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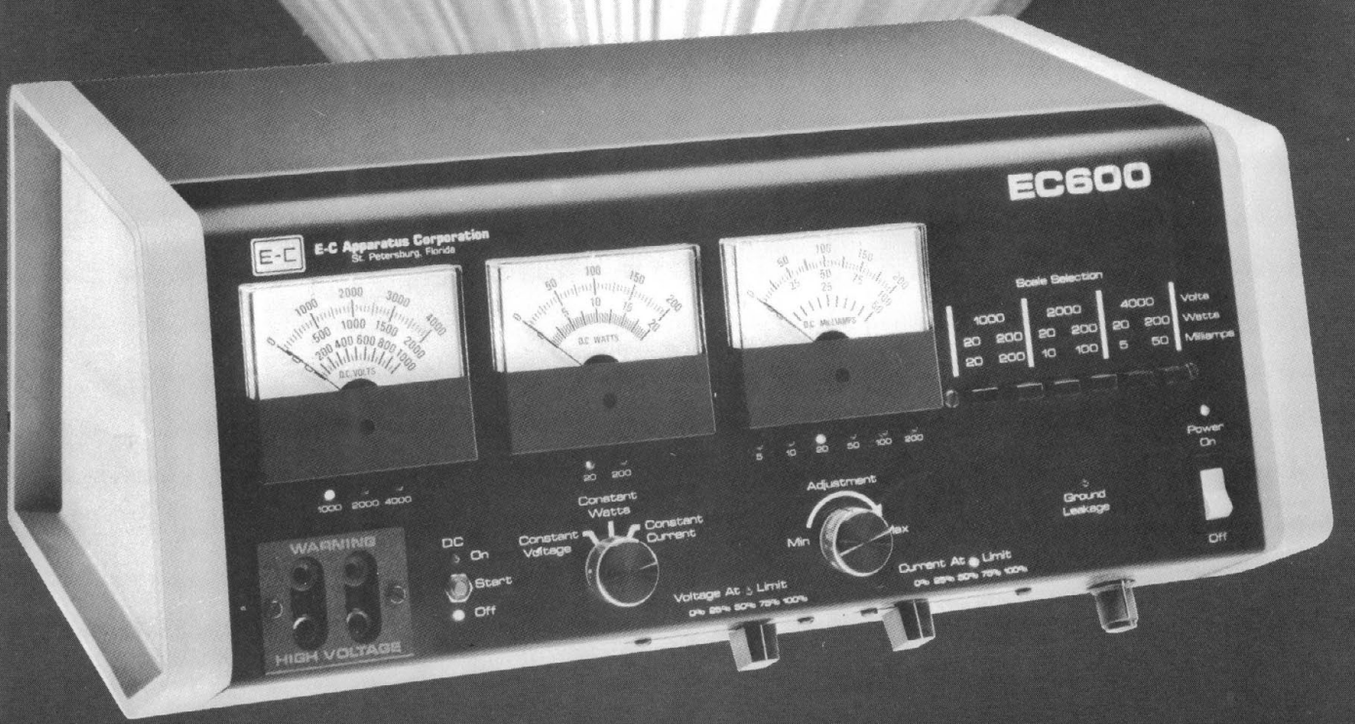

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COVER

Male fawn of the white-tailed deer (*Odocoileus virginianus*), 5 weeks old. Fawns of that age derive most of their energy from milk and the remainder from vegetation. They run about 450 meters in a play bout. When deprived of part of their milk, they continue to play, rest more, and compensate by increased grazing. See page 85. [Richard Altieri, P.O. Box 399, Tully, New York 13159]

OPEN FORUM

Sponsored by the AAAS Committee on Science, Engineering, and Public Policy and the AAAS Congressional Science and Engineering Fellows Program

- **Major Future Science and Technology Issues**
- **What Lies Ahead for Science and Technology Policy**
- **Current Science Issues—The Continuing DNA Controversy**
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If the nation does not approach air pollution control on this basis, we will risk spending more than is necessary to meet our air quality goals, and limited resources will be diverted from more productive uses. We believe the 1-gram-per-mile automobile NO_x standard will produce no significant benefit and is thus a poor bargain for the consumer.

