

Beechey in Kotzebue Sound. However Beechey's expedition was not a failure, for he spent two fruitful summers in Alaskan waters carrying out survey work, gathering natural history specimens, and amassing a substantial collection of ethnographic material from the Alaskan Eskimos. Much of Beechey's ethnographic collection, together with that of his assistant surveyor, Lieutenant Edward Belcher, is now housed in the Pitt Rivers Museum at the University of Oxford, and it is a pleasure to see a catalogue of this early body of Eskimo material culture finally published by that venerable institution.

This catalogue of 119 extant items from the Beechey and Belcher collections, carefully prepared by John R. Bockstoce, gives us a glimpse of Alaskan Eskimo material culture at a very early period in their contact history. The voyage of the Blossom was completed prior to the intensive contact conditions that followed the expansion of Russian-American trading posts in the 1830's and the invasion of Arctic whaling ships after 1848. The artefacts in the catalogue were therefore manufactured during a much earlier stage of acculturation than those represented in previously published collections from northwestern Alaska (Murdoch, 1892; Nelson, 1899; VanStone, 1976), which date from the final decades of the nineteenth century.

It is always disturbing to see how old collections with such tremendous potential for ethnographic research can have their scientific value so sadly diminished by poor documentation. Although the author of the catalogue appears to have made a thorough search for records covering the acquisition of specimens by Beechey and Belcher, he appears to have met with little success. This is particularly serious in the case of the Belcher material, which was not sold by the collector until some time near his death in 1877 and which contains many pieces that are shown by Bockstoce to be wrongly labelled. Even the Beechey material, which tends to be more accurate in this respect, is often merely labelled "Esquimaux" and cannot be pinpointed to specific locations within the vast territory between St. Lawrence Island and Point Barrow. Such poor records of provenance make it difficult if not impossible to analyse the material from the standpoint of either cultural homogeneity or regional differentiation, and perhaps this is one of the main reasons that the author has avoided any general conclusions based on the collection as a whole.

In describing the artefacts, which fall mainly in the general categories of "Hunting and Fishing Equipment" and "Tools and Manufacturing Implements", Bockstoce has done

an exemplary job in producing what could well be used as a model for catalogues of this type. His clear descriptions are supplemented by excellent photographs, with close-up shots of important features, and a few pen-and-ink drawings showing details of construction. The catalogue is enhanced with introductory chapters placing the collections in historical perspective and with ethnographic observations from a variety of sources, including field sketches and excerpts from the journals kept by Beechey, Belcher and other crew members during the voyage of H.M.S. Blossom.

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THE BIOGEOCHEMISTRY OF BLUE, SNOW, AND ROSS' GESE. BY HAROLD C. HANSON AND ROBERT L. JONES. *Carbondale, Illinois: Southern Illinois University Press (Special publication - Illinois Natural History Survey; no. 1.)*, 1976. 10 x 7 inches, 281 pages, illustrated. \$15.00.

In 1965 Hanson and Jones set out to show that chemical patterns in primary wing feathers could be used to determine the geographic origins of geese which nest in the Arctic. During the summer geese are temporarily grounded when they moult their primary feathers. As their new feathers grow, adults and their flightless young feed within an area restricted to the breeding grounds. On the premise that characteristic mineral patterns in the soils should be transmitted through the nutrient chain to appear in the newly grown feathers, Hanson and Jones studied the composition of feather samples collected from the major species of North American geese. In this book they present their results for lesser snow geese (*Anser caerulescens caerulescens* - including both white and blue colour phases), greater snow geese (*Anser caerulescens atlantica*), and Ross' geese (*Anser rossii*). They discuss and explain the many facets of the

biogeochemistry of those birds, which they describe as:

... a study ... of the relationships of mineral concentrations in the various trophic levels of the ecosystem, the mode of transfer of these minerals from one trophic level to the next above, the mechanisms and factors involved in mineral transfers, the metabolic relationships of the concerned minerals to each other in each trophic level, and factors relating to their desposition in feather keratin.

The authors' objective was to determine if analyses of chemical patterns in feathers could be used as a management tool to supplement or even replace conventional leg-banding.

A broad perspective of the breeding colonies of Arctic Canada and Wrangel Island is provided, giving the geological setting and the mineralogy of the soils and plants. Appreciation of local geography is enhanced by an extensive series of low-level aerial photographs taken by Hanson during his visits to most of the important colonies. Material for chemical analyses consisted of samples of primary wing feathers from geese collected on the major colonies, or usually from geese which had been banded on the colonies and subsequently recovered in more southern areas. Samples of food plants and soils from some of the breeding areas were also analysed. Optical emission spectroscopy was used to determine the concentrations of twelve elements (calcium, magnesium, sodium, potassium, phosphorus, iron, copper, zinc, manganese, silicon, aluminum, and boron) in the feathers and plants.

