activity that was taking place during the five decades that form the focus of the book. The binding of the book, essentially a thick, softbound report, could be better and longer lasting (some of the pages of my copy had fallen out by the time I was done reading it), though cost constraints undoubtedly forced this choice on the editor, and it has kept the book at an affordable price.

In summary, *Fifty More Years Below Zero* is a book that anyone doing research in Arctic Alaska with even the least interest in what went before will want to read. Readers are probably best advised to choose the papers they read judiciously, but there are many good ones to choose from. In the end, the papers they read will give them a better understanding—and appreciation—of the work and spirit of the past five decades.

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BY AIRSHIP TO THE NORTH POLE: AN ARCHAEOLOGY OF HUMAN EXPLORATION. By P.J. CAPELOTTI. 1999. New Brunswick, New Jersey: Rutgers University Press. xxiv + 211 p., b&w., illus., notes, bib., index. Hardbound. US$26.00.

ARCTIC MISSION: BY AIRSHIP AND SUBMARINE TO THE FAR NORTH. By WILLIAM ALTHOFF. 1999. Auckland, New Zealand: Lighter-Than-Air Institute. (2nd rev. ed. 2000). xx + 291 p., colour illus., notes, bib., index. Hardbound. US$49.95.

Hasn't virtually every Arctic investigator pinned to the earth's flattish surface dreamt of floating overhead in a balloon or a blimp to get a better look downward? About five years from now (2007), we shall pass the 100th anniversary of the first dirigible flight within the Arctic Circle, and a year later the 50th anniversary of the sixth and last major penetration of the Arctic by lighter-than-air craft—so far. Two books appeared by coincidence in the same year, one describing dawn, the other sunset on dirigibles' role in Arctic exploits. The brief era's 'bookends' are authored by serious scholars; each one refreshes our memories of forgotten events and the periods within which they took place.

Capelotti's *By Airship to the North Pole* raises the curtain on dirigibles operating within the Arctic Circle. He tantalizes readers with his interdisciplinary subtitle. The interdisciplinary tactic of industrial-age archaeology has proven to be fertile ground for one writer addressing controversies surrounding the *Titanic* (Pellegrino, 2000). For cognitive dissonance, Capelotti might have subtitled his book "an archaeology of early aviation." His central character, Walter Wellman, Chicago journalist and polar aeronaut manqué, is a victim of compressed technological revolution sweeping the international fraternity that coveted attainment of the North Pole between 1894 and 1910. Those years when Wellman was part of the polar scene ushered in widespread use of wireless communication, the internal combustion engine, and heavier-than-air flying machines. Wellman's dirigible, *America*, was twice modified in France with funding provided through his employer, the Chicago *Record-Herald*, as if to punctuate his three polar attempts of 1906, 1907, and 1909. Substantial improvements to the "car," the engines, propellers, and size of *America* failed to give her the appearance we associate with the airworthiness of later designs, like Roald Amundsen's *Norge* and Umberto Nobile's *Italia*, airships that successfully attained 90˚N a couple of decades later, in 1926 and 1928, respectively.

America's puny appearance belied the airship's appetite for money from private fundraising. She was the first gasoline-powered heiress to French expertise in balloons to be airborne within the Arctic Circle. Her bills amounted to the equivalent of US$10–15 million today. Wellman was undeniably a world-class fundraiser. His prowess as promoter, fundraiser and author notwithstanding, Wellman's reputation among polar explorers had sunk to somewhere between 'forgotten' and 'discredited' by the 1990s. P.J. Capelotti undertook to give Wellman fair hearing for historical resurrection and validation through archaeological investigations.