BETSY ANCKER-JOHNSON
Environmental Activities Staff,
General Motors Corporation,
General Motors Technical Center,
Warren, Michigan 48090

Important Distinction

In his Nobel lecture (10 July, p. 172) on studies in histocompatibility, George D. Snell mentions the association between H-2 haplotypes and responsiveness to the induction of cleft palate by glucocorticoids in mice and notes that the susceptible A strain has a relatively high spontaneous rate of the same defect. This is incorrect. The spontaneous malformation that A mice have is cleft lip, which may or may not be accompanied by cleft palate (*1*), whereas the corticoid-induced defect is cleft palate, and it never occurs together with cleft lip (*2*). The distinction is important because the conditions are different in numerous respects—etiology, genetics, epidemiology, embryology, morphology, and pathology—in both mice and people (*3*). I thank Snell for making a complex subject lucid and for providing this favorable occasion for recalling the facts.

H. KALTER
Children's Hospital Research Foundation, Cincinnati, Ohio 45229

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1. H. Kalter, *Teratology* **20**, 213 (1979).
2. F. G. Biddle, *Adv. Stud. Birth Defects* **1**, 88 (1979).
3. J. Warkany, *Congenital Malformations* (Year Book, Chicago, 1971); A. Burdi *et al.*, *Teratology* **6**, 255 (1972).

The condition to which Kalter refers was originally described by Reed and Snell (*1*) under the title "Harelip, A new mutation in the house mouse." Kalter is correct in stating that, in the spontaneous form, cleft lip can occur without cleft palate. In the particular strain we were studying, however, a derivative of the Bagg albinos that was not highly inbred, it was observed alone only once in a good many cases. In all the other cases, some degree of cleft palate was present.

With respect to the genetics of the trait, the induced form is clearly dependent on the H-2 genotype (*2*). Because of this, I ventured to ask, in connection with the cleft lip locus identified by Reed and Snell, "Could this have been the first identification of H-2?" Subsequently, Gasser *et al.* (*3*), using congenic lines with H-2 differences on different genetic backgrounds, showed that the spontaneous form, unlike the induced form, is independent of H-2. The speculation implied in my question is thus not substantiated, and the difference between the spontaneous and induced forms stressed by Kalter is further emphasized.

My thanks to Kalter for raising these points.

GEORGE D. SNELL
Jackson Laboratory,
Bar Harbor, Maine 04609

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1. S. C. Reed and G. D. Snell, *Anat. Rec.* **51**, 43 (1931).
2. J. J. Bonner and H. C. Slavkin, *Immunogenetics* **2**, 213 (1975).
3. D. L. Gasser, L. Mele, D. D. Lees, A. S. Goldman, *Proc. Natl. Acad. Sci. U.S.A.* **78**, 3147 (1981).

Education and Industry

D. Allan Bromley (Editorial, 10 July, p. 159) appears to place the burden on industry for correcting a problem brought about by the educational establishment's failing to keep its own house in order. It is not industry that has forced the costs of education up and kept faculty salaries low; it is an interest in research to the exclusion of education at "better" colleges and universities and a sad lack of interest in devoting money or manpower to improving the quality and efficiency of the educational system. For example, how extensive is the commitment of leading "educational" institutions to programs such as the following:

- Taking advantage of the new personal computer technology to provide quality computer-aided instruction for background material so that classroom time across the country can be more effectively used for personal interaction.
- Videotaping the best lecturers in action so that faculty time can be saved and additional dollars made available for graduate or upper-class student assistants.
- Arranging with large corporations to pay the tuition of students selected, say, at the end of their sophomore year who would agree to work for that corporation for some period after graduation.
- Improving utilization of summer vacations or long academic breaks to increase overall financial efficiency.
- Finding ways to safeguard academic

freedom without a tenure system that effectively prevents many schools at all levels from keeping up with changing times.

