Breast Cancer Detection

In the article "Dr. Quinn counsels the House" (Random Samples, 5 Mar., p. 1445), it is reported that actress Jane Seymour suggested that women opt for thermography before mammograms, which "are now known to be causing cancer." This statement was made during a hearing on alternative health care before the Committee on Government Reform in the U.S. House of Representatives.

This statement may have serious repercussions for women's health. First, it may frighten and discourage women from having regular screening mammography. Second, the Food and Drug Administration has not approved thermography equipment for screening purposes.

A high-quality mammogram is the most effective way to detect breast cancer early (even before it can be felt), when it is most treatable. Studies show that regular screening mammograms can help decrease the chance of dying from breast cancer. Finding a breast tumor early may mean that a woman can choose surgery that saves her breast. Also, she may not have to undergo chemotherapy.

While many people are worried about exposure to x-rays over time, the low amount of radiation used for mammograms does not significantly increase the risk for breast cancer. The Mammography Quality Standards Act (MQSA), passed by Congress in 1992, set a maximum radiation dose limit that is acceptable. Under MQSA, all of the nation's mammography facilities receive an annual inspection. The inspection data show that radiation exposures are well within the established limit. Thus, a woman's chances of getting breast cancer from mammography are remote (*1*)

Thermography displays and measures heat patterns in tissues near the surface of the breast. In 1993, the American Medical Association declined to recommend thermography for medical applications. The Agency for Health Care Policy and Research strongly recommends that thermography should not be used as a screening tool for breast cancer detection (*2*). Also, insurance providers, including Medicare, might not pay for thermography for breast cancer screening because it has not been shown to be effective.

Those who are seeking alternative medical procedures, such as thermography, should consult with a reputable, licensed health care provider before using such a procedure.

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References and Notes

1 For more information about mammograms, call the National Cancer Institute at 1-800-4-CANCER.
2. *Clinical Practice Guideline—Quality Determinants of Mammography* (Agency for Health Care Policy and Research, Silver Spring, MD, October 1994), p. 120.

One Signal or Two?

In their Perspective "Communication goes multimodal'" (*Science*'s Compass, 26 Feb., p. 1272), Sarah Partan and Peter Marler describe a theoretical framework for studying multimodal signals. Their arrangement classifies many compound signals (those made up of two or more components), but one class of signals is missing. Partan and Marler assume that each signal component has "meaning" when presented alone, and yet there is no reason why this should be the case. Guilford and Dawkins (*1*) originally proposed that extra signal components could enhance the learning of a message without providing any extra information themselves, a process known as "potentiation." There are not only supportive data for this psychological effect, but also for noninformative components enhancing the detectability and discriminability of informative signal components for receivers (*2*). Noninformative signal components

may produce no measurable behavioral response at all in isolation—for example, the odor and color components in innate biases against warning signals (*3*).

How do these fit into Partan and Marler's model for studying multimodal signals? In the text of the Perspective, they correctly describe such signals as those where the "multimodal stimuli evoke a response not elicited by the unimodal components," yet in the accompanying figure, they appear to assume that each component will produce its own response. The discrepancy may have arisen because Partan and Marler consider only the information content, or the "meaning," of signals. Although this point is fundamental to signal evolution, other selective forces are at work designing signals. Receiver psychology is fundamental to signal design and can select for extra components that do not provide information or provoke a response alone (*2*).

While wholeheartedly supporting their initial approach to the subject, I think that a wider consideration encompassing noninformative signal components provides a more useful framework for studying multimodal signals.

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References and Notes
1. T. Guilford and M. S. Dawkins, *Anim. Behav.* **42**, 1 (1991).
2. C. Rowe, thesis, University of Oxford (1998); ———, in preparation.
3. ——— and T. Guilford, *Nature* **383**, 520 (1996).

Response

Rowe elaborates an interesting topic that we had room to mention only briefly. She discusses the point that certain signals, such as the aromatic pyrazines that are produced by some noxious, aposematic insects, have no apparent behavioral effect on birds when they are presented on their own, but are potent when presented multimodally, as we stated in our Perspective. Although pyrazines in solution at first elicit head-shaking (*1*), a common response to something distasteful, it is indeed remarkable that, alone, the scent of this widely used class of compounds elicits no obvious behavioral response from birds. That the odors do incur latent physiological responses is evident from their potentiation of responsiveness to other stimuli, such as color, as Rowe has shown in her work (cited in our Perspective). The well-documented fact that one stimulus can potentiate ("prime" or "sensitize") or block responses to another stimulus (*2*) is illustrated by our examples of modulation, in which the addition of a second component increases or decreases the effect of the first, as well as by emergence, in which the multimodal signal elicits a novel response.

With regard to the figure, we intended it to symbolize all possible responses, including those that are latent and not immediately apparent in behavior, as was stated in the text. The use of geometric shapes to symbolize different types of responses, such as the square and the circle, includes the possibility of "no overt behavioral response" as one such type.

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References and Notes
1. T. Guilford, C. Nicol, M. Rothschild, B. P. Moore, *Biol. J. Linnean Soc.* **31**, 113 (1987).
2. Reviewed in P. Marler and W. J. Hamilton III, *Mechanisms of Animal Behavior* (Wiley, New York, 1966); N. J. Mackintosh, *The Psychology of Animal Learning* (Academic Press, London, 1974); E. O. Wilson, *Sociobiology* (Harvard Univ. Press, Cambridge, MA, 1975).

CORRECTIONS AND CLARIFICATIONS

Reference 3 in the Research commentary "How calcium enhances plant salt tolerance" by E. Epstein (*Science*'s Compass, 19 June 1998, p. 1906) should have included "J. Li, Y.-R. J. Lee, S. M. Assmann, *Plant Physiol.* **116**, 785 (1998)."