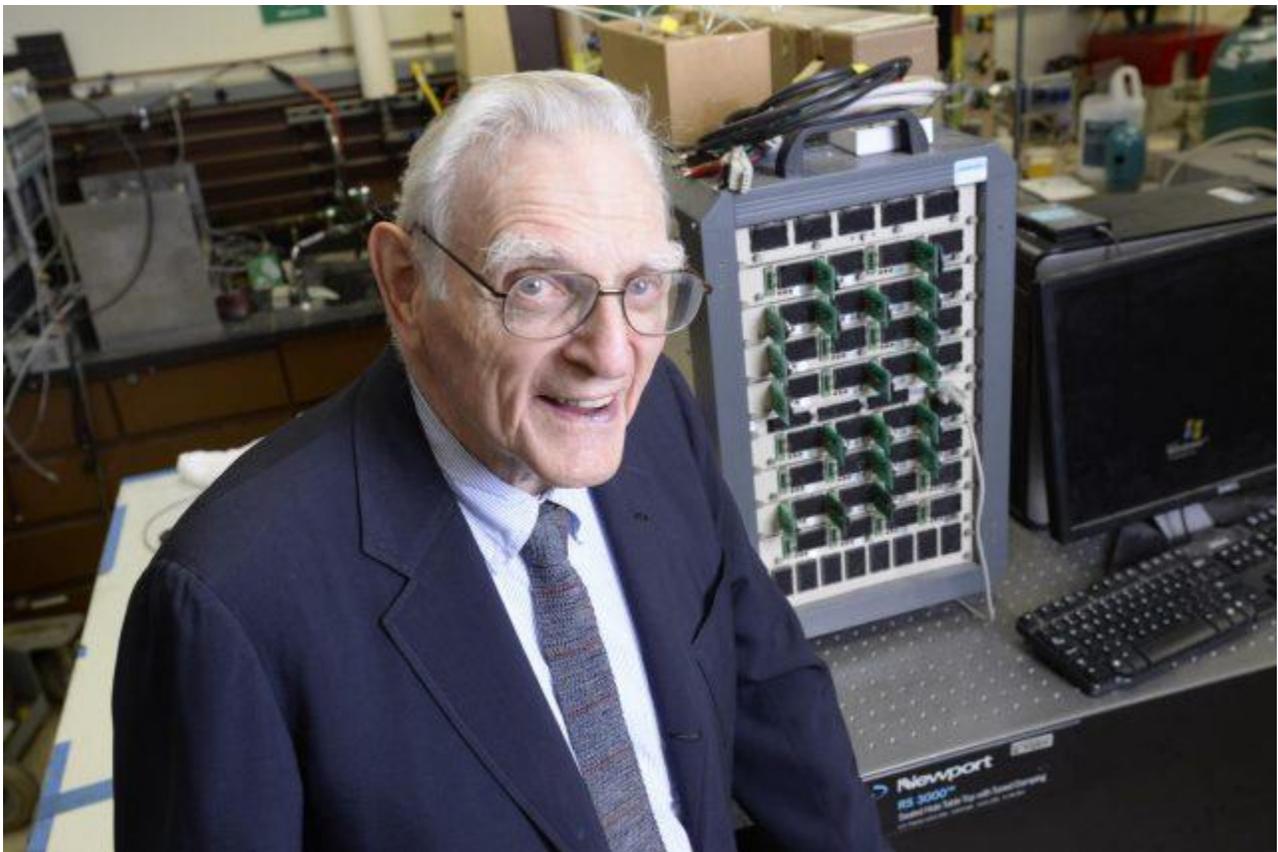


A Battery from Sand, Deserts into Paradise

Now there's a new battery chemistry in town, and it comes from the mind of John B. Goodenough (pictured below): A new battery using Sodium and glass. This could make the [deserts into a paradise](#) and end our dependence on fossil fuels. Goodenough predicts that the new battery will have [triple the energy density of lithium-ion cells](#).



Lithium-ion batteries have been in the news lately because [things Samsung puts them intend to explode](#). They even had some washing machines that apparently [blew up out of sympathetic embarrassment](#). So it's probably wise to reserve judgment until something can be manufactured at scale. Other battery chemistries have [come before, and failed](#). Lithium-air batteries are a great example of a very interesting battery chemistry that we can't use, because its development has been hamstrung by engineering problems we can't yet solve. This [new chemistry](#) has one important difference from the lithium-ion model: It uses sodium instead of lithium. Sodium and lithium are both alkali metals, with the same +1 charge. But

sodium is a whole lot more abundant than lithium, which could make the new battery chemistry less expensive than lithium-ion cells.

John Goodenough is 94, and his current work could be the key to Tesla's future—much as, decades ago, his efforts were an important part of Sony's era of dominance in portable gadgets. Over the years, Goodenough has scuffled with Warren Buffett, wound up screwed by global patent wars, never got rich off a headline-grabbing initial public offering and defied the American tech industry's prejudice that says old people can't innovate.

Contrast that with the way we [celebrate](#) Evan Spiegel, who at 26 is worth \$5 billion because he co-created Snapchat, an app that will probably impact humanity over the long run as profoundly as Cap'n Crunch cereal. Maybe.

