position in tundra (Flanagan and Scarborough in Holding *et al.* (eds.), 1974, Swedish IBP Committee), which Remmert cites as 1973, reported the linear response with temperature of common tundra microorganism). Remmert recovers gracefully at the finish, through small print (an afterthought?). "Unfortunately, such a strict definition [the Arctic Circle] cannot be adhered to throughout. . . . the course taken by our boundary — the Arctic Circle — is full of surprises and may even appear at first sight to be unrealistic in places, but let us see where it will lead us" (6).

I like surprises and read on. The introduction to Part II (Ecological factors in the Arctic; 63 p.), clearly reveals the bloodlines of the hobby horse, 'Arctic Circle'. In Remmert's words (7): "By choosing the Arctic Circle to define the limits of the Arctic we have automatically brought diurnal rhytmicity [sic] and the factors depending upon it into the forefront of our discussion." Remmert's long-standing interest in diurnal rhythms is literally as well as figuratively foremost in the text; the first 17 pages deal with light; the next 34 with temperature; other factors take up seven pages; combination of factors the remaining five.

There are some initial nervous but stimulating moments (pages) as 'Arctic Circle' negotiates difficult terrain. Overstatement and biological omission again facilitate the ride: "Examples of this kind [contradictory] are of very little value." (9); "Almost nothing is known of the activity patterns of High-Arctic animals like reindeer (Rangifer). . ." (19), but White *et al.* in Bliss *et al.* (1981) cite six studies published prior to 1978. Remmert presents so many examples, several conflicting, that reasoned refutation is impossible in a simple review. I found the ride challenging to the reader/spectator, and thus enjoyable as well as frustrating. The section (Diurnal rhythm) should not be read passively. Professor Remmert himself must have had nervous moments in the saddle, for about this time (24) he exhibits his breadth as an arctic ecologist — he dismounts. With 'Arctic Circle' to pasture, he provides a useful synthesis that spans plants, microorganisms, insects, fish, avian and mammalian herbivores, and top carnivores. The treatment of microorganisms is most wanting. The treatment of permafrost (one page) is very superficial given its importance to the structure and function of arctic ecosystems (possibly because permafrost is lacking in Scandinavia). Snow also received remarkably short treatment (about two pages of text); neither of the classic treatments of Formosov or Nasimovich is cited. The value of Remmert's treatment is that it spans diverse taxa and introduces considerable German language literature. Specialists in specific taxa will likely find 'their creatures' slighted; I found the wide-ranging treatment interesting. The detailed treatment of diurnal rhythm is not found in other synthesis volumes, and is a welcome, albeit somewhat untidy, addition.

Part III ('(Almost) common characteristics of arctic animals'; 40 p.) is equally wide-ranging. Four-year (microtine), nine-year (Tetraonid) and 70-year (*Rangifer*) cycles are treated adequately, a cautious blend of speculation and fact. Seasonal migrations of birds and mammals benefit from the 'cross-taxa' treatment. The discussion of entrainment of animals to the yearly cycle also benefits from the 'cross-taxa' treatment and the fact that 'Arctic Circle' has wandered off, forgotten. The treatment of species problems may intrigue taxonomic 'splitters'; 'lumpers' will find straw men. Discussion of the ratio of productivity to biomass in the Arctic is inadequate; readers will do better to refer to relevant chapters and their references in Brown *et al.* (1980) and Bliss *et al.* (1981). This latter comment applies also to Part IV (Peculiarities of the system; 33 p.), with the important exception that Remmert's near-simultaneous treatment of terrestrial, limnic and marine ecosystems is helpful. Few new insights are provided, but diverse evidence is collated.

Part V (Types of arctic climates; 6 p.) presents a lucid, simple scheme unencumbered by data. More comprehensive discussions, which lack this attractive simplicity, can be found in the relevant chapters of *Arctic and Alpine Environments* (Ives and Barry (eds.), 1974, London, Methuen Publ. Co.) and Bliss *et al.* (1981). Part VI (Case studies; 74 p.) treats seven regions: "warm" arctic (Tromsø to Kevo), arctic Alaska, high-arctic continental (the Canadian Archipelgo), high-arctic oceanic (Spitsbergen), arctic lakes, Old World arctic seas, and the Antarctic. 'Case studies' is an appropriate phrase. Observations from many study sites of the IBP Tundra Biome (Abisko, Devon Island, Kevo, Point Barrow and Prudhoe) as well as other areas are selectively summarized without attempts to explain the differences. Much more balanced and comprehensive treatments of many of the areas are found in Rosswall and Heal (1975) and Bliss *et al.* (1981).

