Glossary of Glacier Mass Balance and Related Terms

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Book Reviews

INUIT AND WHALERS ON BAFFIN ISLAND THROUGH GERMAN EYES: WILHELM WEIKE'S ARCTIC JOURNAL AND LETTERS (1883–1884). Edited and written by Ludger Müller-Wille and Bernd Gieseking (in German). Translated by William Barr. Montreal: Baraka Books, 2011. 286 pp. $29.95 (softcover). ISBN: 978-1-926824-11-6

Wilhelm Weike's journals provide a unique perspective on early European anthropological research on Baffin Island. Employed by Franz Boaz, who would later become a noted anthropologist at Columbia University, Weike was asked by his employer to keep a journal of his travels for Boaz's future use. As such, Weike's work provides a unique historical source, useful both to those interested in understanding Boaz better and as a German ''everyman'' perspective on both whaling and Inuit culture on Baffin Island. For the casual reader, it may be slow. For historians and other scholars, maybe just right.

The book is split into two parts. First is the edited version of Weike's journal and letters, and second is a biography of Weike's life by Müller-Wille and Gieseking.

When Weike joined Boaz's expedition, he was 23, and Boaz only 24. They would travel across the Atlantic, along the coast of Greenland and on to Baffin Island aboard the ship *Germania.* On Baffin Island they ventured among whalers and Inuit, continued on to the Cumberland Sound sea ice, and then by dog sled across Baffin Island and along the coast of Davis Strait before boarding a whaling ship headed for Newfoundland, and eventually home to Germany. The second part offers greater context on the life of Weike and on his travels with Boaz. This section could easily be read before diving into the actual journal accounts to aid in the reading of the primary sources.

Perhaps the most compelling part of the book comes from the juxtaposition of Wieke's upbringing and training with that of Franz Boaz. Weike was a servant in Boaz's father's household; Boaz, a newly minted doctor of philosophy with training in physics, geography, and philosophy. Some of the book's most interesting sections are in fact where the editors insert excerpts from Boaz's journal alongside Weike's. In one such example, Boaz waxes on 'my' Kant (referring to a book of philosophy he was traveling with written by Immanuel Kant) and discusses how rough and deprived conditions are in the field. For Weike, it was just another day of work.

As a primary source document, it is apparent that the book's editors and translator have lovingly compiled a useful document for historians. For the more casual reader, the book for the most part lacks compelling storylines that draw one's interest in. However, within the journal and letters there are interesting accounts to read. For example, Weike's descriptions of Inuit burial and grieving practices for a deceased family member are touching, well written, and provide descriptions of traditions not often read about. But one must sift through much of Weike's writing to find accounts worth waiting for. As has been noted in the introduction by Müller-Wille and Gieseking, the ''social distance,'' between Boaz and Wieke persisted ''throughout their shared sojourn in the Arctic.'' Perhaps it is too much to ask of men of a different time, but one wishes for two young, energetic men in such a far-off land to have forged something more special than a master-servant relationship. For the modern reader, this distance means that what we get is essentially another work assignment for Weike, no different than the cooking and cleaning assignment Boaz asked of his servant. This reader wonders what might have been if the account had been written not as a work assignment, but instead as a personal journal.

Journal accounts can draw the reader in powerfully—for example, Dick Proenneke's journals as written up in ONE MAN'S WILDERNESS: AN ALASKAN ODYSSEY. This account does not have that draw. For historians, this work may be first rate; for others it may be more worthwhile to wait for another author to take the more interesting pieces of the account and produce a more readable telling of the story.

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GLOSSARY OF GLACIER MASS BALANCE AND RELATED TERMS. By Cogley, J. G., Hock, R., Rasmussen, L. A., Arendt, A. A., Bauder, A., Braithwaite, R. J., Jansson, P., Kaser, G., Möller, M., Nicholson, L., and Zemp, M. Paris: UNESCO-IHP, IHP-VII Technical Documents in Hydrology No. 86, IACS Contribution No. 2. 114 pp. Free (softcover). Order from ihp@unesco.org

Because of its direct connection to sea level, glacier mass balance is a subject of much interest now, not only to glaciologists, but also to a wide variety of earth scientists and even the general public. Consequently, this comprehensive glossary of terms is timely and welcome to a wide range of readers and users.

