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Battery Wars – This 'Is' the New Frontier

I can picture it now. Luke Skywalker and Darth Vader face off for an epic light-saber battle to the death! The fate of the world hangs in the balance!

Then their light-saber batteries run out of juice so they're left holding onto a couple of limp licorice sticks, resulting in a leg-wrestling extravaganza. Yoda wouldn't stand a chance. Not quite what George Lucas had in mind for the ultimate Star Wars battle scene.

With all of the tremendous advances that are taking place in our world of internet and wireless existence, a person may never consider that the 'holy grail' is in the field of battery life. You might have thought that it would be the next generation of wireless devices that allow you to project holographic images of the Google screen so that you can do web searches in mid-air in the airport. Yep, it's true – it's in the works! The restricting problem is that little-considered power source we simply take for granted. The simple battery. It has been confounding for a century now.

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Thomas Edison said, "I don't think that nature would be so unkind as to withhold the secret of a good storage battery if a real earnest hunt for it is made. I'm going to hunt." That was more than a hundred years ago and the foxes are still out. In fact the hunt is getting very intense.

In a recent article in 'Wired', John Hockenberry states that, "In the last 150 years battery performance has improved only about eightfold. The speed and capacity of silicon chips, of course, improves that much every six years."

In curious irony, as I write this article on my laptop, on an airplane, on my way to Charlotte, my battery has declared bankruptcy and I now have to resort to my back up power source – pen and paper. How Neanderthal! My hand is actually aching because my fingers are apparently out of shape for these callisthenic demands. I thought that my two-fingered typing was just as good as

a Gold's membership for these types of events but I am woefully wrong. It's just another reason that better batteries are required – we can't write anymore, opposable thumbs or not, – it's just an evolutionary thing.

It seems that our insatiable demand for self-powered consumer electronics is driving the battery wars to new heights. Suffice it to say that the spoils of this war will far exceed the wampum that Edison received for that light bulb thing.

As devices miniaturize in size, yet enrich in features, the hapless battery is forced to produce more power in less space. If battery capability stagnates, as history has dictated so far, then portable device capability will follow suit. Yet our demand, and the ability of manufacturers to supply, indicates a burgeoning market for wireless devices to make our lunch, tie our shoes, entertain us, and generally make our lives dependent on such units.

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The problem is that all that functionality is dependent on the development of more efficient, more powerful, and smaller power sources. Oh yeah, and safety seems to matter as well, as evidenced by the recent spate of spontaneously combusting laptops caused by the fire-starter known as the Li-ion battery. Thermal runaway is the name of the culprit, and it means that the chemicals in the battery break out of their metal casing, which causes the lithium to ignite when it makes contact with moisture in the air.

Without getting technical, voltage and current are created chemically to create power through the movement of electrons from pole to pole in the battery. As we have progressed through lead acid for car starters, to alkaline and mercury for transistor radios, to nickel and cadmium for the first laptops and video cameras, to lithium rechargeables for current electronics, including MP3 players, camcorders, and Blackberries, the

digital demands keep multiplying. In fact digital calculations themselves require steady voltage to maintain memory, and power fluctuations can be catastrophic for the device functionality.

Backlit screens, hard drive demands, and graphics needs are mounting the pressure on the development of power sources. At the same time, the thermal runaway risk must be managed which tends to create wasted resources within the battery, and batteries that destroy themselves before they ignite.

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The war rages for alternatives. The venture capitalists are betting big in a number of areas. They are driven by the demand for laptops with dual processors and eight-hour run times. They are driven by our consumer demands that we have wireless devices on our hip that store and play music – 1000 songs at a time, guide us over highways, and send attachments via email. Actually, the device should be in your pocket and not on your hip unless you're a nerd according to insinuations by Kevin Sintumuang, associate editor for GQ.

Among the warring factions for battery supremacy are:

- 1) Lithium batteries with their own chip to manage power resources
- 2) Fuel cells, which have always been challenged with practical design. Proponent Rick Cooper feels that notebooks will have both a fuel cell and a lithium battery engineered into the next generation.
- 3) Silver & zinc chemistry is also on the horizon. Backer, Ross Dueber, makes the point about current lithium alternatives; "It's the only rechargeable battery technology that uses flammable liquid."
- 4) Lithium polymer uses an advanced gel to create a power source as thin as paper. Prototypes have been designed to power a new breed of smart card.
- 5) Then there's Nanograss. It's not a Robin Williams football field, but it is a radical approach to power supply. It allows cells

to carry their own power and to turn on and off chemically. It provides for a solution where there are fields of tiny batteries as opposed to a single power source. This one uses charges to effect the surface tension of fluids by basically making them appear and disappear (into the Nanograss, which is actually metal) depending on conductive requirements.

Regardless of who wins this war, the riches will be great. And regardless of who wins this war, it seems that re-design of electronic devices will be required to allow for the new optimum power delivery system. That means it won't be overnight.

Now let's take the battery war to another level beyond electronic devices with a 'what if' scenario. What if battery technology advanced to the level where a reliable, safe, and powerful field of such tiny units became the source of power for our furnaces, air conditioners, and cars? Not just cars that look like you're driving a phone booth, but real cars – and SUVs. Wouldn't that just change the environment, both figuratively and literally?

Let's just hope there is a winner in the battery war as opposed to continuing stagnation. Let's hope that the hunt that began in earnest with Edison is rewarded with success. Let's hope that new technologies, dependant on battery capability, can continue to develop so we can sate our desire for electronic nirvana. Otherwise we may be stuck in this backward time where battery capability restricts our Columbus-like voyage of discovery of the electronic universe.

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