Whatever its relative strengths and weaknesses in content, *Arctic Animal Ecology* does suffer severely from sloppy editing. One need not read far before several unconventional or distressing features are apparent. They get worse. Four bothered me. First, scientific names are not italicized. Second, the attitude towards citation is somewhat cavalier. Authors are frequently and inconsistently presented without dates; e.g. Nordenskiold in Fig. 1; Pappi, Hoffman and Remmert on p. 7; Demmelmeyer and Haarhaus and Demmelmayer on p. 15; West and Norton on p. 22; Corbet and Tjonneland on p. 24; etc. Far too many authors cited in the text are missing from the literature cited; e.g. Scheer, 1952, p. 12; Hjorth, 1968, p. 12; Berset, 1957, p. 21; etc. Dates of authorship in the text and literature cited are not consistent; e.g. Ferenz is both 1955 and 1975, Authors are sometimes misspelled; e.g. Wielgdaski (p. 30) should read Wielgolaski; Kuty (p. 240) should read Kuyt; etc. Such failings are significant and detract from the volume's utility as a source of reference. Third, typographical errors are distressingly common. In many cases the reader can guess; some are more inconvenient - e.g. ". . . (see p. 124) . . ." (p. 13) should read "(see p. 24)". Some of these errors may result from copy-editing after translation; e.g. the citation for Nuorteva (1963) is presented partly in English and partly in German. Fourth, the axes of graphs are not always labelled, but are left to the reader's interpretation; e.g. Fig. 7, the ordinate is presumably date, and the abscissa, time of day; Fig. 19, the ordinate is presumably latitude.

Despite these weaknesses I learned several things, in no particular order: 1) a man on a hobby horse can negotiate conflicting facts with remarkable alacrity, 2) Remmert commands an impressive breadth of knowledge of arctic ecology, 3) the book contains lots of interesting tidbits about Spitsbergen and diurnal rhythms, 4) arctophiles owe thanks to those individuals primarily responsible for the IBP Tundra Biome synthesis volumes (I name them willingly: L.A. Bliss, J. Brown, J.B. Cragg, O.W. Heal, T. Rosswall, and F.E. Wielgolaski).

I conclude that the volume is worth reading, I am uncertain by whom. Sloppy editing and Remmert's flamboyant gallops about 'Arctic Circle' will make *Arctic Animal Ecology* treacherous and frustrating for students, but challenging for 'old hands'. It is not a useful source of reference, other than to Spitsbergen, and then marginally (better general sources are noted above). Some weaknesses have been stated. Its strengths are the collation of data from Spitsbergen, the introduction of German literature to English-readers, and the presentation of an experienced ecologist's perception of the Arctic. Unexcitable old hands probably should read it — there are sufficient new facts and ideas to keep one interested, sufficient errors to keep one alert. Excitable individuals may find parts of the text, especially 'Literature Cited', aggravating to their health.

F.L. Bunnell
Faculty of Forestry
University of British Columbia
Vancouver, B.C., Canada
V6T 1W5

THE FIRST AMERICANS: ORIGINS, AFFINITIES, AND ADAPTATIONS. Edited by WILLIAMS S. LAUGHLIN and ALBERT B. HARPER. New York, Stuttgart: Gustav Fischer, 1979. xii + 340 p. Cloth, n.p.

Archaeologists and physical anthropologists with eyes to the origin of America's aboriginal human groups have for decades followed the extensive and significant contributions of William S. Laughlin, who with numerous co-workers has made great strides in the understanding of Aleut/Eskimo prehistory and relationships. This volume is organized around such a theme, and that of biological relationships of the First Americans in more general terms. Researchers expecting proof of pre-Wisconsin peopling of the New World will be disappointed; but those in search of varied hypotheses and detailed biological data for modern and prehistoric populations will find much of value. The volume results from one of the last Wenner-Gren Foundation conferences to be held at Burg-Wartenstein, Austria (1976); but bibliographies reveal updating of articles with literature published as late as 1978. Twenty authors are represented by 15 papers, grouped in three subject areas with a general introduction. The volume is well edited, and few typographical errors are noted, all minor. Printing is good and diagrams and charts are readable. There are no photographs.

