deliberate infliction. The only possible justification for causing pain or distress to a living creature is that it is impossible to avoid it in gaining knowledge essential to human or animal health or welfare." (Remember this last phrase.)

"In these experiments, wherein birds are deprived of opportunities for exertion in search of better conditions, the circumstances are so abnormal that much of the information obtained is of doubtful relevance to the life in the wild of the species concerned." And the letter ends with: "In our opinion the publication of papers such as these can but discredit the institutions which permit or tolerate them, and serve only to bring ornithology into dispute."

The attack is double-barreled: essentially, the experiments are of doubtful worth and they are cruel. Thorpe, so far as I am aware, is the only pure scientist among the authors, and he is not a physiologist. One wonders how seriously to take the first, undocumented criticism; the careful considered opinion of a competent physiologist would have strengthened the first criticism immensely. The second criticism is justifiably made by a nonphysiologist. Let us consider the reply (next review).—Jack P. Hailman.

58. (Correspondence.) Richard E. MacMillen, Charles H. Trost and John C. Snelling. 1968. *Auk*, **85** (4): 728-729.—Apparently editor Oliver Austin, Jr., of the *Auk* sent the letter of criticism (see previous review) to these being criticized; he is commended for having done so. MacMillen *et al.* state that "The *Auk* is the only journal in which their letter has appeared that has extended us this courtesy (of simultaneous reply)." MacMiller *et al.* lament that Thorpe *et al.* registered their complaints publicly without writing directly to those being criticized (and apparently without even sending them a copy of the critical letter, thus violating usual academic civility). "Their reliance solely upon indirect communication through journals smacks of a greater concern for influencing editorial policy and animal protection organizations than for dealing actively with the object of their concern."

MacMillen *et al.* then deny that their experiments are "of very questionable relevance," and state that "we have never intentionally subjected experimental animals to conditions more rigorous than those inflicted upon them by the environment." One wonders how much time Thorpe *et al.* have spent in the American deserts of the southwest. MacMillen *et al.* then cite evidence of animals succumbing in the desert under conditions that they attempted to replicate in the laboratory. It seems a logical next step to say that without the knowledge from experiments such as theirs, conservation of desert species would be a difficult task indeed.

Would that the critics had used facts and carefully spelled out arguments as did those criticized.—Jack P. Hailman.

59. Correspondence: experiments on the effects of water deprivation. W. H. Thorpe, Peter Scott, Beesborough, Stanley Cramp, W. J. Eggeling, and Norfolk. 1968. *Ibis* **110** (2): 207.—A word-for-word identity with the letter to *Auk* (see review **57**). Was not one enough?—Jack P. Hailman.

60. Experiments on the effects of water deprivation. Tom J. Cade. 1968. *Ibis*, **110** (4): 579.—Apparently Cade discovered the criticisms of Thorpe *et al* (see review **59**) by reading *Ibis*. Having read the letter, Cade hereby replies. His first point objects to the use of the term "cruelty," which Cade correctly identifies as connoting a state of mind—a willful, enjoyable infliction of pain. Cade rightly objects to having his experiments classed with those "experiments" at Dachau. Cade's second point is more diffuse, but in essence says this. If the only acceptable killing or causing of distress to an animal is when it is absolutely essential to human or animal health or welfare (as Thorpe *et al.* had stated), then why is the British Museum full of specimens? Cade's third point is again linguistic in nature. Animals don't die of "thirst" but of dehydration. Why did scientific critics use words which purposely carry an emotional (and inaccurate) content denoting suffering? And, Cade points out, birds dying of dehydration show less outward signs of pain than a fishing worm being placed on a hook. "Is there a British Society for the Prevention of Cruelty to Angleworms?" he asks. Lastly Cade points out that lines are difficult to draw. The mere act of confinement in zoos and laboratories is stressful; so is deafening birds to study the development of their song. "There are no categorical answers to any of these questions, despite the simplistic views of some moralizers"—Jack P. Hailman.

61. (Experiments on the effects of water deprivation.) W. H. Thorpe. 1968. *Ibis*, **110** (4): 580.—Cade sent a copy of his letter (see review **60**) to Thorpe prior to publication, and the latter took the unusual opportunity of replying last. Thorpe's first point seems to be that since Lord Brain said that animals suffer like persons, they do—at least they also have nervous systems. However, Thorpe sees nothing unethical about causing pain to earthworms, apparently because their nervous system is of a different kind from ours. Thorpe again makes a sound condemnation of "American" practices. He states that his beliefs are well founded, but there simply is not enough space to state what they are. Next, Thorpe defends his own experiments on deafening songbirds on the grounds that the birds show no ill effects. (Note that Cade also uses this argument, and both are based on an anthropomorphic assumption that the outward expression of pain is similar in all species.) Thorpe's last point refers again to Cade's original experiments on water deprivation. Thorpe states that his real objection is not that the experiments were done, but that nothing new was learned by carrying them through to death. (But how would we know that unless they were carried through?)

Summarizing the exchanges, I note first that the editor of the *Auk* behaved properly, while the original critics did not. Neither the criticisms nor the replies are devoid of emotionalism. Both sides raise some valid questions that scientists should be asking, but the critics speak from an authoritarian, pre-established viewpoint from which they are unwilling to budge, yet are unwilling to explain fully. These exchanges are healthy for science and humanity, if done properly and objectively. I have no doubt that the "Americans" are as concerned about suffering as the "British", and I think that the dichotomy used by the critics is without meaning. The British have stiffer laws regarding animal experimentation than we do in the United States. However, one wonders if the British laws are obeyed so rigorously as it might appear. Does each scientist really establish that no "lower" form will do before using a "higher" form of animal for an experiment? (Can we legislate "lowerness" and "higherness"?) Does each British scientist really have on hand only the ridiculously small sample of animals prescribed by English law? If so, how does he ever get the data to be sure enough to publish? We do not necessarily need *more* laws about animal care, we need *better* ones. Better ones will come only if scientists participate in the public debate of the issues. But the debate needs to be fair, well thought out, and, above all, devoid of emotionalism. The present debate does not match up to my standard.—Jack P. Hailman.

MORPHOLOGY AND ANATOMY

(See also 74)

62. Patterns of growth in birds. R. E. Ricklefs. 1968. *Ibis*, **101** (4): 419-451. — This is an important paper, which attempts to find models describing growth and then to put growth in an ecological and evolutionary framework. The rate at which weight-gain is exhibited, the fraction of adult weight gained during the dependency period and the shape of the growth curve are all extremely variable in bird species.

