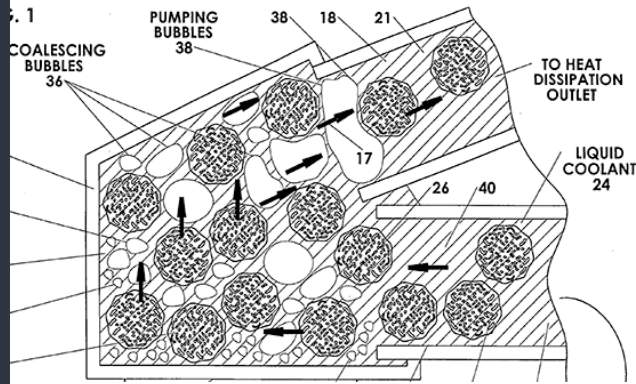


## Transthermal Heat Bridge – Battery Cooler

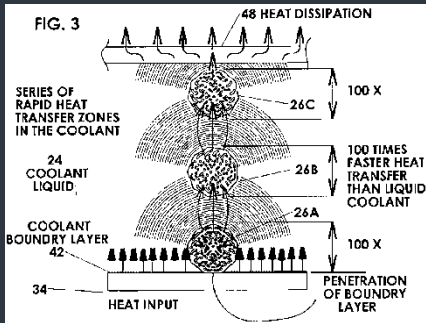
The Transthermal Heat Bridge system consists of a heat absorbing chamber, an outlet bubble pump tube, a heat dissipating radiator and a liquid cooled return tube. The hot liquid is transported from top to bottom of the radiator and then returned from the bottom of the radiator to the heat absorbing chamber via a horizontal fluid flow tube. The bubbles of heated cooling medium then flow at approximately 3cc per second, the heat absorption rate of the metallic foam microspheres combined with the low boiling point flow liquid means that the Heat Bridge transfers thermal energy at 100 times that of standard liquid coolant.



## Livingston Battery Cooler

Illinois-based Livingston Products has developed a new liquid cooling pump system that uses the heat from a battery to propel a proprietary cooling fluid through a system of tubes. The Transthermal Heat Bridge, the subject of more than ten individual patents pending, can be scaled to fit almost any battery configuration, according to the company, from a laptop computer to a vehicle or large-scale battery storage unit.

The key to the system is a bubble pump that does not require an energy source to run. Waste heat from the battery activates the pump, which cycles the cooling agent as long as the battery produces a temperature higher than ambient during operation. The coolant is a slurry that consists of a liquid with a low boiling point and microspheres formed of metallic foam. The microspheres flow onto a heat source and penetrate the coolant boundary layer, transferring heat from the source onto the microspheres and then to a heat-dissipating component.



## Formula E

All 20 cars took to the grid on race day – however Bruno Senna's Mahindra Racing car dropped out on the first lap after losing a wheel. A pity as Senna had a promising second qualification session posting the fastest run with 1:41.341s @ 158.2kmh.

Penalties came thick and fast with 5 cars handed a 10 place grid penalty for having to change gearboxes. Additionally, two cars were handed a 57sec penalty for exceeding the 28kWh energy usage during the race.

After dicing for last half of the race Nick Heidfeld and Nicholas Prost came to grief literally on the last corner with Heidfeld's car being all but destroyed, yet he walked away uninjured; - Prost was given a 10 place grid penalty for race two, which is in Putrajaya, Malaysia on the 22<sup>nd</sup> of November.



## There racing!

The much awaited Formula E race series has taken flight with victory going to Lucas de Grassi of team Audi Sport ABT.

The event took place on Saturday September 13<sup>th</sup> around the grounds of China's iconic Bird's Nest Olympic Stadium, the venue for the 2008 Olympic Games. At 3.44km in length and featuring 20 turns, the anti-clockwise temporary circuit was custom made by designer Rodrigo Nunes.