The introductory essay by Laughlin and S.I. Wolf is a pithy review of preconceptions and reality in the Arctic filter. It is well written and entertaining, though a bit glib, a drawback outweighed by the obvious energy — indeed, excitement — conveyed. The authors clearly believe that their symposium has made significant advances. They consider it

"fortunate that the Western Hemisphere . . . was entered recently enough to fall within the effective range of radiocarbon dating" (p. 10). For Australia, on the other hand, they accept an "actual time depth" of 30 000 years, which "may eventually prove to be twice as great as the occupation of America". Given recent finds in the Old Crow Basin (northern Yukon), the earliest of them available to symposium participants (for instance, Irving and Harington, 1973), and given persistent claims for other ancient sites in the Americas, this could well prove to be no more than wishful thinking based upon biological distances difficult to chronologically control or calibrate.

In Part 1 (Origins), D.M. Hopkins provides an updated view of landscapes and environments in Late Quaternary Beringia, concluding that the arctic steppe was "not a hostile environment to man" (p. 34). He discusses the "funnel" effect of Beringia and of glacial lakes in western Siberia. Closure of a corridor between ice sheets south of Beringia was brief, but a significant funnel effect nevertheless limited dispersal and gene flow during glaciation. Coastal dispersal before about 12 000 yr B.P. was prevented by ice caps and piedmont glaciers. Sea mammal hunting could have begun in southern Beringia by 10 000 yr B.P. Major biotic changes 14 000 to 10 000 years ago placed human populations under stress, likely causing "ethnic or demographic population changes" (p. 35).

J.B. Griffin reviews the archaeological record of human dispersal into North America, taking a conservative stand that is yet not extreme on the point of limited antiquity. Unspecified sites of purported great antiquity are dismissed immediately as "either provocative or very slim evidence" (p. 44). A "definite" early man site is defined as requiring "clearly definable" geologic context, an "adequate" sample of material culture, "well-preserved" utilized animal remains, "associated" pollen and plant macrofossils, and human remains, plus an "adequate" series of C^{14} dates. All these data should "agree" as to age, seasonality, and cultural level. He contends that because such sites are present in the Old World, they can reasonably be required of early man proponents in the New World. However, all the decisions relating to "association", "definability", "preservation", "adequacy", and "agreement" are opinions based upon the observer's biases and open to subjective argument. Recent exchanges about "acceptability" of radiocarbon dates for Meadowcroft Rockshelter, Pennsylvania (Haynes, 1980; Adovasio *et al.*,1980), leave little doubt that there is no "adequate" series of dates to satisfy all; canny critics will continue with vigor, oftimes with justice, and sometimes *ad nauseum* to challenge them anyway, citing different laboratory procedures or new potential contaminants. Who will decide what, in any of the above, is "adequate"? Griffin's review of the archaeological record summarizes well-known viewpoints to show that early Americans migrated through the area east of the Rockies; later migrations were of negligible impact south of the Arctic. This is not new or surprising, and I have the distinct impression that Griffin could have made a more significant contribution by concentrating more upon the crucial issues raised as to the nature and acceptability of archaeological evidence and associations, whatever these might be.

V.P. Alexseev provides a lengthy and valuable review of the anthropometry of Siberian peoples, with data in tabular and cartographic form. "Siberia" to the anthropologist includes most of the Asiatic part of the Soviet Union. Paleosiberians resemble American Indians more closely than do modern Siberians, the latter having more strongly Mongoloid characteristics.

W.S. Laughlin, J.B. Jørgensen and B. Frøhlich summarize anthropometric, archaeological, and paleoenvironmental data to assess the relationships of Aleut and Eskimo. Few raw data are presented *per se* in this overview, which concentrates on the relatively isolated Aleutian Islands Aleut and Greenland Eskimo. Both originated from an "old Bering Sea population" (p. 102) of coast-adapted peoples. Coastal adaptation implies that sites older than 5000 yr B.P. are under water in Beringia because of the early Holocene rise in sea level.

