REVIEWS

Wishbones for Wetmore: Olson, Storrs L. (Editor) 1976: Collected Papers in Avian Paleontology Honoring the 90th Birthday of Alexander Wetmore. *Smithsonian Contributions to Paleobiology* 27, 211 pp., illus.

This *festschrift* for America's greatest ornithologist contains eighteen research papers on fossil birds. They are prefaced by a portrait and by appreciations by S. Dillon Ripley (Secretary of the Smithsonian Institution), Delacour (" one of the few ornithologists of our generation still alive ") and the editor, whose article appraises the current status of the study of fossil birds and Wetmore's great and sustained contribution thereto, and are followed by a list of his 155 papers on the subject and an index of fossil birds named in them. Comment here is largely devoted to papers of universal interest and to one of special relevance to New Zealand.

J. H. Orstrom discusses hypothetical anatomical stages in flight evolution from *Archaeopteryx,* which he believes could not fly (despite its well developed flight feathers, emphasized by Bernard Tucker (1938) in a scholarly paper, not cited by Orstrom, in *Evolution. Essays . . . presented to Professor E. S. Goodrich,* ed. G. R. de Beer, Oxford). Consistently (and in contrast to de Beer's interpretation of 1954 in his British Museum monograph *" Archaeopteryx lithographica,"* 68 pp. London) Orstrom maintains there is no evidence for an ossified sternum in *Archaeopteryx,* implying that it was cartilaginous, probably not carinate, and perhaps membranous. The skeletal characters of *Archaeopteryx* are interpreted as placing " the hands and their activities directly in front of and *above* the animal " suggesting climbing and prey-catching. Orstrom argues that there is no compelling evidence for *Archaeopteryx* being arboreal, the anatomy appearing adapted for ground-dwelling activities, a return to the views of Nopsca (1907, *Proc. zool. Soc. Lond.:* 233) which allowed P. R. Lowe (1928, *Proc. zool. Soc. Lond.:* 185) to suppose the Ratites to be primitively flightless terrestrial and cursorial birds. Orstrom supposes *Archaeopteryx* was insectivorous (" almost certain "), grasping its prey " in the hands or snaring them beneath the forelimb plumage." " The original advantage behind the enlargement of the contour feathers of the forelimb was to enhance insect-catching skills " (but if so why should the whole Class Aves have abandoned this forelimb function after flight was learned ?). Thus the " remiges " of *Archaeopteryx,* " diastataxic " as in flying birds (according to H. Steiner 1918, *Z. Naturw.* 55: 221) are explained as serving quite a different function, before flight was accomplished. There is still much food for thought in *Archaeopteryx,* some meat left on this chicken.

P. D. Gingerich (" Evolutionary Significance of the Mesozoic Toothed Birds ") has confirmed that the Upper Cretaceous *Hesperornis* had toothed jaws and a palaeognathus palate, a condition shared with ratites and certain dinosaurs, and was thus intermediate between dinosaurs and typical birds. He thus rejects Cracraft's view (1974, *Ibis*

116) that the palaeognathous palate is a derived state. Features uniting Ratites and tinamous are primitive, suggesting that they are either survivors of an early radiation of birds or a more recent " artificial group in which primitive characters have reappeared secondarily through neoteny."

L. D. Martin & J. J. Tate Jr. describe in detail " The skeleton of *Babtornis advenus,*" a large loon-like diving bird related to its contemporary *Hesperornis* in the Late Cretaceous. Both are " very primitive birds, which in some characters appear to be little modified from *Archaeopteryx.*" Pierce Brodkorb describes a Cretaceous bird apparently ancestral to the Coraciformes and Piciformes. E. N. Kurochkin (Akademia Nauk, Moscow) surveys the Paleogene birds of Asia, which now amount to 350 satisfactory postcranial specimens. There are also papers of less interest to New Zealand on a Paleocene owl (Rich & Bohaska), the Eocene Piciform *Neanis* (A. Fiduccia) and other North American Piciformes (Fiduccia & Martin), Oligocene Coraciiformes (Olson), an Eogene *Aegialornis* and Miocene swifts (C. T. Collins), a Miocene osprey (S. L. Warter), a flightless auk from the Miocene of California (H. Howard), Pleistocene Grebes (R. W. Stover), a late Pleistocene fauna from Ecuador (K. E. Campbell), giant Pleistocene predators from Cuba (O. Arredondo) and the extinct flightless duck of California (G. V. Morejohn).