Growth (by which is meant gain in weight) can be described empirically by three parameters: (1) magnitude, or whether the young bird reaches the adult weight, fails to reach it, or overshoots it before leaving the nest; (2) form, or the sigmoid shape of the weight-as-a-function-of-age curve; and (3) rate, or the time it takes to reach asymptotic weight. The growth curves are fitted to one of three growth equations (chosen to give the best fit to a particular set of data), by which variation in form is accounted for. Rate appears as a constant (K) in these equations, and because these differ with the form of the equations, another measure is used for cross-equations comparisons: the time required to go from 10% to 90% of asymptotic weight (inverse measure of rate). A table of data is then presented for 105 avian species.

These conclusions emerge from the study: growth parameters exhibit great variability within a species, due to locality and time of nesting. Nutrition and inherited variability may also be important. Species larger than their relatives, and all seabirds, have low growth rates and prolonged growth periods. The shape of the growth curve is not related to the mode of development (i.e., precocial vs.

altricial). Relative growth weights are most highly correlated with adult size. Open nesting birds grow faster than hole nesters of the same size. Oceanic birds with one-egg clutches and tropical species with small clutches have low growth rates. Aerial feeders usually surpass adult weight before leaving the nest, while ground feeders fail to reach it. Some evolutionary hypotheses are discussed at the conclusion of the paper.

I'm a born skeptic. The text says "The components of the growth pattern (form, rate and magnitude) may be described quantitatively by the constants of equations which can be fitted to the growth curves." However, form (as noted above) is disposed of arbitrarily by classifying birds into one of three types of equations. All the equations involve the asymptotic weight as a parameter, regardless of the adult weight of the species. Therefore, the equations do *not* provide a quantitative measure of "magnitude" (fledging weight in relation to adult weight); in fact, they ignore this entirely. Therefore, the equations really only describe the growth rate itself, and even this is not comparable among species that are described by different equations. Therefore, one ends up using the time between 10% and 90% of final weight as the cross-species measure. To be blunt: the equations simply are not useful!

For those ornithologists who are not at home with fitting an equation such as $ae^{-be^{-Kt}}$ to their data, I suggest a simple alternative. Buy some probability paper from Dietzgen or another supplier; convert your weights to percent of the asymptotic values and plot these percentages on the probability axis, versus days since hatching on the arithmetic axis. (Or, if you are familiar with the technique, make a probit transformation of the data.) A ruler laid by eye through the points will give a straight line, the slope of which is the growth rate constant for all species (which is thus based on all the data, and not just the 10% and 90% points). Systematic deviations from the average line provide a measure of the "form" variable discussed by Ricklefs (the magnitude variable can be expressed as a ratio of the final weight to the adult weight). I tried it on some of the data quoted by Ricklefs, and in some cases my line touches more points than his fitted curves.

The assumption of my simple-minded technique is that growth rate as a function of age plots as a normal probability curve (Gaussian, or bell-shaped curve), which certainly is never exactly true. However, systematic deviations from this curve will plot in characteristic ways that will allow judging "form" in a continuous manner, rather than by an initial fitting to one of three arbitrarily chosen equations. The disadvantage of probit analysis is that if the asymptotic values are not available, transforming the data to give the best fit is a laborious task (although not for persons who have access to a computer, since canned programs in the BMD series will do this automatically).

My comments on the decorative equations presented at the outset do not imply any quarrel with the meat of this fine paper. After all, the analysis hardly used the equations.—Jack P. Hailman.

PLUMAGES AND MOLTS

(See also 8, 46, 72, 85)

63. Isolated early molt of the color signals of the head markings in the Garnet and Violet Waxbills. (Die isolierte Frühmauser der Farbmerkmale des Kopfgefieders bei *Uraeginthus granatinus* (L.) und *U. ianthinogaster* Reichw. (Estrildidae).) Jürgen Nicolai. 1968. *Z. Tierpyschol.*, **25** (7): 854-861. (Summary in English.) Color plate of adults and young of *U. granatinus*).—The chicks of these African waxbills molt "those areas of the head which are violet, blue and black in the adults, between the 24th and 35th day after hatching. At this stage they are still dependent on their parents. They have, as a result, the most important sexually dimorphic colour patterns of the adults superimposed on their yellowish-brown juvenile plumage. At the same time the young form stable pair bonds. The complete moult from juvenile to full adult plumage takes place several weeks later.

"The partial early moult evolved as a result of the selection pressure of early pair formation, which is the ontogenetic precursor of the later long-life pair bond.

The juvenile plumage is retained after the growth of sexually dimorphic colour patterns to prevent pair formation between adults, capable of reproduction, and the still immature young."

Although most of the waxbills mate for life, this peculiarly early head molt has not been found in other species of the Estrildinae. The author discusses permanent mating in other birds and finds in the Bearded Tit (*Panurus biarmicus*) an analagous case with these waxbills: soon after fledging, the male's bill turns orange, the female's black; the fledglings become "betrothed" while in juvenile plumage and thereafter live in permanent pairs.—Margaret M. Nice.

ZOOGEOGRAPHY

(See also 11, 68, 70, 84)

64. Fifty years of Soviet ornithology. N. A. Gladkov, and G. P. Dementiev. 1968. *Ornitologiya,* **9:** 3-12. (In Russian.)—It is stated that before the Revolution Russian ornithology, while carried on by some outstanding workers, and productive of several significant publications, was maintained in a comparatively subordinate status in zoological divisions of institutions and expeditions. In recent decades ornithology has become a dominant subject in the general cultural growth of zoology. Prior to the second world war the only serials devoted primarily to birds were *Uragus* and perhaps one or two others published early in the past century. There is still more integration with general zoology than in the West. The chief interests and contributions of about 100 workers are briefly annotated here, their contributions often indicated by date only, an economy little exploited among us. The names Dementiev, Gladkov, Stegmann, Buturlin, Sushkin, Semenov-Tyan-Shanskii, and Novikov, to mention only a few of those more widely known outside USSR, are prominent in more than one field. Many of their contributors to ornithology are vertebrate ecologists, eminent in mammalogy, herpetology, or zoology in general. The issue, within a reasonable time (1951-1954), of the six-volume *Birds of the Soviet Union* (*Ptits Sovetskogo Soyuza*) under editorship of Dementiev and Gladkov ushered in ornithological advances on a widening front, comprising more and more topics: ornithogeography, banding and migration studies, populations and censusing, parasitology and plague transmission, game management, field ecology and biogeocenology, paleornithology, zonal ornithology, systematics and speciation, geographic variation (morphological and ethological), life histories, food habits (particularly of oft-neglected insectivorous passerines), territorialism, bionics, biorhythms and periodicity, relationships to forest shelterbelt culture and fisheries, predation, protection, acclimatization (much more approved there than with us), and attraction, bioenergetics (oft reviewed here in recent years), bioacoustics and acoustic repellants, comparative anatomy and ecologo-morphological studies, and popularizing of ornithology.

