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Cover: The bright glow of grape bud beetles under ultraviolet light can indicate to grape growers when and where their vineyards need insecticide. (Photo: CALIFORNIA AGRICULTURE, Univ. of Calif./Max Badgley)

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Warm idea

Ms. J. Raloff's article on coal burning ("Coal burns best in pipes that hum," SN: 5/5/84, p. 278) relates nicely Ben Zinn's findings of "superior combustion" and of "increasing the transfer of heat ... to the walls of the chamber" due to acoustic vibration.

What Zinn probably hasn't realized is that the vibration of the grid on which the coal rests simply serves to shake off the insulating layer of ash that forms on its surface as it burns, allowing better heat outflow.

I discovered this principle many years ago during a backyard barbeque. I had noticed that the heat output always diminished somewhat after the coals had burned awhile. By stirring them a bit, the heat increase was impressive ...

Steve Ring
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Memories are made of this?

I read with great interest Dietrick E. Thomsen's article entitled "Swimming for the Good Life" (SN: 5/12/84, p. 298). I was particularly captivated by the concept that the lowly *E. coli* bacterium might be equipped with "something like a memory" to allow it the temporal span necessary to compare its relative well-being "before" and "after" as it tastes the additives to its substratum.

Would not understanding *E. coli's* memory help us to understand our own?

The required time lag might be neither more nor less than the time delay of osmosis. It surely takes some finite period for the additives to the substratum to diffuse through the cell membrane into the cytoplasm. In the interlude, the relative concentrations inside and outside the cell differ. Could the bacterium not detect the differential — whether by separate internal and external sensors, or by internal and external components of the same sensor — and react to it? When the concentration of good stuff is higher outside, the organism must be improving its position, moving toward it, so it "runs" longer. When the outside concentration is lower, its position is getting worse, so the bacterium increases its "tumbling"....

The internal-external comparison seems to me to explain all the behavior described in the article, including the inexplicable lengthy "running" when the good stuff is first added to the broth, and the "tumbling" when it is withdrawn. Outside is always the functional equivalent of "before," and inside "after." Moreover, the mechanism is so simple it may consist of no more than an electrical potential across the sensor or the cell membrane itself.

My first reaction to this simple explanation was that I had lost something important just before it was attained. On reflection, however, I began to wonder if memory in higher animals — at least short-term memory — might also be rooted in the osmotic time factor. Intriguing.

Richard S. Platz
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