In Part 2 (Affinities) M. Lampl and B.S. Blumberg summarize distributional data, pertaining mainly to serum albumins and white blood cell HL-A haplotypes, for the Americas. Albumin distributions correlate with linguistic and archaeological data. Polymorphic albumin variants have not been found in the Eskimo, and data from Asia are sorely needed. The authors find that the HL-A system presents strong homogeneity in American Indians, and native Americans can be differentiated from Mongoloids and other Asians. They conclude that a study of these and other systems in target Asian groups "could be designed to identify contemporary Asian populations that might have ancient affinities with native Americans". This is disappointingly self-evident, and one can only hope that such a study is already being pursued with vigor.

K. Hanihara reviews dental traits from Asian, Australian, and New World populations to define a "Mongoloid dental complex" (shovelled upper central incisors, cusp 6, cusp 7, deflecting wrinkle, and protostylid on M_1). Distance coefficients group Japanese, Pima Indians, and Eskimos as Mongoloids; Ainu and Australian Aborigines are apparently tied with this cluster. Caucasians and American Negroes are far from each other and from the Mongoloid cluster. Pimas, interestingly, have larger teeth than Australians; but Mongoloids over all have larger front teeth/smaller molars, while Australians, Caucasians, and American Negroes have smaller front teeth/larger molars. Clearly, available data do not allow us to pinpoint the origin of New World groups.

J.N. Spuhler summarizes blood group gene frequencies in North American Indian and Eskimo populations, with dendrograms of affinity based on four agglomerative computer programs. Tribal admixture is of necessity ignored. Gene frequency affinities are somewhat more strongly correlated with language families than with modern culture areas. Frequencies of rhesus chromosomes and O and A genes are the best affinity indicators. Evidence suggests long occupation of culture areas ("say 2000 to 10 000 years", p. 177) and racial unity of North American Indians, Eskimo and Aleut.

E.J.E. Szathmary summarizes archaeological hypotheses relating to northern North American populations and investigates supportive evidence from blood group frequencies, again through use of dendrograms. Origins and affinities cannot be resolved within limits of statistical significance, but Eskimos on the whole seem closely related to American Indians, particularly of the western Subarctic and northwest coast. Additional data collection is advised.

R.L. Kirk examines differentiation of Australian Aborigines as a parallel case to the American example. Australians share markers with New Guineans and Island Melanesians, but marked divergence has nevertheless taken place between Australians and New Guineans. Mongoloid markers penetrated Indonesia but did not reach Australia, New Guinea, Island Melanesia, or Polynesia (despite long-standing claims of "Mongoloid" traits in Polynesia). Surprisingly, allele frequencies in 13 blood systems suggest a close Noanama (Colombia)/Samoan relationship, Yanomama/central Pacific affinity, and Maori/Maya similarity. Twenty-eight blood genetic loci, however, place American Indians with Japanese, and Polynesians with southern Chinese. One can only echo the author's conclusion, "It makes urgent the collection . . . of such data" (p. 232).

In Part 3 (Adaptations), W.J. Schull and F. Rothhammer contribute a methodological paper on description and measurement of adaptive and genetic characteristics. They concentrate on man's adaptation to hypoxia of altitude, the direct relevance of which is limited here other than as an example. T.D. Stewart undertakes an interesting review of 12 skeletal pathologies in American populations, commenting upon the nature of the evidence and the epidemiological significance of each. Aleuts/Eskimos are distinctive in at least half of the 12, but comparative data for Asians are apparently not available.

F.E. Johnston and L.M. Schell summarize anthropometric variation relating to body size, shape, and obesity for North American children and adults, based on the venerable premise that variation is of adaptive significance. Within native American populations body areal variation is significant, reflecting either a north-south temperature gradient or nutritional differences. Inheritance of skinfold thickness tendencies remains, despite this study, unverified. More data are needed.