Other post-war advances are the, not annual, but at few years intervals, all-union ornithological conferences (at Leningrad, Moscow, Lvov, and Alma-Ata, and attended by even a few American and western European visitors); in addition several Cisbaltic and east Siberian conferences have occurred, also bird sessions in the all-union zoogeographic conferences.

Features more apparent to a foreign observer perhaps are: the increase in number of reserves which maintain bird research staffs and serials for publication of findings; the strong role of their oldest biological scientific society (MOIP) in publication of various research tomes, and ornithological contributions in their ancient serial: *Byulleten moskovskogo obschchestva ispytatelei prirody*; that along with Moscow State University and its museum; the contributions, of the Acadmies of Science, in each of the republics, each with its "izvestiya" and other series; the all-union society of nature conservancy, and the USSR academy of medical sciences also support research. Also, as in this country they have their rugged southwest (Kazakhstan, Turkmeniya etc.) with greatly varied and abruptly transitional life zones, the subject of many ecological studies and striking ethological observations (e. g. the mudnest building nuthatches). Also of concern to ourselves are their reports on nests of our slightly known Murrelets, and occasional reports of North American bird visitors and trans-Siberian migrants.—Leon Kelso.

65. On the ornithofauna of the Volga-Ural Interfluve. E. I. Gavrilov, *et al.* 1968. *Trudy. Zool. Inst. Akad. Nauk. Kazakh. SSR.*, **29:** 153-207.—From observations made in 1956-1961 an annotated list of 105 passerine species is given, with notes on occurrence, habitat, distribution, life history, and behavior.—Leon Kelso.

66. Bluethroat nesting in Scotland. J. J. D. Greenwood. 1968. *Brit. Birds*, **61** (11): 524-525.—The first record of *Luscinia svecica* attempting to breed in the British Isles. The nest with six eggs was often seen, as was the female, but no male was ever observed. The eggs were destroyed by a field mouse or shrew.

This record would seem to "fit in with the recent apparent tendency for Scandinavian birds to colonize Scotland. Redwings *Turdus iliacus* and Wood Sandpipers *Tringa glareola* seem to be well-established breeders; Snowy Owls *Nyctea scandiaca* and Fieldfares *Turdus pilaris* bred in 1967 and 1968; Bramblings *Fringilla montifringilla* have been seen in midsummer."—Margaret M. Nice.

SYSTEMATICS

(See also 39)

67. Behavioural reactions to hyperthermia in *Scopus umbretta* and *Balaeniceps rex*. M. P. Kahl. 1967. *Ostrich*, **38:** 27-30.—When subjected to heat stress the Hamerkop (*Scopus*) reacts by rapid, continuous panting, while the Whaleheaded "Stork" (*Balaeinceps*) reacts by intermittent gular flutter. Since neither excretes on its legs, as Kahl has shown true storks to do (*Physiol. Zool.*, **36:** 141-151, 1963), these species may *not* be closely related to storks, as previously thought.—Jack P. Hailman.

68. Geographic populations of the Mallard in the USSR. T. P. Shevareva. 1968. *Ornitologiya*, **9:** 249-269. (In Russian.) 2 maps, 9 tables. In European USSR Mallards comprise about a third of the total bag of waterfowl; and in the Asiatic portion of the country about a fourth. In the more densely (human) populated localities they constitute 45-93% of the total waterfowl shot in the fall hunt; and about 65% in the spring. In what is a major study in the practical application of bird-banding in conservation, based on 3,014 banding returns, nine distinct Mallard populations are recognized: (1) The northern population, breeding on shores of North and Baltic Seas, wintering in England, Belgium, Holland, Germany, Sweden, France, and Switzerland (based on 939 returns); (2) the western population, nesting in the Kaliningrad region, Lithuania, and White Russia, wintering inland from south Germany and Switzerland to the western Balkan Peninsula area; (3) The central population, breeding southward of Upper Volga to Ukraine, wintering in the Balkans, chiefly Bulgaria; (4) The eastern population, in Komi, Kirov, Tatar, and Bashkiri areas to Saratov, and Orenberg regions, wintering eastward from the Black Sea to Georgia and Armenia; (5) The southern population, in the Ukraine, Rostov, Stauropol, Krasnodar, Kalmyk, and Astrakhan regions, wintering locally, no distant migrations; (6) the west Siberian population, breeding range uncertain, wintering from Turkmenia to south Kazakhstan, western Pakistan, and Kashmir; (7) the east Siberian population, breeding range uncertain, wintering in east Pakistan, China, and Indo-China; (8) the Far East (Daln-Vostok) population, Lena River to Kamchatka, wintering in Japan; and (9) the Primor population, Amur River and Primor regions, wintering in Korea.

It is believed that while their migration routes and wintering ranges frequently intersect, mass mixing of populations is prevented by strength of individual attachment to the home flock, about 90% of the flock returning to the area where born. Others (10% or fewer), in fall or winter, pair with alien flock members; this flock-to-flock interchange, it is believed, has prevented any subspeciation anywhere in the vast Eurasian expanse. A mass of additional interesting information is here recorded.—Leon Kelso.

69. Are territorial attachments of river ducks persistent? A. M. Cheltsov-Bebutov and A. K. Koshkina. 1968. *Ornitologiya*, **9:** 13-26. (In Russian).

—This article takes a stand contrary to that assumed in "Geographic populations of the Mallard in USSR", (see review **68**). It puts forth the belief that fewer individuals of such wide-ranging species as the Mallard and Shoveller remain constant to their area of origin from year to year than commonly supposed. Many pair and disperse among distant populations, this continual mixture preventing the evolution of subspecies.—Leon Kelso.

70. On the distributions of the *argentatus* and *cachinnans* populations of the Herring Gull. (Zur Verbreitung der *argentatus*- und *cachinnans*-Möwen.) P. Voipio. 1968. *Ornis Fenn.*, **45** (3): 73-83. (In German, with summaries in English and Finnish.)—The systematics of the *Larus argentatus* group of gulls is complex, especially in Europe. The nominate race occurs in northerly areas, apparently having spread from the west. The form known in Europe as the Lesser Black-backed Gull. (*L. a. fuscus* or *L. fuscus*) is also northerly, and apparently has come from the east. A southern form, once thought to be a separate species called the Yellow-legged Gull (but now considered to be *L. a. cachinnans*), occupies more southerly parts of Europe. Voipio reviews the status of this latter form in Scandinavia, where it breeds in eastern Fennoscandia and the coasts of the Arctic Ocean. He feels that the yellow foot-coloring must come from the southern *cachinnans* populations (not *de novo* from Fennoscandian populations,) and that the two types of Herring Gulls in the north intergrade.—Jack P. Hailman.

