

a Harvard freshman named William “French” Anderson, who would go on to become a prominent physician. During the lunch break, Ken explained to me that his job was to be a pacer: He would run very fast, too fast for a miler, to lead Anderson but then drop back.

When the afternoon Putnam session had ended, I was a bit discouraged. I had picked up an undetermined number of partial credits, but that was all. I asked Ken how he had done. He said he thought he had gotten maybe 11 correct and partial credits on the 12th. It was a humbling experience for me. As it turned out, Ken finished in the top five in the country. (The Putnam folk do not differentiate among the top five.) In the evening, Ken did his running duty as the pacer, and Anderson won the mile.

Late the next spring, the outdoor Heptagonal Games were also held in Ithaca. I sought out Ken. He was excited because his coach had told him that since this would be the last race of his career, he could run the mile at his own speed and not pace Anderson. So he did, and he won, beating Anderson and the rest of the field.

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Teaching skills and scientists’ future impact

As a scientist myself, I appreciated the commentary “The case for caution in predicting scientists’ future impact,” by Orion Penner, Alexander Petersen, Raj Pan, and Santo Fortunato (PHYSICS TODAY, April 2013, page 8). In addition to their cautions about impact factor, I think the performance of academic scientists as educators also should be taken into account.

The impact of a good science educator on the future of science may be difficult to measure directly, but it is certainly of great importance. Educators will shape the future of potential young scientists, from undergraduate and graduate training all the way to post-doctoral research. The better the educator, of course, the more positive the effect on students. Some brilliant research scientists are very poor educators who can barely transfer their knowledge and skills to students, let alone attract good students in the first place.

Maybe it’s time to put more emphasis

on teaching skills and potential in the evaluation of scientists.

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On modeling electrostatic effects in living cells

Regarding the comment by Bob Eisenberg and the response by authors Eli Barkai, Yuval Garini, and Ralf Metzler (PHYSICS TODAY, July 2013, page 10) in discussing electrostatic effects in living cells, I offer the following:

Eisenberg’s rejection of the use of classical, static analysis raises the question of what should be included in a model of a cell in an electrostatic field. Clearly, the field would create a potential across any cell to which it was applied. And such a potential would alter the shape of the cell, in addition to driving a (possibly minuscule) current through the cell and the surrounding fluid or cellular medium. As the cell moved, the shape and possibly the current would change.

Those effects imply much more than plain diffusion, especially if the medium containing the cell differed considerably from the cell’s own contents.

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Acoustical surface states in the radiation continuum

A Search and Discovery report in the September 2013 issue of PHYSICS TODAY (page 14) describes interesting work by Chia Wei Hsu and colleagues on guided optical modes within the radiation continuum.¹ Readers may be interested to know that surface states in the radiation continuum are well known in crystal acoustics. While surface acoustic waves (SAWs) are normally slower than bulk acoustic waves (see PHYSICS TODAY, March 2002, page 42), crystal surfaces support so-called pseudo-SAWs, whose velocity exceeds the slow transverse bulk velocity.

Pseudo-SAWs are leaky because of their coupling to the radiation continuum of bulk modes, but in isolated

propagation directions the coupling to bulk modes disappears and pure surface modes termed supersonic surface waves appear.² Just as in optics, sometimes symmetry incompatibility is involved. For example, in a supersonic SAW found in the [110] direction on the basal plane of cubic crystals such as silicon and germanium, particles move in ellipses contained in the vertical (sagittal) plane, whereas the slow transverse wave is polarized in the horizontal direction orthogonal to that plane. As soon as the wavevector deviates from [110], symmetry incompatibility is lifted and the mode becomes leaky.

However, the same pseudo-SAW branch contains another isolated, pure-mode point in a totally inconspicuous direction.³ Such “secluded” surface-wave solutions within the radiation continuum that are unrelated to symmetry incompatibility are stable with respect to system perturbations such as a change in the orientation of the surface.⁴ Although the existence of supersonic SAWs on a bare substrate requires elastic anisotropy, we found a supersonic mode guided by a layer with a periodic mass loading on an isotropic substrate.⁵ The structure we considered was somewhat analogous to the photonic-crystal slab used by Hsu and colleagues, but with an important difference: In the acoustic case, there are two bulk modes, longitudinal and transverse; our guided mode was faster than the transverse but slower than the longitudinal. Whether a guided mode can be faster than any bulk wave is unclear, since it will require that the radiation into both bulk modes be canceled simultaneously.

References

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