Goodenough announced in early March that he and his team at the University of Texas at Austin had invented a glass-based battery that blows away the performance of every previous kind of battery, including lithium-ion batteries—which were invented in the 1980s by...him. So right now, Goodenough's technology is powering your smartphone, laptop, electric toothbrush, Tesla and any other rechargeable electronic thing you own. Lots of inventors claim they're working on breakthrough types of batteries. Goodenough is the only one who can also say he's done it before.

End of Gas-Powered Cars?

Goodenough's new battery can store three times more energy than a comparable lithium-ion battery, [according to](#) the very serious Institute of Electrical and Electronic Engineers (IEEE). The new battery also solves some other lithium-ion troubles. Like, it won't catch fire, so a hoverboard won't suddenly melt your kid's Vans as she scoots across the playground. The IEEE also reports that Goodenough's batteries seem to be able to soak up in minutes as much charge as a lithium-ion battery gets in hours.

Battery technology may not make you swoon, but it is the missing link in getting the planet off carbon-based energy. Oil, coal and natural gas are such effective energy sources because they can be stored and burned whenever needed—whether in a car's gas tank or at an electric plant. Solar and wind generate electricity only when nature cooperates, and batteries are the lone way to store electricity to be used anytime. If batteries become cheap, powerful, safe and quick to charge, one of carbon's big advantages disappears. The headline on the IEEE's report even asked: "Will a New Glass Battery Accelerate the End of Oil?"

This breakthrough could finally make gasoline-powered, emission-spewing cars seem as gross and old-timey as an outhouse. If Goodenough's battery works as advertised, Tesla, General Motors and other automakers could sell electric cars that would travel 600 miles on a charge. Recharging would take about as long as a stop for breakfast at a Waffle House. "I think we have the possibility of doing what we've been trying to do for the last 20 years," Goodenough told

the IEEE. “That is, to get an electric car that will be competitive in cost and convenience with the internal combustion engine.”

Breakthroughs—But No Payoff

[Goodenough](#) has been chasing that goal for nearly 50 years. In the 1970s, while working as a scientist at the Massachusetts Institute of Technology, an oil embargo by the Organization of Petroleum Exporting Countries hurled the U.S. into an energy crisis. Goodenough vowed to find a way to end U.S. dependence on oil. A few years later, he moved to Oxford University in England but kept working on portable batteries that would be better than the cylinders we still put in flashlights and toys. While he was at Oxford, a British scientist figured out that lithium ions could make great batteries, but his version kept exploding. In 1980, Goodenough found a way to use cobalt-oxide cathodes to make lithium-based batteries better and safer. “It was the first lithium-ion cathode with the capacity, when installed in a battery, to power both compact and relatively large devices, a quality that would make it far superior to anything on the market,” wrote Steve LeVine in his [book](#) *The Powerhouse*, about battery history.

[Sony](#) was the Apple of the 1980s—the consumer tech company that produced hit after hit. Sony had come out with the Walkman in 1979, the first CD player in 1982 and the Handycam camcorder in 1989. In 1991, the company commercialized Goodenough’s battery, marketing the first rechargeable batteries and solving the problem of powering its portable devices. Sony’s products set off a global frenzy among electronics companies to make lithium-ion batteries and gadgets powered by them.

By then, Goodenough had moved to Austin, having been paid pretty much nothing for his invention that was saturating the world. “Oxford had declined to patent Goodenough’s cathode—the university seemed to see no advantage in owning intellectual property,” LeVine wrote. To compound the insult, Goodenough got nothing when, in 2008, Buffett shelled out \$230 million to buy 10 percent of BYD, a Chinese company that seemed to be building its electric car on advances purloined from Goodenough’s UT lab, according to [Quartz](#). An American company, [A123Systems](#), also built batteries based on his work and in 2009 raised \$587 million in an IPO that didn’t include anything for Goodenough. The inventor of a technology that changed the world should be a multibillionaire but isn’t.

If it makes you feel any better, A123 filed for Chapter 11 bankruptcy in 2012. BYD is kind of China’s Tesla, minus even a remote sense of cool [design](#).

Defying Valley Bias

The tech industry—Silicon Valley in particular—is deplorable when it comes to respect for older inventors and entrepreneurs. Silicon Valley’s 150 largest tech companies were sued 226 times for age bias from 2008 through 2015, [according](#) to data from the California Department of Fair Employment and Housing. Venture capitalist Vinod Khosla has been [quoted](#) saying, “People over 45 basically die in terms of new ideas.” He’s 62.

Lots of evidence pushes back against this ageism. One study [found](#) that twice as many successful entrepreneurs are over 50 as under 25. A 2011 [study](#) found that physicists make their greatest discoveries around age 48. If you saw the movie *The Founder* —which, apparently, nobody did—you might note that Ray Kroc was in his 50s when he got McDonald’s going.

Maybe Goodenough’s career will change some minds. His work has had as big an effect as just about any company founder in tech, and he’s proving there is great value in the knowledge that sits in a 90-year-old noggin. A smart tech company should run this ad: “Great inventor wanted; at least 70 years of experience.”



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