EVOLUTION

(See also 28, 39, 50, 69, 84)

71. The Advantage of Being Parasitized. Neal Griffith Smith. 1968. *Nature*, **219** (5155): 690-694.—This is an exciting paper! The Giant Cowbird (*Scaphidura oryzivora*) of Central and South America is a nest parasite on colonial oropendolas and caciques. Smith studied parasitism of the Wagler's Oropendola (*Zarhynchus wagleri*) and the Yellow-rumped Cacique (*Cacicus cela*) in Panama, along with two other species of oropendola occurring less commonly there. The photograph of figure 1 is hard to believe: it shows eggs from three different colonies of Wagler's Oropendola and next to them perfect egg mimics from the cowbird. The differences between oropendola colonies in egg markings is very great, yet the mimic's eggs match those of the colony exactly. The figure also shows the phenomenon for two colonies of the cacique, plus an egg and mimic from a different species of oropendola. Lastly, the figure shows the nonmimetic egg laid by some female cowbirds.

Caciques nest in joint colonies with one species of oropendola, and in each such colony females of the Giant Cowbird lay three types of eggs: a cacique-like egg, an oropendola-like egg and what Smith calls a "dumper-type" egg. Female cowbirds laying mimetic eggs sneak around the colony and lay one egg in a nest with one (sometimes two) host eggs (always choosing the correct host, of course). Female cowbirds laying the "dumper-type" nonmimetic eggs add to any-sized host clutch, and lay as many as five nonmimetic eggs. These incredible adaptations among the cowbirds seems only possible upon realizing that particular colonies of hosts are extremely stable, several sites in the Canal Zone known to have been used for at least the last twenty years. During two years, 173 nests at two sites reared an average of 111 cowbirds per year! (This phenomenal success only begins the story.)

By placing model eggs in host nests Smith discovered that there are two kinds of cacique-oropendola colonies. Either all female caciques and oropendolas throw out nonmimetic cowbird eggs within five minutes (discriminators) or they accept them (nondiscriminators). Males in the discriminator colonies chased cowbirds away; those in other colonies did not. Discriminator colonies had little variation in their own eggs, while nondiscriminator colonies had much intraspecific variation. Both colonies accepted mimetic eggs. The plot thickens.

Massive chick mortality in colonies of the host is due to a botfly which places its eggs or larvae on the host chicks. The larvae burrow into the chicks, and chicks with seven or more larvae usually die. When placed near colonies of wasps or biting bees, the colonies of caciques and oropendolas suffered relatively little botfly parasitism, since the other insects prey on the botflies. Host colonies not having wasps or biting bees either had massive mortality (383 of 424 chicks) or very little (57 of 676). The latter kind are parasitized by the cowbird, but the former are not. It turns out that the cowbird chicks preen the host chicks in the nest (never vice versa) and thus remove the botflies! Almost all of the 57 cases of mortality are explained by having two host chicks, which is more than the cowbird chick can effectively preen, or by having a host chick that hatched out well before the cowbird chick. A selective advantage of the dumping-type cowbird probably lies in the fact that two cowbird chicks in the same nest will preen one-another, and thus be free of the botflies, whereas single cowbird chicks cannot preen themselves so effectively.

Smith's figures demonstrate that if a cacique-oropendola colony has no wasp-bee protection, it rears more young by having cowbird parasitism; but, if it has the insect protection against the botfly, then it rears more young by rejecting the cowbirds. Hence discriminator and nondiscriminator colonies. There are many other interesting sidelights in this fine report. Smith carefully weighs the advantages and disadvantages of depending upon wasp-bee protection versus cowbird protection. Lest any Thomas doubt the intricate interplay of adaptations let him read this paper. Wow!—Jack P. Hailman.

72. Social mimicry; character convergence versus character displacement. M. Moynihan. 1968. *Evolution,* **22** (2): 315-331.—Moynihan predicts that in addition to character displacement a second evolutionary tendency may be acting that will tend to emphasize morphological and behavioral similarities, this being referred to as social mimicry (any resemblances that are special adaptations to facilitate social reactions among species). This phenomenon is thought to be of significance in certain social situations and is advantageous in that it lessens the problems of interspecific communication in these groups; thus, an individual can display rapidly and with little difficulty to a variety of species without maintaining an inordinately large repertoire. The behavioral mechanisms involved are thought to have arisen from pre-existing intraspecific patterns. This phenomenon is illustrated with certain social groups of birds. Some unrelated species that appear together in groups are considered more similar both in plumage and vocalizations than would be selected by chance. For example, there is a strong tendency for different species of highland mixed-species flocks in Central America to be black or yellow and for certain groups in the Andes to be blue. Since convergence is thought to be involved, the closeness of similarities in such groups would be related directly to the amount of time in which this relationship had existed, with situations of extreme similarity being the oldest. It should be pointed out that many of the factors favoring similarity in sympatric populations of different species can be considered as similar adaptations to the same parameters of the environment (*e.g.* to the same predator, food sources, etc.).

This paper is largely of a theoretical nature, and data in many cases are very limited, if available. Where available, they are in the nature of examples, rather than of a comprehensive survey. Moynihan himself freely acknowledges these difficulties. While no data may be presented to refute the idea, his postulation that one may trace some chains of resemblances over hundreds of miles and through several dozen species certainly falls into the realm of speculation. In another case he makes a point that plumages of a group of honeycreepers have not changed noticeably in approximately the last 150 years and that the frequency of interspecific fighting has not noticeably decreased over the last three years. If evolutionary changes are involved one would not predict such rapid changes, though it is granted that they would be possible.—Douglass H. Morse.

FOOD AND FEEDING

(See also 41, 45, 82)

73. The feeding biology of sea-bird species breeding on the Farne Islands, Northumberland. T. H. Pearson. 1968. *J. Anim. Ecol.,* **37:** (3) 521-552.—The feeding ecology of several species of seabirds—Arctic, Common and

Sandwich Terns, Kittiwake, Lesser Black-backed Gull (all surface feeders); Puffin, Guillemot, Shag and Cormorant (all divers)— was studied during the breeding season. Pearson is concerned about problems involved with analysis of stomach contents of collected birds and instead utilizes food items brought by adults to feed young. (He does not account for the fact that adults may eat items different than those that they feed the young.) Prey items were identified from food regurgitated by adults or by their presence in adult bills. In all cases, fishes (particularly Ammodytidae or sand eels) formed the major part of the birds' diets, and their breeding season coincided with the peak of prey abundance. Surface feeders on the whole take smaller items in relation to their body weight than do divers. Nevertheless, there was considerable overlap. The divers can be separated into ones that feed on mid-water forms, mid-water and bottom living forms, and mid-water and surface forms.