This is not a glossary of glaciology—the only term related to sea ice, for example, is ''*sea ice*''—but the authors have taken a pleasingly broad view of ''Related Terms,'' including terms such as *brightness temperature, permittivity,* and *ice-core stratigraphy* (but not *ice core*), and even organizations, like *World Data Centres* and the *World Glacier Monitoring Service*.

The authors, in their Introduction, give a lucid and apposite explanation of their scope and purpose: ''The aim of this Glossary of Glacier Mass Balance and Related Terms is to update and revise what has long been the effective standard of mass-balance terminology (Anonymous 1969).'' It '' . . . reflects changes in practice with conventional measurement tools, and also what is possible with the wide range of new tools . . . .'' The GLOSSARY includes commentary on usage, particularly problematic usage, with recommendations where appropriate.

''The scope of the Glossary extends beyond the measurement of mass balance. There are articles covering such subjects as gla-

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cier zonation; the definition of glacier features and morphological types of glaciers; the administrative structures within which mass-balance data are archived once collected; and the modelling of mass balance . . . . Also included [are] some terms that are mainly of historical interest, and some technical terms from other disciplines that appear in reports of mass-balance measurements by newer methods.

''The purpose of the Glossary is . . . to promote clarity and reduce ambiguity in the communication of information about glacier mass balance, as well as to provide a range of ancillary material.'' The authors ''have tried to steer a middle course between being prescriptive, that is, laying down the law about how terms are to be used, and being descriptive, that is, simply recording the facts of current usage.'' That purpose is well met by this Glossary.

Following the Introduction are 15 pages of explanatory material, beginning with a brief history of mass balance measurements going back to 1874. The next chapter is on terminology and is straightforward, although some users may not like the adoption of positive and negative signs for mass balance components according to changes in mass, so accumulation (c) is inherently positive and ablation (a) is inherently negative (i.e. an ablating surface has a negative ablation rate) and mass change is the sum of the two (c + a). The authors also describe and accept the alternative usage of positive signs indicating movement in a positive direction with respect to a coordinate axis, useful particularly for glacier flow. The main point is that reports of mass balance should state clearly which convention is used.

A crucial chapter comes next: Formulations of Mass Balance. Here the authors start with the basic equation for the mass balance rate of a column including all components of mass addition and loss, internal as well as external. To help prevent inaccurate usage of the term ''*surface mass balance*'' in the presence of non-zero basal and internal contributions, they introduce two new, closely related terms, ''*climatic mass balance*,'' for the sum of surface mass balance and internal mass balance, and ''*climatic-basal mass balance*,'' for the sum of climatic and basal balances. To get the total mass balance of the column the divergence of the flow vector must be added. The distinctions are important in light of the growing evidence for active internal and basal activity in and under glaciers and ice sheets; it will be interesting to see whether these new terms catch on with glaciologists.

Next there is an excellent discussion of the components of both the point mass balance and the glacier-wide mass balance, including a table of recommended symbols for them and figures depicting them in relation to a complete glacier and, separately, to an ice shelf. The chapter ends with short sections on alternative formulations and seasonal mass balance.

There follows a brief chapter that states what data should be included in mass balance reports and urges that those data be submitted to the World Glacier Monitoring Service for all glacier measurement projects.

