

## Tracking Your Fasteners

by:

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### Powering Mobile Devices

Batteries have been around for 150 years. During that 150 years, there have been significant advances. However, compared to other technological advancements, the progress has only been moderate.

The battery is an imperfect power source. The battery holds relatively little power, it is quite big for the function required, it's heavy and it has a limited life span. Battery power is also expensive when compared to other sources of energy. Not only that, the smaller the battery, the higher the cost-per-watt becomes. Imperfect though it may be, the battery is one of the key elements in the success of mobile computing devices.

### Computing Advances Dramatic

Mobile devices, such as the iPhone are voracious users of power. The battery is improving, but in order to achieve significant improvements in battery life, the engineers at **Apple** designed the new iOS handheld devices around the battery, rather than the other way around. It is helping. My iPhone 6 lasts a full two days, while my iPhone 4s lasted about half a day.

Any small improvement in the battery, opens opportunities for new products and enhanced applications. Since the battery provides us with the freedom of being disconnected from home and office, the better it gets, the greater our mobility and freedom will become.



### Devices Need Less Power

The improvement in mobile devices, like my iPhone, is mainly attributable to this reduction of the power consumption. While the battery has improved, the computing technology has outstripped its progress

by a country mile. While the average annual gain in battery capacity is typically 6%, the computing power has done dramatically better.

**Gordon Moore of Intel** made the observation in 1965 that the growth in the number of transistors per integrated circuit would double every two years. Through the industry's relentless technological advances, "Moore's Law" continues unabated and does not show any signs of slowing down. If batteries improved at the same rate, a heavy-duty car battery would be about the size of a dime today.

### Solar Cells Instead of Batteries?

A new, very efficient approach to solar powered microelectronics is being developed. With this breakthrough, researchers have produced a microchip, which directly integrates with photovoltaic cells. Harnessing sunlight to power microelectronics is not new, but a normal setup would use a separate solar cell and battery. This development is different because, it places high-efficiency solar cells directly onto the electronics. This produces self-sufficient, low-power devices, which are highly suitable for Industrial production and can even operate indoors.

This autonomous microsystem was developed by the Semiconductor Components group at the **University of Twente's MESA+ Institute for Nanotechnology**, led by **Professor Jurriaan Schmitz**. The researchers collaborated with colleagues from **Nankai University** in Tianjin, China and the **Debye Institute of Utrecht University**. The research was made possible by the **STW Technology Foundation**.

The design uses the chip as a base and the solar cell is applied to it layer by layer. According to the UT release, this results in a more efficient production process, uses fewer materials and ultimately performs better.

These types of solar cells can produce sufficient power to allow the microprocessors to operate in low-light or indoors. In order for it to work, the chip's energy use must be well below 1 milliwatt. The good news is that the new devices are using less and less electricity.

### Still in Testing

While the new process is not in full production, tests have shown that the electronics and the solar cells function properly, and the manufacturing process is also highly suitable for industrial serial production with the use of standard processes. Its promise is such that we should be seeing these devices in the near future.

### Fuel Cells

The amazing new **Tesla** automobiles are blazing the trail for the electric car. While, the electric vehicle has so far failed to become the accepted mode of transportation, Tesla is making it cool to have an electric car.

However, because of the battery's relatively short distances between recharging and a limited service life of the battery, there are still concerns. Everyone wants a battery that will last for the life of the vehicle, but battery manufacturers are hesitant to provide the mandatory eight to ten-year warranty.



Continuous improvements in the fuel cell are being made, but the results are slower than with other technologies. Eventually, the fuel cell will find important niche markets, but it does not seem like it will be replacing the polluting internal combustion engine for the mass market. If the fuel cell does become an alternative power source, the air would become a cleaner place, but there are still concerns about how environmentally clean the manufacturing process is.

### The Magic Bullet Battery

The ultimate miracle battery is nowhere in sight and the battery remains the “weak link” for the foreseeable future. As long as the battery is based on an electro-chemical process, limitations of power density and short life expectancy must be taken into account. We must adapt to this constraint and design the equipment around it.

People want an inexhaustible pool of energy in a small package that is cheap, safe and clean. A radical improvement will be needed to satisfy the rapidly growing need for portable and mobile power. We do not know when a superior electro-chemical battery, an improved fuel cell, a practical micro solar cell or some revolutionary energy storage device will make this possible. We definitely know that it is needed.

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**Dennis, R. Cowhey**, COB – Started **Computer Insights** in 1981. He served for many years on the **Illinois CPA Society Computer Information Systems Committee**. He is a frequent author of articles for industry trade magazines. Before starting **Computer Insights**, he served as Central District Manager for a division of **Litton Industries** (now part of **Rockwell**), that offered inventory control systems to retailers. Prior to that, he was a Credit and Financial Analyst for National Credit Office division of **Dun & Bradstreet, Inc.** Cowhey received his education at **Chicago City College** and **DePaul University**.

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