These species also feed in different horizontal areas. Maximum possible distances foraged from the nest were calculated by measuring the time that individuals were away on fishing trips—these suggested a considerable difference in the distance (or at least time) traveled to gather food. The larger a bird is on the whole, the less time will be taken up in feeding young. Thus, in the case of declining food supplies, large birds would have considerably more flexibility than smaller ones, which would be able to fledge fewer young than usual. In species that spend only a fairly small part of their time feeding young, only one parent usually forages at a time, with the other remaining at the nest.

Pearson feels that none of the species, with the possible exception of Arctic and Common Terns, were exploiting their full feeding potential while rearing young. Hence, there was little or no starvation of young. However, if food should become less abundant, the differences that exist in feeding would minimize potential competition. The species studied spread out widely over the ocean during the winter, and perhaps this is an indication of their period of limitation.—Douglass H. Morse.

74. Comparative features of the food of Tetraonids and Phasianids in the USSR. M. A. Kuzmina. 1968. *Trudy Inst. Zoologii. Akad. Nauk, Kazakhskoi SSR,* **29:** 76-152. (In Russian.)—This, the most up-to-date review paper on the Galliformes of the slavic countries, and very desirable for any library on the order, provides a review of the literature on their eight species of tetranoids and 13 species of phasianids, totaling 151 titles. Included is a table of the biochemical composition of many important plant foods, and a list of the Slavic common names of plant foods matched with their scientific names. Seasonal changes in nutrition are more clearly marked in the tetraonids. Especially distinctive is their winter food which is more ligneous, i.e. of twigs, while phasianids are more herbivorous. Summer food of tetraonids is more generalized; phasianids are more selective. In the fall phasianids take their maximum quantity of nutrition; tetraonids increase their intake seasonally only in far northern areas. The main winter foods of tetraonids are rich in cellulose and fats, with little protein; in phasianids the more herbaceous winter food is more nutritious, but the supply is limited and they often starve. The summer foods of both groups, with the exception of the Ulars, *Tetraogallus,* are quite nutritious and contain much animal and vegetable protein. A principal factor in the nutritional features of the tetraonids is the snow cover, which necessitates their taking coarse ligneous foods. The food differences between the tetraonid and phasianid families are reflected in their anatomy, primarily in the structure of their digestive organs, bill, and feet.—Leon Kelso.

75. Foods of the House, Spanish, and Tree Sparrows in the foothills of Kopet-Dag. A. F. Kekilova. 1968. *Izvestiya Akad. Nauk Turkmenskoi SSR,* ser. biol., **1968** (4): 74-79. (In Russian.)—The Asiatic tendency to fewness of species with abundance of individuals and high population pressure is reflected in a study of *Passer domesticus, P. hispaniolensis,* and *P. montanus,* which form large colonies in cultivated areas, inflicting damage to cereal crops. Colonies totaling 630 individuals located 100 m. from wheat fields for example damaged 84% of the heads in an 8 m^2 plot. Most harm was done to grain in the milk stage. However, contents of 73, 33, and 18 stomachs of the House, Spanish and Tree Sparrows, respectively, showed a high percentage of insects.—Leon Kelso.

SONG AND VOCALIZATIONS

(See also 77, 78)

76. A survey of birds' music. K. C. Halafoff. 1968. *Emu.* **68**(1): 21-40.—The paper deals mainly with the questions: "(a) does bird song appear to have all the features of music and, if so, (b) how does that music compare with our own"? The author presents a summary of the opinions of several ornithologists on the musical qualities of bird song and a review of the general characteristics of bird song in musical terminology. He concludes that most bird song "appears to be based more on different glissando [slurring] effects and of their combination with sustained notes, while in human music sustained notes are prevalent and glissando passages are comparatively rare". Birds' music and human music are compared in terms of tempo, harmonics, voice range, and hearing. The birds are superior in all cases. The author feels that it is a grave mistake to consider only the biological significance of bird song and ignore its musical and aesthetic aspects. The article contains 17 sonagraphs of the songs of 9 different species of birds.—Judith E. Donmoyer.

PHOTOGRAPHY

(See also 22)

77. Studies of less familiar birds. 151. Red-spotted Blue-throat. J. J. Ferguson-Lees. 1968. *Brit. Birds,* **61**(11): 525-526.—Five distinguished photographers have contributed eight photographs of this engaging species *Luscinia s. svecica* taken in Scandinavia. The brief text states that in the Arctic this bird's "rich and varied song, surpassing that of the Nightingale, *L. megarhynchos,* is one of the dominant sounds." In winter both sexes sing.—Margaret M. Nice.

RECORDINGS

78. The Beatles. Produced by George Martin. 1968. Emi Records (The Gramophone Co. Ltd.), Hayes, Middlesex, England. SWOB-101. Stereophonic. $11.98 list.—Band 3 on side 1 concerns the Blackbird, which clearly refers to the thrush *Turdus merula* of Britain, and not to the American icterids bearing the same common name. Although the four sides of this recording album are of generally clear quality, the blackbird song seems fuzzy by comparison with the rest—as if it were merely an imitation by an extraordinarily skilled human mimic. The snatches of song are too short to provide an accurate auditory picture of the versatile turdid, and the recording is marred by singing in the foreground. Mammalogists may be interested in band 4 (Piggies) and band 5 (Rocky Racoon), although it is difficult to discern the animal sounds in the latter. The omission of scientific binomials throughout is to be regretted. Although this record is possibly of use as an auxiliary recording to indicate the extreme of variation in the song of *T. merula,* the beginner should seek more standard ornithological recordings for his introduction to this marvelous songster.—Jack P. Hailman.

BOOKS AND MONOGRAPHS

(See also 44)

79. Animal Behavior in Laboratory and Field. Allen W. Stokes (ed.). 1968. W. H. Freeman, San Francisco. 198 pp. Total price not indicated. Individual exercises available as separates at 25c each.—This is the long awaited laboratory manual for an ethology course, prepared by Allen Stokes when he was the Chairman of the Education Committee of the Animal Behavior Society. The manual contains 42 exercises written by a couple of dozen different authors. Since each exercise can be purchased as a separate for classroom use, we will note here specifically those exercises dealing with birds, which might be used in either a course on ethology or one on ornithology.