Updating and revising the mass balance terminology of Anonymous (1969) was a central aim of this report; in Chapter 6 departures from the old standard are discussed. The authors find that the terminological distinction between equivalent quantities in the stratigraphic vis á vis fixed-date time systems has been so muddied over the years that it should be abandoned (although not the terms or the time systems themselves). The fact that geodetic measurements (repeated measurements of surface heights) do not fit into any established time system exacerbates the problem of intercomparison of data between systems. The authors do not offer any solutions in detail for this problem, but do emphasize the importance of reporting dates and methods of measurement accurately. They also diverge from Anonymous (1969) in giving primacy to mass units over volumetric or ''water-equivalent'' units, again not suggesting that the latter be discarded.

The units recommended for use are laid out in the next chapter starting with a look at the basic SI units (Système Internationale d'Unites) relevant to glaciology, and then taking up the case of the ''year,'' a non-SI unit, which they recommend be considered ''a practical extension of the SI'' for obvious historical and practical reasons.

The main body of the Glossary comprises 85 A4-sized pages of definitions, fuller explanations, comments, discussions, and cross-references. The entries range in length from one line to over a page—the Glossary is much more like a small encyclopedia than a dictionary, containing, as it does, a wealth of information. The entry for **Zone**, for example, covers two pages and includes easily legible diagrams of two temperate glaciers, one each with positive and negative mass balance, and one of a cold glacier, and a score of cross-references.

Perhaps that is to be expected for ''zone.'' More surprising is the entry for **stake**: a detailed description of the layers that develop (or disappear) in a year along a stake, again with clear diagrams, and comments about correcting for density changes, stakes that are not vertical, and measuring on a rough surface.

Actually, those two entries are the only ones over a page long, but most others are more than bare-bones definitions, many of them a lot more. All in all, it makes for an extremely interesting and useful glossary. The expanded nature of the entries leads to some redundancy among entries, but that is a positive aspect, not a negative one, because it means that many entries are complete in themselves without excessive cross-referencing—few people will read the Glossary through like a book (probably only reviewers).

Referring back to the cited ''Purpose''—the authors have succeeded admirably in providing clarity and reducing ambiguity and in steering an appropriate course between proscription and description.

With regard to scope: the coverage is comprehensive within the boundary between what is included and what is not. The placement of that boundary, while not precisely defined, seems reasonable and appropriate, although in some places it is rather ragged. Examples of the latter: ''*Altimetry*'' includes radar and laser techniques but not the also important (particularly historically) aneroid altimetry; ''*sonic ranging*'' is here, but not microwave or laser ranging; ''*grounding line*'' is discussed but not the more realistic term, grounding zone; ''*radar sounding ('ground-penetrating radar')*'' is discussed, but there is no mention of seismic sounding; and, as already mentioned, ''*ice-core stratigraphy*'' is here, but not ice core. These slight irregularities in the scope boundary are trivial when stacked against the huge value of the Glossary.

This superb volume belongs on the bookshelf of all practicing glaciologists and, perhaps just as important, on the shelves of non-glaciologists who interact with glacier people.

(Additional Comment)

It is unfortunate that the Working Group included nobody from outside western Europe and North America (one member was based in Chile for a year and a half and two other have done glaciological research in South America). That came about because the Working Group comprised glaciologists who volunteered at a mass balance workshop in Norway in 2008 that included few attendees, and no volunteers, from the rest of the world. The Working Group did have useful correspondence with several Russian experts, but since this Glossary and its recommendations will undoubtedly become a new world standard, a broader, worldwide representation in its construction would have been gratifying.

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THE GREAT BASIN: A NATURAL PREHISTORY. By Donald K. Grayson. Berkeley and Los Angeles: University of California Press, 2011. 418 pp. $75.00 (hardcover). ISBN: 978-0-520-26747-3

This book is the revised and expanded edition of the author's 1993 book, THE DESERT'S PAST: A NATURAL PREHISTORY OF THE GREAT BASIN. I found this book to be a well researched and written account of very many things natural in the Great Basin, of interest to a variety of scientists and laymen. The book is broken into six parts, some of which are subdivided into several chapters.

