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# Research Highlights . . .



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## Bugs in a bottle

Researchers at DOE's [National Energy Technology Laboratory](#) successfully sustained a population of bacteria that produces almost as much as their containment vessel's volume, in hydrogen, every day. Tested for over 45 days in a 10 liter bioreactor, the bacteria, [Thermotoga neapolitana](#), produced an estimated 8 liters of hydrogen in 24 hours. This unusual thermophilic (heat-requiring) strain converts sugar into hydrogen with nearly 100 percent efficiency. Tests were conducted with pure sugar—a standard that allows comparisons to results of similar research. However, NETL researchers have established that a wide range of sugar and carbohydrate food sources, including organic wastes, would be practical as feedstock.

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## 'Lite' done right

Better performance for less hassle that's the advantage of Ames Laboratory's new message-passing library, MP\_Lite. The innovative library can extract optimum performance from both workstation and personal computer clusters, as well as from large massively parallel computers. It supports and enhances the basic capabilities that most software programs require to communicate between computers. MP\_Lite is a "slimmed-down," user-friendly version of the more complex message-passing interface standard, MPI. Although it can be scaled up easily, MP\_Lite offers only the core MPI functions, implementing them in the most efficient manner to provide all the performance without all the extras.

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## Fermilab Tevatron sets new luminosity record

On July 26, the chances that a proton would collide with an antiproton at DOE's [Fermilab](#) reached an all-time high. That chance is determined by luminosity, or beam brightness, which is achieved by squeezing as many particles as possible into as small a space as you can. The higher the luminosity, the greater the chance for physics discoveries. The new record, set during [Run II](#) of the [Tevatron](#), is 2.64E31 (2.64 x 10<sup>31</sup>) protons per square centimeter per second, an improvement over the previous record—set in 1995—of 2.50E31. Fermilab hopes to push the Tevatron's luminosity even further in the next few months, and has set a goal of 4.00E31 by October 1.

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## Sniffing out chemical dangers

A "microelectronic nose" that sniffs out chemical poisons, including non-lethal concentrations of cyanogen chloride and hydrogen cyanide gases, has been developed by DOE's [Argonne National Laboratory](#). Part of the homeland security effort, the palm-sized instrument can also be used to detect VX, sarin and mustard gases. The ceramic-metallic sensor arrays, which are smaller than postage stamps and can be integrated into personal monitors, identify "fingerprints" given off by chemicals in contact with the sensors. Each chemical changes the electrical resistance of the detector's components, allowing a computer to pass small amounts of chemicals over the sensors and determine the presence and concentration of each chemical.

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