For the current season 10 teams, each with two drivers are competing the FIA Formula E Championship. Each team will run four Spark-Renault SRT\_01E Formula E cars, two per driver, with the cars/teams based at a purpose built central workshop at Donington Park Leicestershire, England between races.

From season two, Formula E will become an 'Open Championship' allowing teams to design and develop their own cars - in accordance to the technical specifications set out by the FIA - and showcasing their electrical energy innovations in a competitive, racing environment.





## “Atomic Batteries to Power!”



Now here's something truly out of left field. Researchers at the University of Missouri have created a long-lasting (think 20 Years per charge;) and more efficient nuclear battery that could be used for many applications such as a reliable energy source in automobiles and also in complicated applications such as space flight

Betavoltaics, a battery technology that generates power from radiation, has been studied as an energy source since the 1950's. The battery uses a radioactive isotope “Strontium-90” that boosts electrochemical energy in a water-based solution. A nanostructured titanium dioxide electrode (the common element found in sunscreens and UV blockers) with a platinum coating collects and effectively converts energy into electrons. The technology to keep an eye on here is “Plasmon-assisted radiolytic energy conversion in aqueous solutions” Are they safe? Well we already use nuclear devices in household smoke detectors!!

## Prodrive Silicon Carbide



British motorsport and technology firm Prodrive has successfully run a silicon carbide-based multiport DC-DC converter in an EV. Silicon carbide devices operate at a higher frequency than equivalent silicon components – at 75 kHz in this iteration – which produces a significant reduction in switching losses. This allows the magnetic components to be reduced in size, and has enabled the converter to achieve efficiency of 98.7%, gravimetric power density of 10.5 kW/kg and volumetric power density of 20kW/liter. The DC-DC converter acts as a hub that transfers energy between key components of the vehicle's electrical system. It has four ports: two connect to the traction motor and high voltage battery; a third connects to a secondary energy source, which in this test car is a supercapacitor bank; and the fourth powers the vehicle's 12 V systems.

The converter matches the voltages of the various power sources and transfers energy among them in response to CAN commands from an external controller. The test vehicle was running a 220V battery, 37kW traction motor and two 200kJ supercapacitor banks, which operate between 75-150V. In normal driving, the converter boosts the battery voltage to around 400V to optimize motor performance, and can supplement the battery supply with additional energy from the supercap banks when the driving situation demands it. During regeneration, the converter transfers energy from the motor to the battery or supercap banks as requested by the supervisory controller. Energy can also be transferred directly between the battery and supercapacitor ports.

## The *SHAPE* of Things to Come??



## Sparky Nissan Leaf UTE

Nissan's Technical Center in Stanfield, Arizona, where engineers are plentiful and they love to build things, test things and tinker with things. This team thinks a lot about "why not?" Recently they created a one-of-a-kind electric vehicle to haul supplies and people around on the tech center property. The vehicle is not really going to be a production model any time soon but has confirmed the versatility of the EV drive platform. The design engineers at Nissan's 3050 acre Technical Center needed a personal transport and load carrying vehicle but none were available – so they built one. Cutting the back off a standard leaf, welding the cut down rear doors shut and modifying a Navara tray to fit into the newly available space they had the perfect solution to their problem. However, since being spotted at the Arizona facility by the media, international attention has been putting some pressure on the Nissan hierarchy for a production release of Sparky.

## This Month's Technology Review



BorgWarner has an EV specific final drive transmission unit available. The 31-03 eGearDrive is a purpose built, high performance transmission that can be broadly adapted to a variety of electric propulsion systems. The transmission system enables launch assist, energy recovery, and AWD performance for the secondary-driven axle on any type of vehicle. These independent transaxles have been used in everything from the very first Tesla Roadsters, Coda Electric and the Ford Transit Electric. Weight 28kg, 200nm Torque (300nm Peak), 8.28:1 Drive Ratio and 14,000 input RPM Efficiency 97%. see <http://evwest.com/catalog/>