Virgo Bay in Svalbard (Spitsbergen) was the same bay from which three Swedish balloonists, led by Salomon August Andrée, had set out to be blown by southerly winds to the pole. In 1897, their "free" hydrogen balloon *Örnen* (*Eagle*) lofted them to oblivion. For 33 years, the trio was assumed to have perished on the pack ice without a trace (except for a couple of messages delivered by carrier pigeons released from the still-airborne balloon), far from land or any hope of return to it. Wellman's pole-hopeful dirigible was barely more than an elongated balloon, powered by gasoline-engine-driven propellers, which the journalist readied for flight less than a decade after Andrée's disappearance. *America* was designed to correct flaws in the configuration of the unpowered balloon that polar commentators blamed for the Swedes' disappearance. The technological innovations between the Andrée launch and the Wellman launches assume pivotal importance, especially in the mind of an investigator qualified to evaluate and compare the "material culture" at the two launch points within sight of each other in Virgo Bay.

Real aficionados of Arctic history could stage a fanciful tournament of "what ifs?" by imagining the consequences of prompt finding of Andrée's survival camp, logbooks, and bodily remains of the trio on White Island. All were found, of course, 33 years after the balloonists' disappearance, by which time Roald Amundsen and Umberto Nobile had each reached 90˚N in their carbon-copy dirigibles. Wellman's feeble attempts to improve on Andrée's

performance might have been shaped quite differently if the fate of the balloonists had been known, say, by 1900.

Archaeological evidence may not explain Wellman's gross neglect of field-testing equipment before shipping tons of it to the Arctic, nor justify the corners that Wellman cut on the construction of his dirigible hangar in Virgo Bay. Charles Lindbergh, for contrast, was a celebrated stickler for preparation and pre-flight testing (Berg, 1998). There were, on the other hand, issues in written records that begged resolution by Capelotti's archaeology: the contested quality of raw materials used to generate hydrogen (hence the lifting power generated per unit reagent mass and per unit reaction time) for *America* at Virgo Bay, the debated extent to which tubular steel had replaced wooden struts in one reconstruction of *America*'s car, and evidence of the extent to which Wellman himself was beholden to products whose advertisers subsidized the Chicago *Record-Herald*. My reading of the book suggests that Capelotti's scholarship has rescued Walter Wellman from the obscure shadows of a nonachiever, elevating his status to significant architect of polar aviation history.

Despite its different style, the second of the airship-era bookends is equally thought-provoking. Most writing that reflects an author's passion for his subject is worth attentive reading. In *Arctic Mission*, William Althoff shares persuasive fascination with lighter-than-air (LTA) craft in connection with Arctic exploration. He closes the curtain on the LTA era of polar aviation by plucking the 1958 trip of the *Snow Goose* (U.S. Navy, ZPG-2 #126719) from the same relative obscurity that Capelotti probed for Wellman's exploits. The late 1950s wove a rich tapestry of events through the Arctic. The Cold War was barely a decade old when its principal antagonists engineered its first thaw, the International Geophysical Year (IGY) scheduled for 1957–58. Althoff indulges in serious and sensitive reflections on Canada-U.S. relations, both in general history and as they played out in Cold War contexts of the 1950s. Counterpoint draws the most out of what I consider his main project of information salvage. That is, the Navy's polar LTA flight is linked to the better-remembered transit of the Arctic Ocean (Bering Strait to Portsmouth, England) by the U.S. nuclear submarine *Nautilus* in the same months of 1958. It is striking that Althoff uses the dirigible-submarine counterpoint with the same enlightening effect that Capelotti achieves with his dirigible-balloon counterpoint. Symbolism flavors the contrast between the last Arctic dirigible's being best known in genderless workmanlike terms like "719," whereas its ancestral airships had carried names of nation-states northward. Equally symbolic was the submarine SSN 571's bearing the name of Jules Verne's fictional submersible. Sir Hubert Wilkins had previously borrowed "Nautilus" for the World War I surplus submarine that he used in his plucky adventure beneath sea ice in 1931. Count on Althoff, however, to treat you to a reading experience considerably more profound than exploring symbolism, or commemorating the end of the dirigible era and the opening of the nuclear submarine era in the Arctic.

