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## Summer Reading: Consider... the Unassuming Battery

*“‘A battery behaves like a human being. It senses the kindness provided and delivers on the care and attention given,’ writes Isidor Buchmann in his book, Batteries in a Portable World. And if you think that the topic would bore your summer barbecue friends, consider the global race to create the world’s most powerful battery. There’s a story. Steve LeVine’s The Powerhouse: Inside the Invention of a Battery to Save the World reads like a thriller. Both make great summer reading.”*

With Field Day 2017 in the recent past, I have to say that Field Day always reminds me of the little things we depend upon because they serve a critical role for which our otherwise inventive nature can find no substitute readily at hand. It’s easy to overlook the indispensables: just 10 more feet of coax; a barrel connector; spare fuse for that orphan transceiver suddenly pressed into service for the GOTA station; the antenna launcher!

Then there’s the deep-cycle monster battery. It’s capable of operating the entire event. You remembered to pack it, but left it un-charged from your prior portable adventure. Batteries! Without modern batteries, carefully maintained, portable communications would be impossible.

Yesterday at the beach, I was reading the Buchmann book, which is available on the ARRL website (okay, a shameless plug). Picking it up, I thought, “I know all about batteries. What’s so complicated? They have no moving parts.” Well, I learned that I know nothing. Or at least, very little.

Buchmann briefly recounts the history of these small, but essential, devices. Then he plunges into an artful discussion of wide-ranging modern battery topics. These include a battery’s multiple performance vectors: weight versus volume; specific energy versus performance; cost versus safety; life span versus specific power. He even explores the environmental impact of various alternatives. All of these trade-offs have significant consequences and major design and use implications. Buchmann’s explanations are technical and lucid, without being overwhelming. He intersperses anecdotes (if batteries can be anecdotal) that lighten the narrative but drive home the point. One relates to how the British almost lost the Falklands War because improperly maintained batteries in the British Army’s rocket launchers failed to fire. Another mentions that batteries are more expensive than munitions for US soldiers and Marines. And that Marines carry five sets of six types of batteries for radios, flashlights, GPS, and night vision scopes. For an expeditionary force, the weight adds up quickly.

The most valuable chapter remains the one devoted to extending battery life. It’s a must-read for anybody who carries a hand-held radio, totes a gel-cell wagon, or even works off a wet-cell, deep-cycle bank. The author doesn’t overlook a single battery variant, with robust and practical recommendations for every style from Lithium-ion to Lead-acid. It contains the first coherent explanation I have yet encountered of why Li-ion batteries

should never be fully discharged nor fully charged. Buchmann’s book, while precise and thorough, is also practical and eminently useful. I could have saved a fortune.

The other summer reading suggestion is a tale of corporate and public intrigue on a global scale by Steve LeVine. *The Powerhouse: Inside the Invention of a Battery to Save the World*, recounts the headlong, flat-out race by US scientists to develop a super battery for powering electric vehicles. Throughout the mid-1990s, various unrelated but opposing teams compete, neck and neck, attempting to recast a whole series of metals and chemistry — nickel, manganese, cobalt, iron, and lithium — to concoct the super battery for GM’s Volt model. The story is a familiar one to all of us: try, fail, try again — cut and try. The book is available on Amazon and is still in bookstores.

There appears no silver bullet or shortcut alternative to elbow grease, persistence, and the triumph of hope over experience. Of course, development of a super battery for an electric vehicle has some meaningful implications for alternative power, whether wind or solar. And, as Tesla the car maker has demonstrated, even for standby or emergency power alternatives to generators. In fact, I am told that you can back up your hybrid and run a large tent with air conditioning. But over the past few decades, the power of Moore’s law has escaped the battery game. Buchmann makes clear that, pound-for-pound and cubic inch, fossil fuels pack 30 times the energy of Lithium-ion. That’s a quantum difference, but it’s a target to shoot for in the evolution of batteries. LeVine and Buchmann both suggest that a quantum breakthrough lies out there on the horizon waiting to be discovered.

While you’re reading on the beach, the lake, or just with your feet up on the porch this summer, consider the importance of small things and how they impact everything we do. “Batteries have become the lifeline of society,” Buchmann writes. “They are like us and deliver on the good care given but quit on their own terms.” And consider this, too. Somewhere in the world is a 12-year-old who someday will make that breakthrough happen. I hope he or she is a ham.

Have a safe and restful summer.

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