The first chapter is Peter Marler's fine elementary instructions on how to watch, describe and experiment upon animals. The second chapter by William H. Calhoun entitled "the observation and comparison of behavior" begins by ignoring Marler's caution about prejudging behavior by terms, in that Calhoun calls every behavior pattern a "response." The basic study described is a so-called open-field, meaning one puts a rat in a box and notes where he defecates (Calhoun asks us to count the number of boli). One could learn far more by way of introduction to behavior by watching house sparrows or starlings from the laboratory window.

The second unit of the manual is on nonsocial behavior. Dietland Mueller-Schwarze's chapter is on locomotion in animals, by which he means arthropods and mammals. The basic principle that underlies both insect and mammal walking (i.e., keeping a supporting triangle of legs on the ground at all times) is never even mentioned, and one must procure films of horses in order to do most of the exercise. Flight and swimming are completely ignored. John King's following chapter rectifies this with a good simple exercise on insect flight. Then follow chapters on optical orientation in fly larvae (Jennings and Clack), pheromones and ants (Kanzler), dancing in bees (Rettenmeyer), schooling in fish (Keenleyside), wall-seeking in mice (Brukbaer), geotaxis in mice (Thiessen and Lindzey), visual alarm reactions (Hayes) earthworms (Ratner and Gardner), cockroaches (Hawsley), milkweed bugs (Caldwell and Dingle), and hoarding in rats (Mueller-Schwarze).

Chapter 16 by Marler is the next to deal with birds. First, the student observes day-old chicks or ducklings in a glass enclosure, making notes on their calls and movements. Then individuals are given various stimulus-objects such as companions, food, noises, etc. Then hormone pellets are implanted and the birds are observed for morphological and behavioral changes the next week. Finally some simple colored disks are presented to illustrate color preferences in feeding (with ample warning to the student about the uncontrolled aspects of hue, saturation and intensity). I do a similar exercise in my own course, and it all works beautifully. Chapter 17 is on visual discrimination in birds (adult chickens), by Martin Schien. A simple two-choice feeding box allows conditioning to stimuli.

Unit III is on "social" behavior, and includes mating in fruit flies (Marler and another chapter by Lee Ehrman), crickets (Dingle), sticklebacks (Muller-Schwarze), anabantid fish (Southwick), frogs (Carpenter), and lizards (Carpenter). Marler's chapter 25 is on Zebra Finches, based on the excellent studies of Morris and Immelmann, and his chapter 26 is somewhat similar, but on ring doves. Editor Stokes wrote chapter 27 on chicken behavior, and Mueller-Schwarze wrote chapter 28 on mobbing in birds using a stuffed hawk in the field (we do this experiment at Maryland, and it works very well). Chapter 29 on courtship in Japanese Quail (Calhoun) is another alternative for chapters 25 and 26. The next four chapters are on rodents (Southwick, Calhoun, McGill and Diamond).

Unit IV is on development and learning, and thus does not seem consistent with the organization of the manual to this point, based on a functional classification of behavior. Gottlieb's fascinating chapters 34 and 35 require manipulations with chick embryos, which might prove too difficult for beginning students or too expensive for many courses, but which should be tried if possible. Studies of fish are provided by Delorge and Marler. Schein's chapter 38 is on social integration in birds, and overlaps with Marler's exercise on day-old chicks. Schein then presents an exercise on dust-bathing in birds, in which one group is denied early opportunities for dust-bathing. Klopfer's chapter 40 is on imprinting; this has worked with only moderate success in my course due to the large samples required to show an unambiguous result. Klopfer's next chapter is on effects of social experiences in birds. The last chapter is on maternal behavior in mice (Whalen).

The final glossary (Guhl and Schein) is certainly the worst part of the book (despite the fact that this reviewer's own words are quoted therein). The beginning student will hardly profit from the definition of classical conditioning as "learning that takes place when a conditioned stimulus is paired with an unconditioned stimulus" since neither kind of stimulus is defined and the definition of learning offered is too general to help. The definition of "instinct" is based on a completely unsubstantiated pious hope that the physiological mechanisms underlying stereotyped behavior are fundamentally different from those underlying variable behavior, and the definition offered fails to communicate to the student any of the other hundreds of different meanings for this overworked and nearly useless term. And the definition of "animal behavior" as "any reaction of the whole organism" leaves more than a little to be desired.

This manual is a brave undertaking, which comes off reasonably well. A heavier editorial hand in the write-ups would have improved individual exercises, and an index would certainly have been helpful. Unfortunately, there is no exercise on the selective pressures on behavior, or even on the evolution of behavior. I made a game of rating teachers by their writeups: my list will remain a closely guarded secret.—Jack P. Hailman.

80. Alps and Savannahs. (Fjäll och savan.). Kai Curry-Lindahl. 1968. Natur och Kultur, Stockholm. 266 pp., illustrated. Price: 44:50 Sw. Kr.—This is primarily a collection of essays on nature in various parts of the globe from the high arctic of Europe to the deep south of Australia and New Zealand, from Africa to the Americas. Some of these have been published before, others are new, all are written with the author's usual facility of expression and keen feeling for the environment in all its aspects.

Against this background the author presents his studies of land preservation on a global scale. His highly informed and logical conclusions reveal some startling facts that are not only well worth serious study but also eventually may give a different direction and a more realistic impetus to the present frustrated concepts of conservation.

"Since the declarations of independence of the countries in tropical Africa, American and European delegations have inundated them, offering huge sums for specific projects. Unfortunately few of these projects have taken into consideration certain elementary basic prerequisites, because agronomists and economists have neglected to consult the ecologists." "The interplay between vegetation and fauna from the small termites to the large mammals is one of the contributing elements for the existence of the savannahs. The seasonal migrations of the herbivores . . . create a shift cultivation of the grasslands, a partnership between plant and animal life. These continuous migrations do not suit man and his cattle, who do not migrate until the soil has been transformed into a sterile naked surface ready to receive the coup de grace of erosion." Enormous responsibility rests upon the shoulders of modern technologists, especially in the matter of land use. The immediate and constant collaboration between the agronomist, the geologist, the engineer, the sociologist (anthropologist) and the ecologist is essential. Without this close cooperation and consultation—which instead of confining the scope to narrow specialization adds width, breadth, background and vision to the projects—the technologists may soon greatly contribute to the annihilation of what there is left of earth sustaining highest potential productivity. This, in all its facets, is the main theme of the book. This is the new conservation breaking through, concerned not with local interests alone but global, not with the enjoyment and recreation of man only but directly with his survival.—Louise de K. Lawrence.