J. Robert-Lamblin investigates endogamy and exogamy in Aleut and Greenland Eskimo communities, finding "total endogamy before their contact with the western world . . . the two groups therefore constituted true biological, cultural, and linguistic isolates" (p. 306). A.B. Harper examines life expectancy as a measure of successful adaptation. Life tables are advanced as a valuable aid in quantifying adaptive success and comparing populations. Aleutian Islands Aleut enjoy an adaptive superiority over other Arctic Mongoloids, including other Aleut groups (e.g., Pribilof Aleut). Availability of reefs and streams for inshore net and weir fishing is thought to allow old Aleutian Islands Aleut to gather food with relative ease; and general richness of resources further enhances their survival advantages.

The volume as a whole is rich in information. I am grateful to have read the articles, and expect to use them in the future. However, I am left with a feeling of disappointment, as well. In terms of the three emphases of the book (origins, affinities, and adaptations), the first is handled too gingerly

to leave the impression that real advances have been made. In some papers it is difficult to distinguish evidence of the goals of the symposium. Those authors who mention Asiatic origins all too frequently do so only to mourn a lack of data, and to make the standard call for additional collection of data. The flyleaf of the book primes us with the emphatic statement that "The origins and evolution of the First Americans can only be appreciated as an event of intercontinental or interhemispheric proportions with international and interdisciplinary dimensions". This, a direct quote from the Introduction (p. 1), only serves to underscore my disappointment that few of the authors have anything at all to say about happenings on the Asiatic side of Beringia. Many good ideas are presented only to be followed by pleas for collection of supportive data, so that a test can be conducted in the future. In some of the more extreme cases, the papers thus end up sounding more like preambles to grant proposals (literature search, justification for additional research to be conducted, bibliography) than substantive contributions to ongoing research. In time, perhaps, we will tire of the growing tendency to publish ideas as soon as we get them, before we can test derived hypotheses. Given the promise of the symposium and the enthusiastic introduction, I expected more meat on these bones; failing this, I wonder if the book is *really* any more useful to us than a series of articles in the appropriate journals. We have here a chronicle of the *encounter* of a group of scientists; their *cooperation* is unclear.

As an example, no mention is made of the possible correlation of at least one skeletal pathology (ankylosing spondylitis) with an HL-A antigen (HL-A W-27), a finding that was easily available to symposium participants (Brewerton *et al.*, 1973; Bass *et al.*, 1974). The possible linkage of skeletal pathologies with immune reactions that are therefore detectable in both modern and fossil populations is not mentioned in Stewart's summary of skeletal pathologies, or Lampl and Blumberg's summary of HL-A data. Perhaps there is potential here for the documentation of a Founder's Effect in gene frequencies in both hard parts and soft parts — surely a topic worthy of at least passing mention in this forum, and a finding already suggested by the relative homogeneity of HL-A haplotypes in the New World.

In sum, I have the suspicion that the grand integrative goal that stimulated the syposium could not be attained, and that it is only approached in one or two of the papers and in the introduction. The latter, with some amplification, would therefore have made an excellent review article in an appropriate journal, whether or not it was accompanied by the other papers. Considering that the symposium was held in Austria, the participation of only one Russian researcher does not augur well for the health of east-west interchange of ideas and data. I come away from the book with the conclusion that in terms of communication and information, we are not much closer to the discovery of the "origins" of the First Americans than we were before the symposium. The consensus in the book points to Asia.

REFERENCES

ADOVASIO, J.M., GUNN, J.D., DONAHUE, J., STUCKENRATH, R., GUILDAY, J.E. and VOMAN, K. 1980. Yes Virginia, it really is that old: A reply to Haynes and Mead. American Antiquity 45(3):588-595.

BASS, W.M., GREGG, J.B. and PROVOST, P.E. 1974. Ankylosing spondylitis (Marie Strumpel disease) in Historic and Prehistoric Northern Plains Indians. Plains Anthropologist 19(66, part 1):303-305.

BREWERTON, D.A., HART, F.D. and NICHOLLS, A. 1973, Ankylosing spondylitis and HL-A-27. Lancet 1:904-907.

HAYNES, C. VANCE. 1980. Paleoindian charcoal from Meadowcroft Rockshelter: Is contamination a problem? American Antiquity 45(3):582-587.