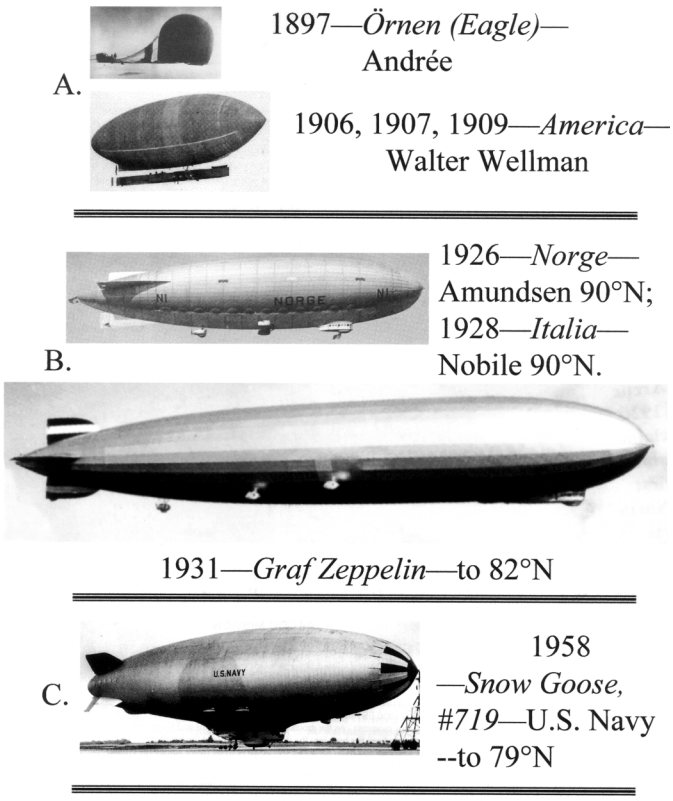

FIG. 1. The six lighter-than-air (LTA) ships that flew in the Arctic, one free balloon and five dirigibles, all shown approximately to relative size scale (*America* was 57 m long, *Norge* and *Italia* 104 m, and *Graf Zeppelin* 235 m in length). (A) Dawn of the Arctic LTA era, 1897–1909. Andrée's balloon pictured on the polar pack ice after crashing north of Svalbard, in film recovered in 1930 and developed 33 years after its exposure. Photos: reproduced from Capelotti (1999), Rutgers University Press. (B) High Noon of the Arctic LTA era, 1926–31. (C) Sunset on the Arctic LTA era, 1958. Photos in B and C are from Althoff (1999), New Zealand Lighter-Than-Air Institute.

Sputnik's launch by the USSR 10 months earlier inspired this air and sea assault on the Far North by the U.S. Navy. President Eisenhower capitalized on a chance to send the flag forth with the military establishment, while the U.S. space program ironed out its post-Sputnik difficulties. Althoff shows how both the Cold War and its first thaw forged a number of the book's themes. He pauses with the introduction of each new topic, and digresses into the high points of that topic's history. Thus, for example, he helpfully traces the chronology of dirigibles in the Arctic and which nation-states participated in transitions (p. 13l–135), and similarly for drifting ice stations (p. 151–165).

Built upon foundations of geology (the author's training), history, imagery (unrivalled crispness of photographs reproduced from the 1950s, supplemented by the author's own and others from the 1980s) and undeniable skill at writing (not always skillfully edited), Althoff's contribution to chronicling an interlude of Arctic history deserves recognition as a piece of art. This art combines a reference book, a coffee-table piece, and an entertaining vein of stories. Rather than being a page-turner, Althoff's text is best read in measured doses, perhaps reflecting the

unhurried pace with which the book was compiled. Readers should be forewarned to overlook a few idiosyncrasies with this book. Running heads are printed so large that you may think you are starting a new chapter at every other turn of a page. Expect frustration if you try to connect chapter endnotes at the back of the book to the correct place in the text, because chapter titles are replaced by meaningless chapter numbers in the endnotes.

