

SCIENCE & INDUSTRY

kosmetikos***Roses on the 'Net****E-noses are the next step for the Web savvy.***By Steve Herman*

*What have we here? a man or a fish?
dead or alive? A fish: he smells like a fish;
a very ancient and fish-like smell...*

—Shakespeare, The Tempest

When John Glenn went up with the shuttle Discovery on mission STS-95, the big news was the 77-year-old Senator was returning to space 36 years after his first orbital flight in Friendship 7. Tucked away on the same flight was a less-illustrious passenger, an electronic nose. E-noses have recently found many uses, and technology is about to revolutionize our awareness of the sense of smell.

Painters had to adapt to the introduction of photography a century and a half ago. More recently, photographers had to accept the easy digital manipulation of photographs. Most musicians welcomed the invention and continual refinement of recorded sound. Readers can now obtain e-books. We accept the transmission and digitalization of words, images, and sounds—but, what about odors?

The sense of smell-olfaction is an example of chemoreception. In human chemoreception, the olfactory system responds to odors, the trigeminal nerve detects certain hazardous chemicals, and the vomeronasal organ (VNO) is the putative pheromone

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*Greek kosmētikos, skilled in adornment or decorating.

receptor. For an odor detection to occur, a low molecular weight molecule interacts with an odor-binding protein and triggers a series of biochemical amplifications, which are decoded in the hypothalamus.

Starting in the 1960s, gas chromatography allowed the separation of complex odor mixtures into components, and a subsequent development allowed the identification of the components by mass spectroscopy. The GC-MS combination revolutionized the process of analyzing and duplicating perfume oils. The e-nose (Figure 1) is the next step in the analysis of odors.^{1,2}

While the human nose uses proteins as receptors, the e-nose can use a variety of materials capable of creating an olfactory "fingerprint." Detectors include metal oxides, quartz microbalance, SAW (Surface Acoustic Wave), and organic conducting polymers. Metal oxide sensors work by performing oxidation/reduction reactions on the surface, which is in contact with the gas. Quartz microbalances are piezoelectric crystals, which increase in mass as odorants are absorbed, altering the oscillation frequency. SAW devices also measure a frequency varying with mass. Conducting polymers³ are based on heterocyclic molecules, such as polypyrrole and polythiophene. The polymers have absorptive surfaces that interact with volatile chemicals, resulting in changes in electrical resistance. E-noses employ an array of sensors selective to different chemicals, creating a unique response pattern.

Two industrial examples demonstrate the potential scope of e-nose applications: fisheries and automotive engineering. It is possible to expose an e-nose to the odor of a fresh fish and establish the characteristic response. The response to a spoiled fish can also be determined. The e-nose can then identify spoiled fish and they can be removed before shipping.



The "new car" smell of leather is well-known. The actual environment inside a car is a combination of volatile materials from the rubber, leather, cloth, plastic, and wood used in manufacturing. The auto industry has tried to strictly control the volatiles inside the vehicle with analytical specifications, human evaluators, and now the e-nose.⁴ The Ford Focus, developed in Europe, was the first new model built with the input of e-nose data.

The development of smaller, less-expensive e-noses has enlarged the potential, and portable units will expand the range of practical applications. Some perfume and personal-care uses include quality control of essential oils⁵; stability in bases, such as shampoos⁶; and quantification of perfumes in cosmetic bases.⁷

The electronic tongue, a recent development by Alpha M.O.S., is an extension of the e-nose concept into liquids.⁸ Since the media is different, electrodes—rather than metal oxide sensors—are used. The responses of the electrodes to different tastes are combined with software to evaluate taste, sweetness, bitterness, etc. This is currently useful in the quality control of food production.

An almost limitless range of information can be sent over the Internet. Thus far, smells have resisted the move to cyberspace. Software to encode odor profiles, an odor transfer

protocol for the Web, and hardware at the receiving end—a miniature perfume lab—is near commercialization. Technology is also being commercialized to fragrance video games and movies.

At least three U.S. companies are developing scent machines for home computers: AromaJet, Digiscents, and TriSenx. An Israeli company, senseIT, is also in the race. Procter & Gamble has thrown its not inconsiderable presence behind an association with Digiscents. With Estée Lauder finally planning online sales early next year through its purchase of gloss.com, it is inevitable that every

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FIGURE 1 E-nose

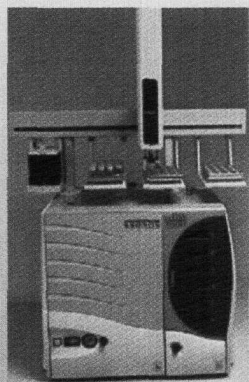


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expansion of Internet-based technologies will find an audience.

Caliban, in *The Tempest*, smelled like a fish. This was not a flight of Shakespeare's fancy. There is a rare disease, zrimethylaminuria, which can cause people to smell fish-like. It is caused by a defect in an enzyme, which breaks down trimethylamine, a by-product of protein digestion released by bacteria in the digestive tract. In fact, many diseases have characteristic odors. Smell was once a common diagnostic tool. One important application of odor analysis and transmission is the potential for distant diagnosis of medical conditions.

Smells have eluded conquest by technology for centuries. The olfactory system has yet to be totally elucidated. Separating odor mixtures and identifying the components is now routine. Giving odors characteristic fingerprints and applying the results is the contribution of the e-nose. Transferring odors

to computers around the world completes the technology loop. From Smellovision to the space shuttle, from fisheries to medicine, new applications are revolutionizing the significance of odors in modern life. ■

References

General interest Websites:

www.alpha-mos.com
www.digiscents.com
www.trisenx.com
www.aromajet.com

1. Kher, Unmesh, *Electronic Noses Sniff Out a Market or Two*, *Time*, March 20, 2000.
2. Strassburger, Kenneth J., *A Better Smelling Technology*, *ChemTech*, Dec. 1997.
3. w.micro.caltech.edu/micro/research/electronic_nose.html
4. Moran, Tim, *Ah, The Aroma of Just-Baked Sedan and Sniffing Car Parts: Yes, The Job Stinks*, *NY Times* May 14, 2000.
5. Alpha M.O.S. Application Note No. 11, June 1994.
6. Alpha M.O.S. Application Note No. 18, June 1994.
7. Alpha M.O.S. Application Note No. 19, July 1994.
8. Schmitt, Vincent et al., *The New Electronic Tongue: A unique breakthrough in liquid and taste analysis*. (In manuscript)
9. Kalman, Matthew, *Israeli Scientists First on Their block with Smellovision*, *Toronto Globe and Mail*, May 10, 2000.



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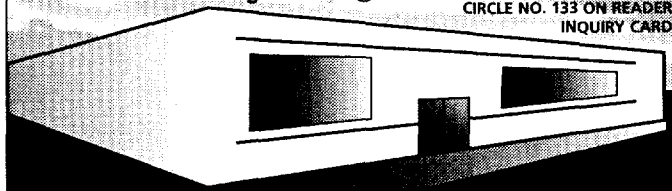
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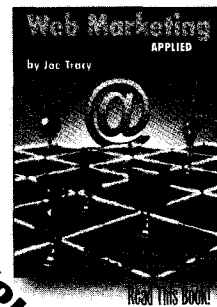
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