LETTERS

Standing firm

Readers offer views on a number of topics: "[R]esidents of Alaska will find . . . benefits" from a "world-class" ionosphere research facility (below); publishing raw genetic sequences will "not likely" thwart the patenting and commercialization of gene products; to avoid "victimization" of unknowing authors, journals should insist that coauthors consult one another before their names appear on a paper; the challenge of predicting the "behavior of ecological systems" should be "tackled vigorously"; "flexible funds" should be made available to medical schools for the "support [of] their academic objectives"; and international support for the "biodiversity information associated with natural history museum collections" should be made more widely available.

HAARP Facility in Alaska

With respect to the News & Comment article "Ionosphere research lab sparks fears in Alaska" by Lisa Busch (21 Feb., p. 1060), I would like to make two points.

First, the anti-HAARP (High-Frequency Active Auroral Research Program) activists overestimated the power of the Gakona, Alaska, facility by a factor of more than a million and then used statements in patents (*1*) to fuel speculations on the part of the public about possible effects such as weather manipulations, mind warping, and communication disruptions. This incorrect information has been refuted in hearings in the Alaska legislature, in a video prepared by Senator Frank H. Murkowski (R–AK) for airing in Alaska, and at open-house sessions at the site for interested visitors.

Second, the Gakona site is now intended to be a world-class facility for studying the upper atmosphere, although the function has evolved from an over-the-horizon radar (never constructed), to a high-frequency facility (under construction) to generate ELF (Extremely Low Frequency) radio waves in the ionosphere, to a major center for upper atmosphere studies using a variety of diagnostics (some in place) with a powerful incoherent scatter radar (ISR) as the core instrument (to be constructed). The core instrument will join with existing ISRs at Svalbard and Tromsø in Norway; Sondrestrom, Greenland; and Boston, Massachusetts, and with the proposed ISR at Resolute Bay, Canada, to form an Arctic network of radars to observe virtually the whole Polar Cap and to track disturbances produced by solar inputs in the form of waves and particles. The network will be a remarkable additon to the tools available to the atmospheric science community with applications to space weather, Arctic and satellite communications, and electric power-grid problems.

In the early days of the Arecibo Observatory in Puerto Rico there were concerns expressed about the facility, but these have long since been replaced by satisfaction with the scientific outcomes and the benefits to the local economy. The residents of Alaska will find similar benefits.

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References

1. B. J. Eastlund, Patent No. 4686605, 11 August 1987; and S. Ramo, Patent No. 4712155, 8 December 1987; B. J. Eastlund, Patent No. 5038664, 13 August 1991.

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Sequence Patents

In Eliot Marshall's News & Comment article of 7 February (p. 777), it is suggested that the National Institutes of Health's (NIH's) insistence on rapid release of gene sequence information arising from their large-scale sequencing programs and avoidance of patent filing on such information is in violation of the Bayh-Dole Act. This is not correct.

Sequence fragments of unknown utility, although important starting points for further research, are likely not to be inven-

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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References

1. *In re Deuel* **51** Fed. 3d 1552, 1559; **34** USPQ2d 1210, 1215 (Fed. Cir., 1995).

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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