Despite its long gestation, *Arctic Mission* does not refer to several key publications prepared during the same years that were germane to Arctic submarines, to Cold War intrigues (Leary and LeSchack, 1996; Leary, 1999; Britton, 2001), or to dirigibles in the Arctic (the Capelotti book itself). Had I been attempting Althoff's writing project, I imagine myself reaching out to pick the brains of other authors actively researching related topics. That Althoff succeeds without leaning upon a circle of like-minded authors is a tribute to his energy and the completeness of his research.

Perhaps the most valuable section of Althoff's book will prove to be his Epilogue (p. 209–233). All his various threads and stories are wrapped up, and individual performers in the body of the book are followed from 1958 to their end-of-century status. It is worth noting generally that a number of the young scientific assistants, for example those on Ice Station Bravo (as T-3 was designated during the IGY), had completed their doctoral studies and become leading polar scholars by the end of the 20th century. Likewise, Hugh Mulligan, the Associated Press writer who covered the dirigible and submarine exploits of 1958, was destined to have a long and honored career in journalism. Althoff has particularly fond and gracious things to say about Canadian participants, among them Commodore O.C.S. "Robbie" Robertson, who became Canada's senior specialist in U.S. Naval Arctic operations, and who earned his American colleagues' profound admiration (Britton, 2001).

Nuclear submarines and their Arctic operations are amply covered by other published (and no doubt many still-classified) documents, so this book's real contribution has to be its thoughtful coverage of the dirigible adventure. Althoff's consideration of the pros and cons of dirigible operations in the Arctic is concentrated in this Epilogue. The constraints that limited to six the total number of LTA ships in the Arctic (Andrée's *Eagle*, Wellman's *America*, Amundsen's *Norge*, Nobile's *Italia*, the *Graf Zeppelin*, and the U.S. Navy's #719, Fig. 1) are given balanced treatment by Althoff's work.

There are some undeniable practical virtues to airships besides their "ungainly charm." Above all, they were splendid observation platforms for visual or radar surveillance. Robbie Robertson and others on the voyage of the Navy's #719 over sea ice never tired of watching bears and whales from 300 m or less and cruising along at a leisurely pace of 70 km per hour. To be sure, there is talk of a dirigible revival. It crops up in Russia and Canada and is called "helium fever" in the United States. German heavy lift operations are the only true revival underway as the 21st century begins. It would seem that needs for moving heavy loads would make the Arctic especially eager to adopt solutions offered by airships' static lift capabilities. Dirigible (blimp, LTA, semi-rigid airship) operations are facilitated in the Arctic by the density of cold air, which provides more lift per volume of helium.

On the other hand, LTA operations suffer from handicaps that until now have more than offset their advantages. Historically, the 1937 flaming death of the hydrogen-filled *Hindenburg* at Lakehurst, New Jersey, left an indelible visual impression on generations of Movietone News viewers. Nobile's agonizing disaster in the *Italia* in 1928 had earlier chilled Arctic enthusiasm. Even if we imagined lighter-than-air ships free of historical scars, as if they were just now being invented, their future would have to overcome hurdles. Whenever you enclose 30 000 m^3 of gas (a million cubic feet) in a bag as long as a football field, the bag seeks to join the atmosphere surrounding it in whatever mischief might be taking place at the moment. High winds, for example, put airships at the mercy of motions by the gaseous environment of the nearby atmosphere. Guarding against atmospheric mishaps explains why an inflated dirigible, unlike an airplane, requires constant manned attention: the pilot and crew cannot simply tie an airship to the ground and walk away. Dirigibles are labor-intensive craft. So long as hydrocarbon fuel energy remains cheaper than human labor, we can expect fuel-hogging helicopters and high-flying, high-speed jet airplanes to squander energy on lifting, while hogging the skies that some of us (like William Althoff and me) would like to see shared with dirigibles.

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