Thomas Misa; Robert W. Seidel, eds. *College of Science and Engineering: The Institute of Technology Years (1935–2010).*
College of Science and Engineering: The Institute of Technology Years (1935—2010) by Thomas Misa; Robert W. Seidel
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order pioneers, like Van Allen, Herbert Friedman, or Fred Whipple, who came to this new way to practice science already trained, mature and established in their respective fields. Ludwig's memoir is a coming-of-age testimonial; it is not heraldic or particularly celebratory but, instead, a clinical reliving of endless labor, frustration, and jubilation at achieving any degree of success. Of course, as expected, there is a certain conviction to this work; as a winner's narrative it is constructed as a continuous thread, with very little doubt or deviation. Even so, Ludwig's accounting of events in the years 1957 and 1958 reveals the intensity of constantly conflicting demands of preparing payloads, attending to launches, retrieving data, and puzzling over the meaning of it all, amid constant worry about the effect his absences were having on his young family. It is an intimate portrait of how incremental advance led ultimately, but not inevitably, to revolutionary knowledge.

Opening Space Research chronicles Van Allen's creation of the Iowa cosmic ray program; it starts in the early 1950s, with his arrival on campus and establishment of a research team of undergraduate and graduate students. The first chapters chronicle the expeditions the team took developing and flying the innovative "rockoon" systems of balloon-launched sounding rockets. Recounting these early years, Ludwig provides both technical and operational perspective on preparing for launches at remote geomagnetic latitudes in expeditions made possible by Van Allen's strong contacts within naval circles. After a recounting of Van Allen's centrality to planning for the International Geophysical Year (IGY), Ludwig then shows the incorporation of the continuing Iowa expeditions into IGY aspirations, which led to a strong alignment with Wernher von Braun's Army Ballistic Missile Agency (ABMA). Throughout, Ludwig provides valuable insight into how Van Allen's close working relations with both Navy and Army patrons translated to the working level in his team of students.

Highly useful is the perspective Ludwig brings for understanding the interinstitutional complexities obtaining between Van Allen's Iowa team, Von Braun's ABMA, and William Pickering's Jet Propulsion Laboratory. We are all familiar with the iconic portrait of those three men, holding aloft an Explorer satellite on the stage of the Great Hall of the National Academy of Sciences at 1:30 a.m. on Saturday, 1 February 1958 (reproduced in the book as Figure 9.3). Space history wonks delight in speculating on whether Pickering and Von Braun were consciously holding the cylinder just out of Van Allen's comfortable reach. Ludwig's detailed breakdown of events and circumstances leading to this triumphal moment more than justifies our speculation.

Later chapters follow the Iowa team's participation in discovering the trapped radiation and elucidating its extent and structure. Probably of greatest interest for *Isis* readers, however, will be Ludwig's detailed accounting of Iowa team participation in the Argus project. His narrative may not change the minds of those who criticize Van Allen's participation in monitoring these atmospheric nuclear tests, but it may help them appreciate why he really had no viable choice in the matter—which was, of course, characteristic of the emerging space sciences.

DAVID DEVORKIN

Thomas Misa; Robert W. Seidel (Editors). *College of Science and Engineering: The Institute of Technology Years (1935–2010).* iv + 192 pp., illus., app., bibls. Minneapolis: Charles Babbage Institute, 2010. $58.99 (cloth).

The College of Science and Engineering at the University of Minnesota is today one of the finest technological institutions in the country. It all began in 1851, when the Territorial Legislature founded the Minneapolis-based university as a preparatory school where, for the munificent sum of $4 a quarter, an elderly clergyman instructed a handful of local children in the three Rs. The technical subjects developed in fits and starts, spurred by the passage of the Morrill Act in 1862, which offered states (Minnesota had taken its first baby steps as a state in 1858) large grants of land in exchange for college-level work in agriculture and vocational training in engineering, industrial drawing, and other "mechanic arts" subjects. With the financial backing of state senator and flour magnate John Sargent Pillsbury, who joined the university's board of trustees in 1863, school officials effectively shelved plans by the state's agricultural interests to create a second campus elsewhere. Pillsbury Hall, a monument to his efforts to grow the university in Minneapolis, opened in 1890.