To facilitate visual appraisal of results, approximately 200 twelve-spoke diagrams show the concentrations for each element in a given sample of feathers. Statistical analyses are applied to many of the data, including a discriminant function analysis for the lesser snow goose colonies of the eastern Arctic. At first glance the data display wide variation, but, through classification and analyses, the authors are able to state that, "Despite the number and diversity of intracolony feather mineral patterns, these differences were not sufficient to blur basic elemental differences between colonies that result from differential inputs of minerals into the ecosystems of the breeding and feeding areas". They found all colonies of lesser snow geese were distinguishable from each other, usually on the basis of several elements, and that, "In accordance with the greater differences and complexities among the geologies of the colony areas and the mineralogies of the drainage basins in which they are situated, the total of significant differences in feather mineral patterns among

western Arctic colonies were much greater than among eastern Arctic colonies".

As a test of their analysis techniques, the authors treated statistically the individuals making up the eastern Arctic reference samples as birds of unknown origin. Results show that from 85% to 70% of the geese were correctly identified as to actual colony of origin. Analytical results from a large number of unbanded (i.e., of truly unknown origin) samples are presented and arguments are made as to their probable origins. The authors go on to conclude that feather mineral data can be used to determine the origins of wild geese and could be used in population management. They cite an example of how such data could be used to supplement existing banding recovery data in order to interpret the contribution each colony makes to the goose harvest in a migration or wintering area where birds from various colonies mix.

The final third of the book deals with the more basic ecosystem and metabolic relationships between the geese and mineralogy of their breeding environments as indicated by the deposition of minerals in primary feathers. The discussion, which includes a systematic review of the known and theoretical metabolic role of each of the twelve elements under consideration, covers a wide range of references and examples. A general conclusion is that most geese are contending with mineral surpluses rather than deficiencies and that the regulation of excretion is more important in maintaining homeostasis than regulation of absorption. In addition to its main thesis, the book brings out a host of intriguing points on related topics. The bibliography is large and diverse but it lacks a few important references (eg. ¹) which deal with biogeochemistry.

The single most serious weakness of this work is the small number of samples of reference feathers from known colonies. The authors fully acknowledge that weakness, pointing out that they pressed on in the face of financial limitations. As a consequence many statistical treatments which would have been appropriate were not done and some of the treatments which were applied might be questioned due to inadequate sample sizes. The importance of larger, more representative samples is evident from several recent papers which apparently appeared after the draft of this book was finalized.^{2, 3, 4, 5, 6} for example, the problem of birds using different colonies in different years is probably greater than Hanson and Jones recognized.² However, they conclude that the best feather samples to use as reference material in identifying unknowns on the migration and wintering areas would be from birds, particularly immatures, banded on

the breeding grounds and shot by hunters in the same year. They go on to point out that the ideal method of putting feather chemistry into a more operational phase would be to run a feather recovery and analysis program concurrently with a large-scale banding program which included all major colonies of a given population. Such a banding program is in fact planned, under the auspices of a joint Canada-United States study of the eastern Arctic lesser snow geese.

A well-written text and appropriate illustrations, combined with excellent editing, design and printing, make this an attractive and readable book. As the first major application of biogeochemistry to migratory birds on a continent-wide scale, it ranks as a significant contribution to wildlife management. With considerable skill and effort the authors have synthesized a complex subject ranging over many scientific disciplines, producing a book which should stimulate discussion and further research in many theoretical and applied fields.

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- "THE ORDER OF WOLVES" By Richard Fiennes. 1976. *Hamish Hamilton, London.* 206 pp. *illustr. Price* 55.25

In the preface to his book "The Order of Wolves", Richard Fiennes states that his objectives in writing this volume are to dispel some of the many myths surrounding this species, particularly those which portray it as an evil and unwanted killer, constantly at odds with man. The table of contents further raises optimistic anticipation on the part of the reader that the book will perform its purpose and summarize information from recent research studies. Alas, this reader at least was disappointed. Mr. Fiennes instead produces a curious mixture of scientific facts, anecdotal and frequently naive anthropomorphism, coupled with his own mythology about how wolves should behave. Perhaps this is the result of his stated opinion that the carefully undertaken studies by such biologists as David Mech and others, provide information of no greater truth than do the works of such delightful novelists as Farley Mowat. This is a great pity. The author is obviously widely read and has otherwise carefully consulted most major works on wolves and their relatives. The book contains excellent illustrations and tables, but interspersed between the lines are all too frequent, inexcusable errors; especially for, as we are informed, the author is an animal biologist (e.g. primary producers are herbivores — p58). These errors and occasional obvious contradictions in his arguments result in an overall impression which tends to negate the author's original purpose. Added to this are the Ardrey-like jumps Fiennes makes in comparing wolf and human behaviour and organization. Suffice it to say that most of these problems could have been eliminated, without losing the author's original intent, if the book had received a thorough review before going to the presses. This is essential considering the wide readership to which this book is presumably directed. For any potential purchaser, the reviewer suggests a critical scrutiny of the text, before deciding on this or alternative books on the subject.

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