81. The Zoological Record: Aves (Volume 102 for 1965). O. M. Theobald. 1968. Zoological Society of London. 212 pp. 60s.—It runs late, but it is so helpful. For those who have not seen recent editions, the Aves section of *Zoo Record* is now organized like this: first comes a list of full bibliographic titles (about 100 pages), then a subject index to that list, a distribution index, and finally a systematic index. We can all make *Zoo Record* more valuable by sending a copy of each published paper to the Editor at Regent's Park, London, N. W. 1, England.—Jack P. Hailman.

82. Avian Physiology. (Fiziologiya ptits.) A. Sevastyanov, and A. D. Slonim, editors, 1967. A joint publication of Akademiya Nauk USSR, and Akad. Nauk Esthonian SSR. "Valgus" Publishing House, Tallin, Esthonia. 267 pp. (In Russian.) 1 rouble, 37 kopecks (about $2.00 U. S.)—Herein are published the proceedings of the All-Union conference on the physiology of birds convened at Tallin, Esthonia, Sept.-Oct., 1965. Following an introductory outline on purposes of research on ecological physiology of birds by A. D. Slonim, there are 5 chapters comprised of 44 articles by participants at the conference. Chapters 1, Physiology of embryo and early post embryo development (8 articles); 2, Metabolism and physiology of digestion (10 articles); 3, Thermoregulation (11 articles); and 4, Physiology of reproduction (7 articles), while presenting definite research advances, have domestic fowl and ducks as their study material and are thus in the realm of poultry science. Principles of adaptive modifications for heat metabolism in birds and mammals, by I. A. Shilov (p. 119) is of special theoretic interest; it would even include migration, construction or adoption of shelters, gregariousness, and food storage among adaptations in the annual heat economy. Chapter 5, Physiology of migration (8 articles) is of broader significance: The need of collaboration of ecologists and physiologists in the study of avian migratory behavior, by E. V. Kumari (like other cooperative needs, much more discussed than achieved); the migratory state theory for birds, by V. R. Dolnik; Geographic differences in the formation of daily migratory rhythms of bioenergetic processes in the Chaffinch and Willow Warbler on the Cisbaltic, by T. I. Blumenthal; Bioenergetic adaptations of passerines to wintering at high latitudes, by V. R. Dolnik (repeats the discovered paradox of lowest metabolic rate in forms farthest north); The fall migratory state in the transient race of the House Sparrow, by Dolnik; Evocation by colors of the conditioned feeding reflex in birds, by N. V. Vinogradova; Avian orientation in winter while in a photostimulated migratory state, by M. E. Shumakov; and An analysis of the functional states of avian skeletal musculature, by I. A. Ler. All are present advances in research, and have been published elsewhere in part (e.g., Cisbaltic Bird Migration, reviewed in *Bird-Banding,* **39:** 237, 238, 1968).—Leon Kelso.

83. Bird Navigation. G. V. T. Matthews. 1968. Cambridge Monographs in Experimental Biology, No. 3. 2nd edition, Cambridge University Press, 197 pp. Price $7.00 Cloth, $2.45 Paper.—Although labelled as a second edition of Matthews' 1955 book of the same title, this is actually a completely revised and re written monograph, a thorough survey of the literature on bird navigation down to early 1968, with a bibliography of over 500 titles. Since 1955 there have been two major discoveries: the use of star-patterns for orientation by nocturnal migrants, announced (with damaging over-enthusiasm) by Sauer in 1957, and recently confirmed by Emlen; and the phenomenon which Matthews terms 'nonsense' orientation—the adoption of a single compass bearing by birds released away from home, whatever the direction of displacement. Using some adroit (and in places subjective) arguments, Matthews succeeds in dismissing these discoveries, and some other more minor or controversial phenomena, as irrelevant to the main problem. The stars, he argues, are used only as a compass, not to determine position; the main importance of nonsense orientation, whatever its significance in the life of the animal, is that it complicates experiments. Matthews claims that nonsense orientation has affected the results of all experiments on homing except his own early work with pigeons and shearwaters; yet these experiments do not really meet the more exacting standards of experimental design which are required in present-day work. He uses the term 'control' in a very loose sense, and his treatment of statistical analysis (in a field whose history is replete with statistical errors) is disturbingly subjective: only one statistical test is described in the whole book, and that is inappropriate to the problem that is examined.

Matthews finally restates his original theory of navigation (1951-53) that birds determine their latitude and longitude by observing a small portion of the arc described across the sky by the sun, and extrapolating it to determine the zenith of the arc. Work since 1955 has made a theory of this type seem less improbable: homing experiments suggest that birds are unable to 'navigate' within 25-50 miles of home, and measurements of visual discrimination and of internal clocks (most of the critical experiments relating to invertebrates rather than to birds) indicate surprisingly high discriminatory powers. However, Matthews has still not clarified the visual discrimination required by his theory: to extrapolate a curve requires measurements not only of position and slope (Pennycuick's theory) but also of *curvature,* and this would require extremely accurate measurement.

Two opening chapters review observations (9 pages) and experiments (12 pages) on wild migrants. It is perhaps true that such studies yield little positive evidence for mechanisms of 'navigation', but the negative evidence seems too hastily dismissed. It is still only an article of faith that homing of pigeons, which is the real subject of this book, has any relevance whatever to bird migration. Even if the mechanisms should prove to be the same, the evidence is mounting that wild birds do not use them in a straightforward way.—I. C. T. Nisbet.

84. Extinct and Vanishing Birds of the World. James C. Greenway, Jr. 1967. Dover, N. Y. 520 pp. $3.50 paperback.—Since Dover reprints only "classics" it seems safe to say that "Greenway", as the book is called, has become classic in less than a decade since its original publication in 1958. The reprint has a short new preface, some added notes throughout, and additional references at the end. For those who missed it the first time around, the book has a brief explanation of species and subspecies concepts and an introduction that acts as a summary as well (lists birds that are extinct, probably extinct, known only from bones, hypothetical, have small populations, and are rare but in no immediate danger). After this follows the section of the geography of extinction, with emphasis on specialized insular forms, and then the species accounts of extinct and vanishing birds. There is a fine bibliography and an appendix of museums in which specimens of the extinct forms are located. The index does not come last between the covers, since Dover partakes of its usual annoying habit of putting several pages of ads for books after the last page of the index.