By then, a full-fledged course in electrical engineering had been introduced, the physics department boasted one professor on its roster, and the rush to add courses in telegraph, telephone, and electric railways had begun. The coming and going of instructors in these fields, and the rise of a new School of Technical and Applied Chemistry in 1897 and its transformation into an independent School of Chemistry in 1904, is the starting point of Chapter 1 of this

history. In 1935, President Lotus D. Coffman put an end to the bickering and feuding among faculty members in the three separate schools of mining and metallurgy, chemistry, and engineering and architecture and founded the university's Institute of Technology (IT).

Succeeding chapters (there are a total of seven) recount the institute's role in harnessing hydroelectric power from the St. Anthony Falls, the only natural falls on the Mississippi River; revitalizing Minnesota's iron ore industry using taconite; the critical (and surely controversial) role of Athelstan Spilhaus, dean of the Institute of Technology from 1949 to 1967, who "cleaned house" (p. 73) and pushed for physics to become part of IT over the objection of the physics chair and other faculty within the university; the fight over how to handle pure and applied mathematics; and the rise of the School of Earth Sciences and astronomy. Spilhaus, who emphasized the importance of the hard sciences in building IT's research programs in engineering after World War II, also supported the dramatic makeover of chemical engineering into the powerhouse it has since become. The tensions that surely existed between the university and the Institute of Technology are hinted at but never fully explored.

On 1 July 2010, Minnesota's Institute of Technology changed its name to the College of Science and Engineering, a not-so-subtle admission, perhaps, that after seventy-five years confusion reigned "as to the exact role of the college in the university" (p. 143).

College of Science and Engineering: The Institute of Technology Years (1935–2010) is a book written by a committee. It does not make compelling reading, and there is, unfortunately, no index, although the book is full of names, some of them significant. Nevertheless, it is an important contribution to the literature on American institutions of higher education. As such, it may well belong in your bookcase.

JUDITH GOODSTEIN

Curtis Peebles (Editor). *The Spoken Word II: Recollections of Dryden History, Beyond the Sky*. (Monographs in Aerospace History, 42.) xi + 199 pp., illus., bibl. Washington, D.C.: NASA History Division, 2011. (Paper.)

Since its establishment, the National Aeronautics and Space Administration (NASA; 1958–present) has vigorously documented its history and that of its predecessor, the National Advisory Committee for Aeronautics (NACA; 1915–1958). Dozens of books, chronologies, special studies, and specialized monographs have appeared examining the agency—its people, facilities, and leading research programs (of which the trio of Mercury, Gemini, and Apollo are the most recognized).

Historians of science and technology have increasingly examined the agency, informed not only by these works but by the ready availability of much of its professional documentation via the National Archives and Records Administration and, as well, the relevant presidential libraries and various collections of private papers held by institutions such as the U.S. Library of Congress, the National Air and Space Museum of the Smithsonian Institution, and various schools and universities.

With the broad outlines of both NASA and NACA now well examined, historians and popular authors alike have begun delving more deeply, looking at the "bottom-up" history of the agencies, increasingly focusing on the work and activities of the engineers and technical workers who contributed so much to both.

Curtis Peebles has contributed a very useful collection of oral history excerpts from ten NACA/NASA pioneers (the most recognizable of whom is the test pilot and Apollo astronaut Neil A. Armstrong) who worked at the NASA Flight Research Center, later redesignated the NASA Dryden Flight Research Center (after Hugh L. Dryden, a noted American aerospace researcher and research director/administrator). Peebles avoids a common problem with such compilations—namely, the tendency of editors to rely on the words of the participants themselves to carry the history. Wisely, he has grouped the excerpts according to the rough historical framework of NASA after its creation: the drive into space, the Apollo development effort, post-Apollo research leading to the space shuttle, and the evolution and flight testing of the shuttle itself. The individuals whose memories and experiences are captured in this work are test pilots/astronauts, engineers, technicians, and research administrators.

NASA has always been an agency torn in two directions—between flight within the atmosphere, or aeronautics (the "first A in NASA," as its proponents readily assert), and flight into space, using both inhabited and uninhabited systems. The Dryden Center, whose origins date to 1946 and the initial drive through the much-hyped (if nevertheless quite dangerous) "sound barrier," has always been focused primarily on aeronautics. Even so, Peebles's book demonstrates that, after 1958, the center and its personnel were intimately involved in the drive into space and beyond, with "transatmospheric" pro-