Tracking an Invention

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Everybody knows who first man to orbit the Earth was, and when: Yuri Gagarin, on 12 April, 1961. These facts are undisputed and precise, in sharp contrast to the answer to “who invented the first pacemaker?”

A new book by Wilson Greatbatch, described as “The Inventor of the Pacemaker” on its cover, does little to enlighten us. Its title is The Making of the Pacemaker—Celebrating a Lifesaving Invention, but little space is devoted to the first implants. We learn only that the very first pacemaker was implanted on 7 May 1958 by Greatbatch along with Drs. William C. Chardack and Andrew Cage, and that the recipient was a dog. Electronics and batteries were sealed by being wrapped in electrical tape. Fluid quickly entered the device and it stopped working after several minutes. It is this the book commemorates as the first artificial, fully implanted pacemaker.

First human implant

But the first pacemaker was implanted into a human a few months later, in Sweden, on 8 October 1958. Two Swedish researchers were involved, a Dr. Aka Senning and a chemical engineer named Rune Elquist. The patient, a victim of a hepatitis infection, received two units in quick succession, as the first pacemaker worked for less than a day. The second lasted eight days.

Interestingly, the patient, Arne Larsson, who in later years was often present as a guest of honor at conferences for pacemaker physicians, did not need another pacemaker until 1961. And he was still alive in 2000, having received 26 pacemakers all told. But this book mentions Senning’s implant trials only in passing.

Yet, Greatbatch would have us believe that he was the inventor of the first human pacemaker. In his introduction he says, “Use in an experimental animal took place in May, 1958, and its successful use in a patient occurred on April 7, 1960.” (“Successful” is defined by Greatbatch as a year’s continual use.)

So, while everybody accepts that the first manned space flight was made by Yuri Gagarin—even though it only lasted 1 hour and 48 minutes—Greatbatch claims that the first “successful” human pacemaker implant was his, because the Swedish pacemaker worked only for hours!

The trick was in the batteries

Besides implanting the first pacemaker in a dog, Greatbatch does have another breakthrough to his credit. He was the first to see the importance of switching from mercury-zinc to lithium batteries, and he built a lithium battery manufacturing empire. The batteries from this company power most of today’s pacemakers.

Greatbatch was the first to realize the importance of a battery that could be sealed against the human body’s moist environment. Mercury-zinc batteries leak hydrogen and therefore cannot be totally sealed. Also, their discharge process is much less predictable than for lithium batteries.

I remember vividly how often in early years patients were rushed to hospital by ambulance because their pacemaker battery had failed unexpectedly, despite the fact that we had seen them in our pacemaker outpatient clinic a few days before and thought the batteries were fine. Many people believe that the lithium battery, and not “the invention of the pacemaker,” is the true accomplishment of Wilson Greatbatch.

As a clinician, I also enjoyed the few lines where Greatbatch describes the medical aspects of his inventions. This look into history gave me information I had been seeking for a long time. In particular, I had wondered about a pacemaker made in the 1960s that was called programmable because its characteristics could be modified by inserting the equivalent of a wrench into holes on its side—by going through the patient’s skin with a needle! It was very interesting to learn more about the technique used for these devices, and I was relieved to read that doctors mostly declined to use this rather cruel form of programming. Also of great interest are the historical photos, such as those of the very first pacemaker implanted in a dog, with its components crudely wrapped in tape.

There are pearls in this book, as may be expected when such an important pioneer of medical electronics looks back on his life. But I wish some experienced editor had streamlined the narrative and made clearer exactly where Greatbatch’s accomplishments, as well as his precise role in medico-technical history.
The literature on the exploration and exploitation of space is very diffuse. An outsider deeply interested on a relatively nontechnical, but detailed, level must depend largely on magazines published by space advocacy organizations and on occasional features in news magazines, which emphasize the spectacular and the tragic at the expense of perspective and balance. Richard Wagner’s and Richard Godwin’s books are effective remedies to this problem.

Wagner’s Designs on Space is a broad and coherent account of the near-term future of space exploration and even visits by space-hopping tourists. The text, consisting of 37 short chapters, is supplemented by art work on nearly every page. The drawings are a cross between three-dimensional engineering views and artistic impressions. The combination of text and art works well, holding the reader’s interest while providing concrete images for the imagination to use as a starting point.

The author takes for his subject matter the entire future of space in the new century. There is no historical background, no dwelling on the Space Shuttle system, no recapitulation of familiar facts about Apollo. The book begins with the International Space Station (I write this review in February as astronaut Tom Jones space-walks around the station exterior.) After surveying the stages in the station’s assembly and operation, it moves briskly on to private space activities, including private launch companies and plans for space tourism.

The material is generally quite up-to-date, excepting only the financial
collapse of the Rotary Rocket Co., of small reusable rocket fame, which occurred after the book’s publication.

An extensive discussion of current and future Mars exploration programs is included, along with a variety of missions to comets and asteroids, including the private Near Earth Asteroid Prospector mission of the Spacedev Co., Poway, Calif. Beyond that, the objectives of a number of solar system exploration missions are summarized, including a mission to orbit a probe around Europa, the Next Generation Space Telescope, and probes to Pluto being developed by the U.S. space agency.

The concept of solar power satellites beaming an endless supply of electricity to power-hungry Earth is described in the context of the 1995 NASA Fresh Look study, missing only the announcement this past February in which the Japanese committed to a program of development of operational multi-giga-watt solar power satellites by 2040. The ideas of David Criswell at the University of Houston for lunar-based solar power stations are absent from the discussion, possibly the only important oversight I could identify in the book.

The volume concludes with brief descriptions of matter/antimatter and fusion ramjet propulsion systems for interstellar probes, a subject whose timeline is sufficiently uncertain to make its inclusion in this 21st-century future history debatable.

Unfortunately, the book lacks an index. This is a significant oversight, even though the organization of the book makes an index somewhat less vital than it might otherwise be. Nevertheless, I recommend this book to a wide range of readers, both laypersons and technically astute specialists from other fields, for its clarity and scope. The
The reader cannot help but assimilate some part of the emerging vision of the 21st century: that private endeavor may accomplish wonders, even as the dinosaurs of giant government programs still walk the Earth.

**Missions to Mars**

Except for only a brief introduction and afterword by the editor, Richard Godwin, *Mars: The NASA Mission Reports* is entirely assembled from original NASA documents. This is not gushy public relations prose; it is the actual documentation of these missions and what they found. All the details of what, when, where, who, and how are here. It is easy to get absorbed in the story.

The book covers the entire sequence of NASA Mars missions to date—from the Mariner flybys and orbiter, the Viking 1 and 2 orbiter and lander missions and their search for life, the Mars Observer, Pathfinder, and Global Surveyor—and concludes with the Mars Climate Orbiter and the Mars Polar Lander. It is unfortunate that this long and exciting story must end on the sour notes of those last two missions, which were failures.

But, as a long-time space buff, I confess to experiencing a thrill upon reliving the early Mariner and Viking success stories. Somewhat poignantly, the Mars book ends with a 1969 presentation by Wernher von Braun on plans for a manned mission to Mars. Ah, those were the days—back when there was still an exciting future and reliable government support for dreams of human exploration.

For the interested reader, it is worth noting that this is but one of a series of books published by Apogee Books that document, for example, the Apollo 11 and Apollo 13 missions in great detail. In many ways, this book is complementary to *Designs on Space*—nuts-and-bolts realism and gritty history juxtaposed against visionary sketches of the future. Space is neither one alone; but combining the two gives us a sort of baked Alaska of complementary delights.

*Stephen Cass, Editor*