a refractive index equal to one of the indexes of the fibers as an analyzer. They suggested that such a structure was the basis of biological detection of polarized light. The suggestion seems plausible. Has it been confirmed or refuted?

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References

1. A. N. Fankuchen and I. Fankuchen, *Nature (Lond.)* **182**, 1372 (1958).

Aldrin and Dieldrin

In the report (News and Comment, 16 Aug., p. 601) of the suspension of the manufacture of aldrin and its metabolite dieldrin by the Environmental Protection Agency (EPA), it is not mentioned that the EPA will continue to permit the use of these compounds against termites, as a dip for roots and tops of nonfood plants, and against clothes moths under certain circumstances (*1*). As a result of these exemptions, aldrin and dieldrin will in all likelihood continue to be manufactured.

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References

1. Environmental Protection Agency, "Aldrin and dieldrin may be used for termite control and two other uses" (News Release R-558, EPA Information Section, Washington, D.C., 1974).

Evaluating Acupuncture

It was refreshing to read Clark and Yang's report (7 June, p. 1096) attempting to objectively evaluate a procedure used in acupuncture. Although I have no scientific evidence to support or refute the use of acupuncture as an analgesic, I have had the opportunity of seeing many unfortunate individuals from various parts of the United States who were "treated" with acupuncture for a neural hearing loss, and I have yet to see a change for the better. I might add that such evidence has not slowed down those who benefit financially from the practice of acupuncture for "nerve deafness."

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Clark and Yang suggest that many studies similar to theirs must be done "before it can be concluded that acupunctural analgesia is a myth." No one thinks acupunctural analgesia is a myth any more than many other unknowns, such as the placebo effect, hypnosis, and the workings of some analgesic medications that we cannot explain, are a "myth." They are real, and the only myths are some of the explanations for them. This is an important distinction. Highly useful techniques may remain unused because adequate physiological explanations for them do not exist.

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Success in Graduate School

As a recent graduate in the biological sciences, I read with interest Warren Willingham's "Predicting success in graduate education" (25 Jan., p. 273). However, I believe it is virtually impossible to predict success in graduate education with any reasonable degree of surety. The data in Willingham's Table 2 indicate that no predictor currently employed is a valid indicator of success in graduate education in biology. This is especially true today, when so many seemingly equally qualified students are entering graduate programs, but not all are attaining a degree.

Perhaps the emphasis of graduate schools, in the absence of any predictor that can measure the myriad intangibles that make successful graduate students, should be on developing valid criteria for judging success. I note with dismay the scarcity of data on the use of departmental qualifying examinations as a criteria of success. As Willingham notes, this "could provide the most reliable and valid criteria of subject competence."

A properly constructed examination, consisting of both objective and subjective written and oral portions and prepared by a well-chosen doctoral committee, serves several functions. First, it provides the student with an opportunity to demonstrate the wealth of important factual knowledge he or she possesses. Second, it provides the doctoral committee, if well chosen, an opportunity to evaluate how well the student can integrate and synthesize the

factual and theoretical knowledge of the subject matter. Third, putting the "bits and pieces" from various sources together allows the student to see, perhaps clearly for the first time, that these bits and pieces can be assembled into a coherent whole. Last, a qualifying examination provides the firm factual and theoretical base needed for the student to begin the next phase of his education; demonstrating his or her ability to think independently by conducting independent research, the ultimate goal of graduate education.

Until the test-makers can provide predictors to measure the numerous "unmeasurables" that make certain graduate students successful, perhaps more emphasis should be placed on proper development of qualifying examinations, one of the two most valuable and reliable criteria of success in graduate school.

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As chairman of our department's admissions committee, I should like to respond to Willingham's article, to what it says and to what it doesn't say.

My primary reservation about what *is* said concerns the validity studies which provide the basis for Willingham's conclusions. As he tells us, the data in his Tables 1 and 2 are summarized from 43 studies with a variety of sample sizes (20 to 1479 students), done over a 20-year span, in a variety of settings. If there is any reason to assume these studies have comparable results, this reason is not presented to us. And, in fact, the author states, "The studies represented in Table 1 vary widely in quality and scope. Some are based on small samples, making individual correlations unreliable." He concludes, however, that these widely varying studies may be advantageously combined. Perhaps. The idea that the results from two or more studies of dubious value become valid by their combination is not on the face of it a compelling argument. Obviously, if one does not accept the data, one does not accept the conclusion drawn from them.

In that regard, the author proposes an incomplete model of the admissions procedure. Standard test scores, recommendations, background information, transcripts, and the personal interview whenever possible are all used in attempting to evaluate each applicant. The weighting schemes used are complex and not explicitly formulated. They relate to a pattern recognition on the part of the assessor ("A student much like this one did well here"). Moreover, these procedures may be sequential, involving successive screenings of applicants. An analysis of this process would be most interesting, particularly with regard to the impact of political and psychological factors.

More significantly, the attempt to correlate tests scores and "success" measures seems rather misleading. At best, these tests may measure some aspect of a student's potential to comprehend certain material by virtue of his mastery of English or arithmetic skills. They clearly do not measure his motivation, his tenacity, his response to program demands, his response to personal problems, or his response to changes in the employment market. These are factors which bear heavily on the likelihood of student "success." And, it is these things which point out the impossibility of admitting only "successful" students.

Beyond approaching these tasks rationally and with goodwill, and convincing the university bureaucracy not to lose chosen applicants through oversight, I frankly don't know which way to go. How welcome a system that eliminates the need to make painful decisions would be.

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I find no quarrel with most of the points raised in the two letters concerning my article, but I would note that studies on any given topic usually vary in quality and importance. This is certainly true in the case of research on predicting success in graduate education, although work of "dubious value" was not included in the review. The qualification expressed in my article referred especially to the small samples in some studies. Summarizing a set of correlations that may be individually unstable is a routine procedure for estimating the strength of a relationship. While the authors cited in my article did not study other topics, such as student motivation or the nature of the admissions process, I certainly agree that these are interesting and important problems.

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