Part 1 sets the background for the region. The first chapter deals with the early explorations in the region that led to the conclusion that no rivers flowed out of it, they only stay within. It was Frémont who coined the term ''The Great Basin'' in 1843. The following chapter discusses the various ways to define the Great Basin, such as being based on hydrographic, physiographic, or floristic data.

Part 2 is entitled ''Some Ice Age Background.'' First is a good discussion of the Bering Land Bridge, the geological conditions (e.g., ice volume and sea level positions) necessary to form it, and migration across it. The author goes over key archaeological sites, information needed to correctly identify such, and concludes that people were in North America by 12.5 Ka, before Clovis time. The next chapter centers on an in-depth discussion of the extinction of mammals. Every argument is thoroughly and carefully laid out. His conclusion is that there is little evidence that people caused it, and that the time was near 11 Ka. It is here that I was first impressed with his excellent knowledge of the diverse fields he covers and brings together—such as geology, archaeology, and the flora and fauna.

Part 3 covers ''The Late Ice Age Great Basin.'' To make the reading more interesting, he intersperses recent history where appropriate, such as the use of the incredibly level surfaces of late Quaternary salty lake beds to set land speed records (763 mph in a vehicle and 152 mph on a bike!), and a discussion of problems faced by the Donner Party that eventually led to their gruesome camp at the foot of the Sierra Nevada. The discussion of the pluvial lake histories is current and detailed and demonstrates his in-depth knowledge of the geography of the region. I am prejudiced toward mapping and would have included a discussion of Roger Morrison's maps in the Lake Lahonton area, as they are exceptionally detailed and are the kind of work that is the key to any correct interpretation. With so many lakes oscillating in elevation over time, a few more figures might have helped the reader keep them in order.

The glacial history coverage seemed a bit short, and could have benefited from a figure of regional paleoglacier extent, if an appropriate one is available. The author follows with a good discussion of how the lake and glacial records can give insight into past climates. I have some knowledge of the references used in this chapter, and if their selection is any indication, I am confident that the references listed on 54 pages at the end of the book are well thought out and current.

The next chapter covers past vegetation. Much of the record comes from packrat middens, which is nice, because the plant remains are visible and radiocarbon dating can be applied. He even recounts how some hungry early explorers did not know what these deposits were and tried to eat them! Other data come from the analyses of pollen and other fossils in lake and pond deposits. He clearly lays out the kind of record each yields. The story that emerges is complex and detailed across this huge area and was hard for me to keep straight. However, there was a lack of summary vegetation maps or charts, but maybe this lack indicates how difficult they are to construct. The discussion is interspersed with comments on what the reconstructed vegetation says about past temperatures and precipitations over time. For example, Death Valley could have been 14-25° F colder and 3–4 times wetter during the last full glacial.

Next is a chapter on late Pleistocene vertebrates. The list of these is large and includes mammals, birds, rabbits, marmots, gophers, and pikas. He discusses the dating problems of many sites containing these, their geographic distributions, migrations and extinctions, and concludes they did not all disappear at once.

Part 4 consists of one chapter on the Holocene. Here again he displays the breadth of his knowledge as he interweaves the record of such phenomena as packrat middens, pollen, and mammals in an attempt to provide a region-wide climatic picture. For us old timers it was good to have the update on Ernst Antev's climatic model published in 1948 that had a profound impact on subsequent workers. This is where the term ''*Altithermal*'' was introduced, and in my field, we were forever searching for that Altithermal soil.

Part 5 covers prehistoric archaeology, and the most accepted record starts with Clovis sites, but he goes on to describe other sites. He gives an in-depth treatment of point styles, their ages, and what they mean. Ways to depict population size is given, and this is related to food sources, and even the expenditure of calories to produce food, how the density of grinding stones is related to climate, and the use of seeds for food. Also included are such diverse subjects as the evolution of languages, the finding of alpine sites, the introduction of the bow and arrow, and the role of climate change. This is an amazing amount of material to keep track of, and he does it well.

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