The new preface sums up changes between 1954 (when the original manuscript was completed) and 1967. Six birds thought to be extinct have been found again (Eskimo Curlew, Australian Scrub-bird, Eyrean Grass-wren of Australia plus three subspecies of flourishing species). One species (Huia of New Zealand) and four subspecies bit the dust in the intervening years. I suppose that is as good as we can hope for.—Jack P. Hailman.

85. Birds of the Atlantic Ocean. Paintings by Keith Shackleton and text by Ted Stokes. 1968. Macmillan, N. Y. 156 pp. $12.95.—Those of us who love seabirds welcome any new volume. It is no accident in this one that the artist is listed first on the title page, for it is best considered a book of illustrations with an accompanying text. Fifteen oil paintings of single species and 23 plates of drawings in gouache illustrate the penguins, albatrosses, petrels, shearwaters, storm petrels, tropic birds, pelicans, gannets and boobies, cormorants, frigatebirds, phalaropes, skuas, gulls, terns, skimmers, alcids and other birds of the entire Atlantic Ocean.

The illustrations are good, and for the most part quite accurate (although I have never encountered a Franklin's Gull having a yellow tip to its red beak—and I've examined hundreds of specimens). The drawings are of the type we have become accustomed to in field guides and handbooks, with more attention given to accuracy than artistic setting; I like these better than the full oils of single species. (This is no field guide, however; it measures nearly a foot square). There is no cross-reference from text to illustrations, which is occasionally annoying. If one turns to page 142, which begins the text on skimmers, he finds a full color plate of alcids on the opposite page, with a diagram of the plate on the text page; the next page ends the text on skimmers, but still no pictures of skimmers! The sharp-eyed reader will remember the oil of the black skimmer on p. 139, but is unlikely to recall the head of the African skimmer in the lower left corner of the plate of terns back on page 135!

The accompanying material consists of a description and a range map for each species. As is to be expected, the maps leave something to be desired. The Laughing Gull's range in the Pacific part of the map is entirely omitted (whereas the Franklin's Gull is shown in the Pacific on the adjacent map). Some maps (e. g., Arctic Skua, Fairy Prior, Shy Albatross) have strange, unexplained gray arrows protruding from the range shading. The Magnificent Frigatebird's illustrated range does not go north of Florida (I've seen the species in North Carolina), whereas the Brown Pelican is shown going to Nova Scotia! The *breeding* range of the latter species is shown only as far north as Georgia, yet Brown Pelicans breed in North Carolina. The Olivaceous Cormorant is shown breeding throughout the Gulf of Mexico, across the whole peninsula of Florida, and throughout the Caribbean, including the Bahamas. Surely, it breeds only as far north as the southern tip of Texas! And as far as I can determine, this species is not even seen east of western Louisiana. When does an inaccuracy become an outright mistake?

The text, written by a Commander retired from the British Navy, is certainly the weakest aspect of the book. He says frankly "I have never seen many of the birds featured in this book." However, first-hand familiarity is not necessary for clear exposition. We are told that the Laughing Gull lays "from April to July, depending on the latitude of the colony." *How* does the egg date depend upon latitude? The author apparently has little familiarity with evolutionary theory, and his ignorance makes him antagonistic. We find such statements as "to make up to the twenty-five recognised species of Atlantic gull (sic), the original ancestral stock did not exceed more than about four recognisable super species." If Stokes really does understand what a superspecies is, he fails to enlighten the reader. And does he understand what a species is? "The ways of scientists are indeed difficult for the mere layman to understand." Birds sometimes look the same and are called different species "yet no one doubts that (the north European man and the pigmy) are merely race variations of the species *H. sapiens*." If you like anthropomorphic descriptions of birds, attend to the Herring Gull which "is one of the most evil scoundels of all birds . . . Nothing is too despicable for the Herring Gull." And some of the writing is simply poor: "The name [of the Adèlie Penguin] is derived from Madam Adèlie Durville, after whom the bird was originally named."

It is unfortunate that the illustrator, Shackleton, did not write the text, for his preface is the most literate of its kind I have read: "A fickle task-master, the ocean has guided a trend of evolution for those who live off her bounty, with scope enough to make the flightless penguin equally as successful an animal as the long-winged albatross." And the masterful Shackleton sums up for us his subjects: "They bewitch us and humiliate us with their unassuming mastery of wind, water and whereabouts. They provide inspiration and example for mariners and aeronauts alike, but that is not all. Since man first ventured into their domain they have offered the solace of live company and visual delight where their need is greatest."

Buy this book, read Shackleton's preface, marvel at his illustrations, but forget the text.—Jack P. Hailman.

86. Wildfowl 19. G. V. T. Mathews and M. A. Ogilvie. 1968. Wildfowl Trust, Slimbridge, Gloucestershire, England. 172 pp. $2.50 paperback.—*Wildfowl* 19 is the continuation of the old *Wildfowl Trust Annual Reports,* which went 18 volumes. The new issue contains 18 papers (some of which are noted elsewhere: see reviews **8, 16, 36, 38, 45, 46**), an editorial, some miscellaneous reports, and the annual report of the Trust. It is an attractive volume (the cover painting and drawings by Peter Scott help greatly), and yet a scientific one too. It contains magnificent photographs. Some of the contributions lack summaries, an omission that is tantamount to criminal in the modern age of information explosion. And lest Americans get confused, "wildfowl" means only ducks, geese and swans, not all wild fowl. The new publishing concept is a good one, and we shall await *Wildfowl* 20 with anticipation.—Jack P. Hailman.

NOTES AND NEWS

The Bowdoin Scientific Station (Kent Island, Grand Manan, New Brunswick, Canada) offers facilities for research, on colonial sea-birds in particular. Visitors not planning research are welcome, if space permits. Inquiries may be addressed to the Director, Prof. Charles E. Huntington, Dept. of Biology, Bowdoin College, Brunswick, Me. 04011.

NEBBA dates to bear in mind: a spring field meeting on June 21 and 22, 1969, in Litchfield County, Conn. (centered at the White Memorial Foundation); the annual meeting on November 8th, again at Drumlin Farm in Lincoln, Mass.

NEBBA now has 18 types of mist nets in stock, including tethered types, corresponding to all standard types except type B. The quantities in stock vary greatly. While NEBBA makes immediate shipment on over 99% of all orders, we regret that we cannot guarantee immediate shipment across the board. Inquiries or orders should be directed to: Mr. E. A. Bergstrom, 37 Old Brook Road, West Hartford, Conn. 06117.

The Manomet Bird Observatory has started a membership drive. The Observatory has been offered 18 acres of land (with a quartermile of shorefront) with a house for headquarters, 44 miles south of Boston, in a natural concentration spot for migrants. The Observatory will serve as an educational center for en-