Gulliver's fuel cell travels: Investors back a wide mix

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Venturing into the uncharted waters of energy-startup development, one can feel a bit like the title character in Jonathan Swift's "Gulliver's Travels," with a revelation on every island.

Take Lilliputian Systems, a Massachusetts Institute of Technology spinout developing fuel cells for portable devices like laptop computers. Last summer Lilliputian raised $30 million in funding, which will go down as one of the largest funding rounds locally for a non-biotechnology company in the past few years.

With that amount of backing, it seems a safe bet that Lilliputian has tied up a significant customer for its product. Just last week, Watertown's A123 Systems justified the $20 million it booked last May by coming out of stealth mode with Maryland tool-manufacturer Black & Decker, a customer for its power-dense batteries. Long term, A123 sees hybrid vehicles as the ultimate market.

So too do designers of fuel cells, which strip electricity out of atoms by forcing them through membranes, producing water as a byproduct. As a potential source of abundant "clean" energy, the hype and hope of fuel cells has perhaps only been exceeded by fusion, the process of harvesting the energy produced by atoms fusing together, which to date has bedeviled scientists at MIT and other energy-research laboratories.

The first generation of fuel cell companies locally included Westwood's Acumentrics, Cell Tech Power, Protonex Technology of Southborough, Ztek in Woburn, and Cambridge sister companies TIAX and Nuvera Fuel Cells. All have focused primarily on large fuel cells to generate electricity and power vehicles.

If the feat in miniaturization Lilliputian is attempting sounds gargantuan, keep in mind several industry Brobdingnagians are also chasing the opportunity, including NEC, Samsung, and Toshiba.

Just as Swift's Lilliputians warred with the miniature inhabitants of Blefuscu, an assortment of Blefuscudans are vying to produce tiny fuel cells as well, including Burlington's Integrated Fuel Cell Technologies. IFCT has raised $1 million from Echelon Ventures of Boston and OnPoint Technologies, a Florida investment firm backed by the U.S. Army. It creates a fuel cell by etching a channel in a semiconductor wafer and dividing it with a proton-exchange membrane.

Hydrogen enters the groove on one side and reacts with a catalyst to release hydrogen ions. Those protons are absorbed into the membrane and recombine with the hydrogen electrons and oxygen on the other side of the membrane to form water.

INI Power Systems in Cary, N.C., recently closed $3 million in financing to produce small fuel cells for consumer devices. Wyoming's Nanomaterials Research is chasing a similar goal with $3 million in financing received from the Department of Defense.

Until the past few years, the venture community's adventures in fuel cell technology resembled what Lemuel Gulliver found on the island of Balnibarbi -- the crazed pursuit of science without practical results. According to PricewaterhouseCoopers, it was not until 2002 that annual revenue produced by fuel cells exceeded research expenditures. And revenue contracted at the top two public companies in the sector, British Columbia's Ballard Power Systems and FuelCell Energy in Danbury, Conn.

Meanwhile, a University of Massachusetts Amherst researcher named Derek Lovley may have found the energy equivalent of the Houyhnhnms -- "a perfection of nature" in Swift's translation of the horse-like species' language. The Department of Energy last month awarded Lovley $22 million to continue his investigation of bacteria capable of producing electricity. Geobacter, the focus of his study, is said to essentially act like a battery by stripping electrons from nearby iron and uranium. Lovley thinks the microbe could act as a nanowire powering electronic devices.

As for fusion energy? We have a ways to go before energy startups need to worry about fusion making them obsolete -- until 2050, according to Miklos Porkolabb, who runs MIT's Plasma Science and Fusion Center. The center has licensed a "plasma fuel reformer" to a Michigan company called ArvinMeritor to produce hydrogen from the emissions of gasoline and diesel engines.
Stealth detector

Cell Tech founder Scott Rackey has formed a derivative company in Westborough called CTP Hydrogen to commercialize a way to derive hydrogen fuel from sulfur-bearing hydrocarbon fuel in one step. CTP is one of several companies to emerge the past few years with hydrogen-production methods, including Safe Hydrogen in Lexington and Nanoptek in Maynard.

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