Chemistry

Cracking the code of corn chip aroma

Heating, baking, roasting or toasting foods creates and liberates a menagerie of volatile flavor chemicals. A person's taste experience emerges from a complex interplay of food chemistry and sensory physiology. During studies of how two compounds – methyl amine, a somewhat fishy-smelling gas at room temperature, and diacetyl, which smells like butter – react to form new flavor chemicals, Thomas H. Parliment at the General Foods Technical Center in Tarrytown, N.Y., noticed the unmistakable aroma of toasted corn. "People started walking into the lab asking for some corn chips," he recalls.

He set out to identify the chemical responsible for the aroma. Earlier this month, at the Sixth International Flavor Conference held on the Greek island of Crete, Parliment reported that the reaction product, 2-methylimino-3-butanone, is responsible for the intense corn chip/cereal aroma and that it shares chemical features of other cereal-like flavor compounds such as 2-acetyl-1-pyrroline, which gives the crust of wheat bread its aroma. Parliment holds a U.S. patent on both the corn chip flavor compound and a way to make it.

To isolate and identify the compound, he sent the reaction products through a gas chromatograph, which separates a mixture's components so that each can be further analyzed and identified without interference from the others. By following the noses of fellow General Foods employees, Parliment succeeded in isolating the gas chromatographic fraction containing the corn essence. Elucidating the chemical's structure then came easily. One potential application could be to enhance the aroma of snack products that might not be heated long enough during processing to form their own toasty-corn flavor compounds.

Cold fusion gets a bruisin' from DOE

Generating energy by means of low-temperature nuclear fusion appears a remote possibility, concludes a Department of Energy advisory group in a preliminary report released July 12. "The panel recommends against any significant expenditures to establish cold fusion research centers or to support new efforts to find cold fusion," the report states. "Indeed, evidence for the discovery of a new nuclear process termed cold fusion is not persuasive."

This strikes yet another blow against the sensational March 23 claim by electrochemists B. Stanley Pons of the University of Utah in Salt Lake City and Martin Fleischmann of the University of Southampton in England that they had found a means of generating energy by steadily fusing atoms at room temperature with a large accompanying release of heat. Argues the 22-member cold fusion panel: "So far, we have seen no experimental results that are sufficiently free of ambiguities and calibration problems to make us confident that the steady production of excess heat has been observed."

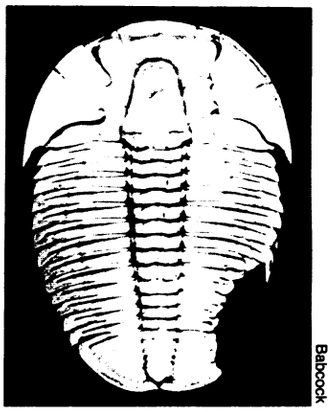
The final version of the report goes to Energy Secretary James D. Watkins in November. "Some minor things could change – even major ones – between now and November," notes nuclear chemist John R. Huizenga from the University of Rochester (N.Y.), co-chairman of the panel. However, he adds, "I don't expect that to happen."

The panel says also that "there remain unresolved issues and scientifically interesting questions" and recommends their investigation within existing federal research programs. These issues include apparently unflawed reports of heat bursts and potential fusion products such as neutron bursts and tritium, Huizenga says. Even if these observations are confirmed, the panel doubts they would apply to energy production. Meanwhile, the General Electric Co. in Schenectady, N.Y., has committed four scientists to the task of "unraveling what processes might be taking place."

Geology

Richard Monastersky reports from Washington, D.C., at the 28th International Geological Congress

Why bite the right of a trilobite?


Babcock

If old wounds heal, what might they reveal 500 million years later? According to paleontologist Loren E. Babcock, injuries that old can offer surprising information about long-extinct animals. Take, for instance, the trilobite, an ancient, crustacean-like creature. While studying bite marks on fossilized trilobites, Babcock and Richard A. Robison of the University of Kansas in Lawrence discovered that bite scars most often appear on the right-hand side of the fossil – suggesting the intriguing possibility that trilobite predators preferred attacking from the right side, the researchers report.

Trilobites, which lived mostly on the seafloor, are among the earliest known organisms to grow hard shells. In their study of 158 trilobite fossils with obvious wounds, Babcock and Robinson adopted a scheme to distinguish regular injuries from healed bite marks. They discounted any damage to fragile parts of the body that might have broken easily. They also looked for large curve-shaped wounds, as these should match the mouth shape of trilobite predators, which were arthropods, fish and nautilus-like animals.

Of the 81 trilobite fossils bearing bite wounds, 69 percent have chunks missing from their right side only, while 27 percent show marks on their left side only. The rest of the individuals have scars on both sides. For comparison, non-bite wounds are almost evenly distributed between right and left sides.

Babcock calls this relationship important because it suggests trilobite predators most often attacked from the right. If so, this find would represent the earliest known example of behavioral asymmetry – the tendency to use right and left sides of the body differently. Many animals, both invertebrates and vertebrates, exhibit this trait, which often reflects asymmetries in the brain. The Kansas team proposes brain asymmetries date back to the time of the trilobite predators.

Some scientists, however, snap at such suggestions about biting and brains. "I am terribly skeptical about this stuff. I think they are totally overstepping their bounds in the interpretations," says Geerat Vermeij, an evolutionary biologist at the University of California, Davis. Vermeij says it is impossible to decipher anything about predatory behavior from the propensity toward right-side scars. Others suggest trilobites may have caused the side bias. Perhaps the prey curled up with their right side always exposed. Alternately, trilobites may have had a vital organ on their left side. If so, a predator attacking from the left would stand a better chance of killing the trilobite and eating the whole thing, eliminating the trilobite's chance of becoming a fossil.

Healthy turnout of Chinese researchers

One bright note amid the dark events of late in China – 95 scientists from the People's Republic of China attended the international geological gathering. The larger-than-expected delegation indicates China wants to keep science avenues open, says Bruce Hanshaw, the meeting's secretary general. In early spring, organizers of the meeting were "pretty sure" that at least 60 Chinese scientists would come. But after the June 3 bloodshed in Beijing, Chinese contacts indicated only 16 would travel to the United States, says Hanshaw. At the last congress in Moscow in 1985, 78 Chinese attended.