IRVING, W.N. and HARINGTON, C.R. 1973. Upper Pleistocene radiocarbon-dated artifacts from the Northern Yukon. Science 179:335-340.

Michael Wilson
Department of Geology/Geophysics
University of Calgary
Calgary, Alberta, Canada
T2N 1N4

PATTERNS OF VEGETATION AND HERBIVORY IN ARCTIC TUNDRA. Edited by G.O. BATZLI. Arctic and Alpine Research Vol. 12 No. 2. U.S. $3.50.

Upon completion of the I.B.P. studies at Barrow, Alaska, a three-year study on vegetation and herbivory sponsored by the Division of Polar Programs (N.S.F.) was undertaken near Atkasook on the Meade River. Eight of the ten projects undertaken are reported in this issue of *Arctic and Alpine Research*. The papers include: summer climate (1), soils (1), plant communities (3), plant ecophysiology (2), and herbivory (4).

Haugen and Brown used regression analysis of air temperature data to show the pattern of increasing mean daily temperature and thawing degree days from the coast to 120 km inland. July mean air temperature averages ≃ 4°C at the coastal stations, 9°C at Atkasook 48 km inland and ≃ 11°C near the southern edge of the coastal plain. Thawing degree days near the coast average 300-650°C, 670°C at Aktasook, and ≃ 1000 at 120 km. The 7°C July isotherm was used to mark the southern limit of the littoral zone characterized by an absence of shrub tundra and a preponderance of wet meadow tundra.

The papers by Billings and Peterson, and Peterson and Billings, describe the thaw-lake cycle near Barrow and the plant community patterns and succession at Atkasook, respectively. Both studies show the close relationship between microtopography-soil moisture-species distribution, and that geomorphic processes, controlled by ice-rich permafrost, play a central role in the long-term cyclic pattern of succession. As elsewhere in the Arctic, autogenic processes are quite minor in plant succession. Komarkova and Webber have prepared two detailed maps of plant communities at scales of 1:10 500 and 1:21 000. They also point out that soil moisture and permafrost are basic controls of vegetation as does Everett in his paper on soils. On a local basis, random variability in soil chemistry limits high correlations with plant community types.

The papers on the nutritional ecology of microtines (Batzli and Jung), the abundance and forage patterns of ground squirrels (Batzli and Sobaski, and habitat preference and forage consumption by caribou and reindeer (White and Trudell) are the most significant components of the study. For the first time, we have detailed data on the role that secondary compounds and plant growth form play in arctic herbivory. Evergreen shrubs are avoided by microtines, ground squirrels, and reindeer. Food selection by reindeer appeared to be related to plant availability, nutrient content, digestibility, and secondary compounds. These animals have a high preference for forbs, deciduous shrubs, and lichens, but they avoid leaves of *Carex* and favor *Eriophorum vaginatum* flower heads.

The nutrient allocation paper by Chapin shows that several preferred forage species (*Salix pulchra, Eriophorum vaginatum*) along with *Betula nana* and *Carex aquatilis* have high nutrient content, rapid growth, and large belowground storage relative to the evergreen shrub *Ledum palustre*. The deciduous species can rapidly translocate nutrients to new growth and the defoliation of *Eriophorum* and *Carex* results in large nutrient investment in new leaves. Only with chronic leaf defoliation is there root mortality. The paper by Archer and Tieszen stresses the importance of plant growth form (deciduous, evergreen shrub, forbs, graminoids) with regard to photosynthetic rates and carbon allocation. Carbon allocation to maintenance tissue or to long-lived stems and leaves is accompanied by mechanisms that reduce grazing.

Students of tundra ecosystems, and especially those interested in the role of herbivory in arctic systems, will find this issue of *Arctic and Alpine Research* especially valuable and the cost is low ($3.50). These researchers, and especially Dr. Batzli, are to be commended for obtaining funding to publish their series of papers as a regular issue of a journal. The all-too-common practice of publishing a book results only in high prices, a limited number of copies and as a consequence, the reference books are purchased by only libraries rather than by researchers and their students. One hopes this journal has printed a large run of this number.

L.C. Bliss
Department of Botany
University of Washington
Seattle, Washington 98195
U.S.A.