tions, and hence not within the Bayh-Doyle purview. NIH's early applications to patent such sequences, as discussed clearly in Marshall's companion article (News & Comment, 7 Feb., p. 780), were considered unpatentable by the U.S. Patent and Trademark Office (PTO), and although there was no appeal to trigger a more final decision, few if any patents of a similar nature have since been issued.

Furthermore, it is not likely that commercialization will be thwarted by publication of a sequence, as confirmed by the decision *In re Deuel* (*1*) (patentability of partially published protein sequence). Instead of wasting PTO and applicant time and money on trying to patent the unpatentable, the focus should be on protecting the commercially important invention. Most often, that invention will be the identification of how a particular sequence can be used and patent coverage for a diagnostic or therapeutic modality that can actually be incorporated into a product useful to the public. NIH and the universities have no reluctance to file for patents and encourage commercialization of inventions such as these.

The record is clear that we recognize the role of patents in advancing the health and welfare of the communities we serve and in encouraging economic competitiveness. It is perfectly consistent with the Bayh-Dole Act to encourage more dissemination of sequence information, so that the actual inventions can be made.

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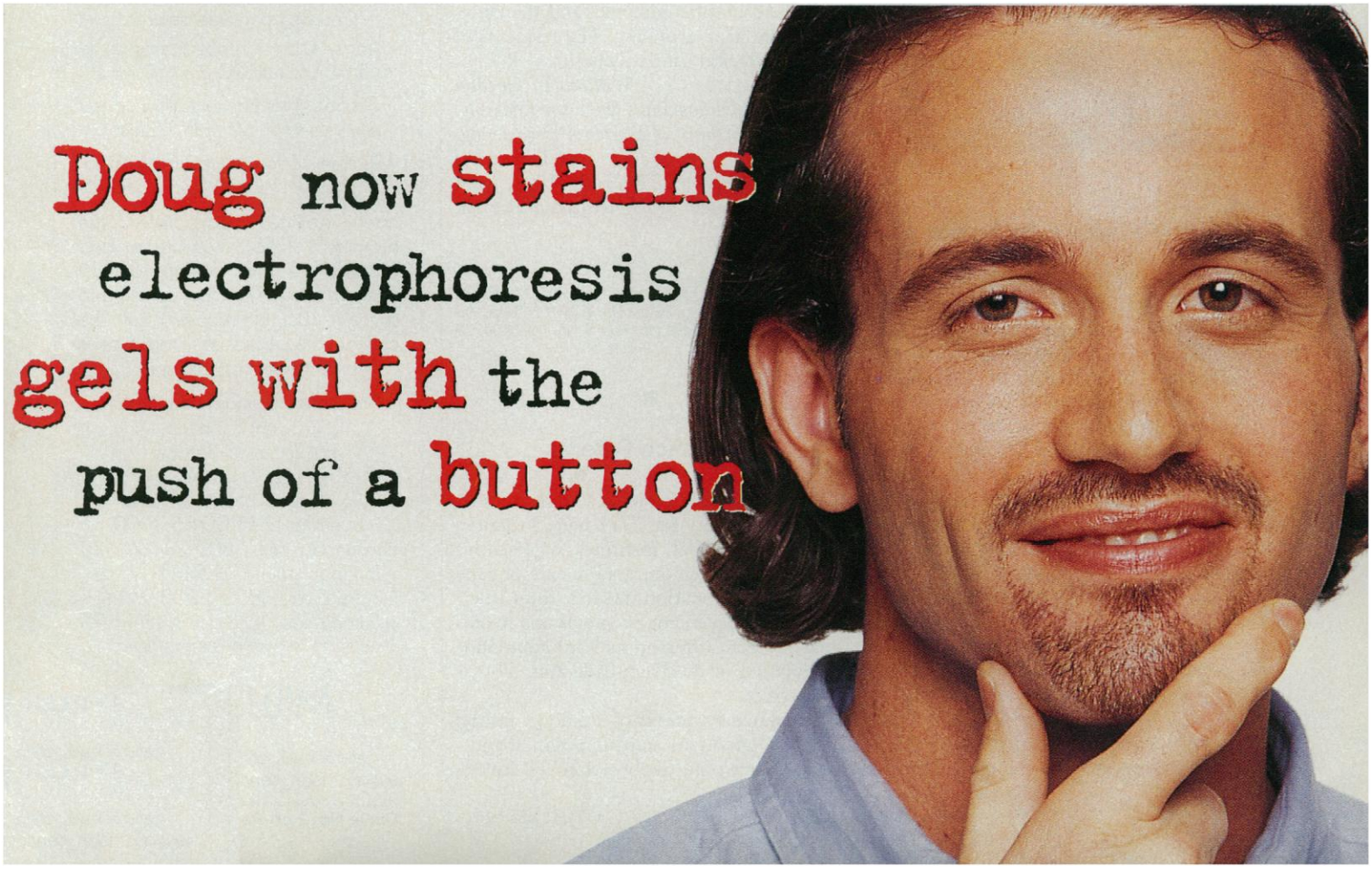
Bioinformatics: Mathematical Challenges and Ecology