A REVISION OF THE MOAS

Of direct relevance to New Zealand is " The Species of Moas (Aves: Dinornithidae)" by Joel Cracraft, who reviews the species-level systematics of the moas after analysing intraspecific variability among the specimens in the Britsih Museum, American Museum of Natural History, Field Museum of Natural History, and Canterbury, Otago and National Museums in New Zealand; supplemented by data from Auckland Museum specimens obtained from Archey's monograph (1941, *Auck. Inst. Bull.* 1). All species recognised by Oliver (1949, *Dom. Mus. Bull.* 15) were examined except for *Pachyornis murihiku, Anomalopteryx antiquus, Megalapteryx hectori* and *M. benhami,* but apart from *M. benhami* these are probably invalid. Dimensions of hindlimb bones were analysed both by standard univariate procedures and by several multivariate statistical techniques to determine variability patterns in relation to species distinctness and sexual dimorphism.

As a basis for comparison Cracraft studied the variability of a Kiwi, *Apteryx australis* (sample from Castle Rocks Cave), and of four moas believed to be " good " species: *Megalapteryx didinus, Anomalopteryx didiformis, Dinornis torosus* and *Pachyornis elephantopus.* Coefficients of variation are generally greater than found for the Emu. He believes temporal variation relatively unimportant but geographic variation important, partly inter-island (NorthIsland/South Island) but also suggests there is intra-island variation due to post-glacial contact and sympatry of isolates differentiated morphologically in separate forest refugia; " some of the variation observed may be the result of recent character displacement in size following this contact."

As a result of these investigations, Cracraft classifies the moas as follows (N, North Island; S, South Island; NS, both islands): *Anomalopteryx didiformis* (NS), *A. oweni* (N); *Megalapteryx didinus*

(S), *M. benhami* (S); *Pachyornis mappini* (N), *P. elephantopus* (S); *Euryapteryx geranoides* (NS), *E. curtus* (N); *Emeus crassus* (N?, S); *Dinornis struthoides* (N, S?); *D. novaezelandiae* (NS), *D. giganteus* (NS), *D. torosus* (S). When this is compared with R. J. Scarlett's rationalisation of moa classification (1972, "Bones for the New Zealand Archaeologist," *Canterbury Mus. Bull.* 4) based on much practical experience without the help of a computer we find, not surprisingly, that Scarlett anticipated most of the conclusions (e.g. in *Anomalopteryx, Megalapteryx, Emeus* and in his treatment of *P. elephantopus, Dinornis struthoides* and *D. torosus.* Scarlett's more tentative suggestions for other species of *Pachyornis* and *Euryapteryx* also approached Cracraft's while his acceptance of North/South Island species pairs in *Dinornis (giganteus/maximus* and *novaezelandiae/robustus)* is only nomenclaturally different from Cracraft's recognition of North/South size differences within *D. giganteus* and *D. novaezelandiae.*

Even among flying birds, North and South Island populations generally differ subspecifically after about 10 000 years of isolation by Cook Strait, in plumage as well as size, though often with wide overlap. The apparently clear separation of *Dinornis torosus* and *D. struthoides* is comparable with that of *Mohoua albicilla* and *M. ochrocephala,* whereas the overlapping *dimensions* of *Dinornis giganteus* and *D. maximus* and of *D. novaezelandiae* and *D. robustus* are more like the subspecies of *Petroica* or *Philesturnus.* We can only guess whether these Moas (like *Apteryx australis*) differed in plumage as well as dimensions, but at least their degree of differentiation at Cook Strait was comparable with that of less mobile members of the Passeres.

Cracraft's paper makes a long overdue contribution to the treatment of Dinornithiformes as living populations. It will doubtless provoke further work and thought, for it is not quite the last word. Thank goodness !

C. A. F.

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Birds of Paradise — The World's Glamour Birds. *B.H.P. Journal* 2: 76.

An interesting contribution to the literature of these fabulous birds is a short article by W. S. Peckover. It is beautifully illustrated by his own colour photographs and two splendid paintings by Bill Cooper.

Those birds which have the brightest colours and gaudy display plumage are usually promiscuous breeders. A group of males display in a chosen tree and one is selected by a watching female. After mating she will be chased off to undertake nesting activities alone while he will continue his display with the other males "awaiting the arrival of the next adult female who has selected their display tree for her quick time mate."

Of the 43 species, five are black, male and female almost alike and these follow "normal" breeding patterns, with a pair bond lasting at least one season, and the male assists with nest building, brooding and feeding the offspring. "Ornithologists now believe that pairing