The article "Mathematical and computational challenges in population biology and ecosystems science" by Simon A. Levin *et al.* (17 Jan., p. 334) discusses exciting developments and challenges for studies of complex ecological systems, with special emphasis on simulation and analytical approaches. The authors highlight how increased computation capability is affecting our ability to tackle tough questions about complex system behavior. Another related area with similar challenges and advances, however, is the statistical analysis of data from complex systems. Extracting a clear understanding of how complex ecological systems operate will depend not only on our ability to simulate component processes but will also require us to go beyond traditional experimental approaches, which are limited in their scope, duration, and realism, for practical reasons.

Relative to their rapid adoption of simulation and analytic approaches, ecologists have been slow to exploit the most recent advances in multivariate analyses. Traditional statistical approaches have often distinguished between ANOVA/MANOVA (analysis of variance/multivariate analyses of variance) approaches—which have a limited capability to deal with multivariate, interacting factors—and descriptive multivariate methods such as principal component analysis, factor analysis, and multiple regression. With the development of new programs that use the ready availability of increased computing power, data analysts are examining more of the whole covariance structure that occurs in complex systems. Expanded capacity for covariance analysis within ANOVA as well as capabilities in structural equation modeling are leading toward more general



and less restricted methods of analysis. In the forefront of this enterprise should be the difficult task of interpreting the results from these analyses. No doubt, mistakes will be made and major refinements required. Nonetheless, in order to make useful predictions about the behavior of ecological systems, the challenge of conducting and interpreting multivariate analyses of interacting components must be tackled with vigor.

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Surprise Authorship

Recent letters (6 Dec., p. 1593; 24 Jan., p. 461) have proposed strict rules for co-authorship of scientific publications. I wholeheartedly agree that to put one's name on a paper is an assurance to the scientific community that one has contributed to the work and that one stands behind the work reported. However, one aspect of the co-authorship problem that I have not seen discussed in this forum is that of finding one's name as a co-author on a publication of which one has no knowledge. This recently happened to a colleague and me when we found a paper in a journal listing our names as co-authors, although neither of us had ever contributed to the work, seen the manuscript, or been notified of its submission or publication.

I felt victimized by this event and by the use of my name in an inappropriate manner. Integrity and reputation are among our major assets as scientists. I agree with previous letter writers that every reputable journal should secure a written statement from each author listed on a manuscript assuring that a contribution to the work was made and accepting responsibility for the work. Such a requirement will protect both the integrity of the literature from bogus authorship and the integrity of researchers whose names may be usurped.

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Medical School Funding

Although medical schools might appear to be robust enterprises, with aggregate annual expenditures in 1995 of more than $30 billion, the fact is that on average only about 10 to 20% of their annual revenues comes from such secure sources as tuition and fees, endowment earnings and gifts, or (mainly for the public schools) state support. About 20% of their annual revenues comes from the NIH (National Institutes of Health), nearly 35% from fees generated by the faculty physicians' practice of medicine, and another roughly 15% in direct payments from teaching hospital partners. In other words, about 50% of the schools' aggregate revenues is derived from the provision of medical care; these revenues have provided surpluses that have been used by the medical schools as flexible funds for academic investments. In fiscal year 1994, the Association of American Medical Colleges survey indicated that revenues from the faculty physicians' practice alone contributed $2.4 billion to medical schools for support of education and research. Although the majority of the funds were expended for clinical education and research, not all of them were, and the fact that the funds were discretionary is their critically important feature. It is these clinical surpluses that are being wrung out of the health care system by a managed care enterprise that has demonstrated little willingness to contribute to the costs of education and