It should come as no great surprise that many of the most capable teachers are leaving universities, colleges, and secondary schools for more rewarding jobs in industry. Having been compelled to go into industry because of the job market in academic physics and astronomy in the early 1970's, I would not now return to the academic community even though I love teaching. This is partly due to the financial rewards and the more challenging environment of industry and partly due to the lack of any real interest (reflected in hiring, promotions, and salary) on the part of universities in providing the product which is so desperately needed—quality education at a reasonable price. That educational programs are as good as they are in the face of institutional disinterest is a credit to the strong personal commitment of many faculty members. It is largely up to the college and university administrators themselves to find solutions to problems which they have in large part created.

JAMES R. WERTZ
Defense and Space Systems Group, TRW Inc., 1 Space Park, Redondo Beach, California 90278

Space Shuttle: Remote Manipulator Arm

The article "Shuttle launch expected soon" (News and Comment, 9 Oct., p. 160) by R. Jeffrey Smith contains a description of the remote manipulator arm that requires elucidation. Smith describes the arm as having three joints. Technically speaking, the arm has six joints: shoulder yaw, shoulder pitch, elbow pitch, wrist pitch, wrist yaw, and wrist roll.

The $100 million (Canadian dollars) for the development of the remote manipulator arm was contributed entirely by Canada to the U.S. Space Shuttle Program. The National Aeronautics and Space Administration will procure the next three arms for only $25 million (Canadian dollars) each.

BENJAMIN J. BOURGEOIS
Houston Astronautics Division, McDonnell Douglas Technical Services Company, Inc., 16441 Space Center Boulevard, Houston, Texas 77058

Erratum. In the report entitled "Autoimmune encephalomyelitis: Simultaneous identification of T and B cells in the target organ" by U. Traugott *et al.* (11 Dec., p. 1251), the name of the fourth author should have been S. H. Stone.

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Luck, Merit, and Peer Review

Every year the National Science Foundation spends a billion dollars, mostly on the support of research. A recent report commissioned by the foundation* suggests that chance enters significantly into decisions of the peer review system by which NSF evaluates funding requests for scientific research. The report indicates that about 25 percent of NSF decisions would be reversed by a different panel.

"Capital punishment," or loss of grant support, is cruel, but no longer unusual, in academia. The notion that chance enters into the decision-making process adds a special twist, and this study has raised calls from many quarters for elimination of the peer review system—a reaction not at all justified by the findings. Distribution of research funds in block grants to states or by random lottery, both of which have been suggested, would foster mediocre research.

We have become chary. We insist on certainty whether or not it is practical. We want zero levels for pollution, accountability of school teachers for what our children learn, and guarantees that the products we buy will not break, wear out, or cause injury. If disappointed, we sue for damages.

But honest scientific research is a gamble. The peer review system is probably the best method the NSF has for placing its chips. Every time a bet is placed, something is risked. We might reduce the uncertainty considerably by doubling the number of readers for each proposal. Would this be worthwhile?

In the peer review system, a proposal is evaluated independently by "peers" chosen from a pool of reviewers qualified in the area of the proposal. In most areas, only proposals rated "excellent" or "very good" have been funded in recent years. Budgetary constraints undoubtedly prevent the funding of many worthwhile proposals.

Since research proposals are by their very nature speculative, it would be dishonest to propose funding for research already completed. Therefore it is not surprising that reviewers disagree substantially on the value of proposed research, the ability of the scientist, and the level of funding required.

How likely is it that one panel of five will disagree with another?

Suppose there are 20 qualified reviewers for a proposal, all of whom give an opinion. If 13 of them are in favor of the proposal and seven are against it, the majority opinion will carry and the proposal will be funded. If, however, five reviewers are chosen at random from the 20, slightly more than 20 percent of the proposals they evaluate will not be funded. If only 12 of the 20 eligible reviewers favored the proposals, 30 percent of the time a "wrong" result would occur. In the three fields considered by the report, between 24 and 30 percent of the decisions would have been reversed by a different panel.

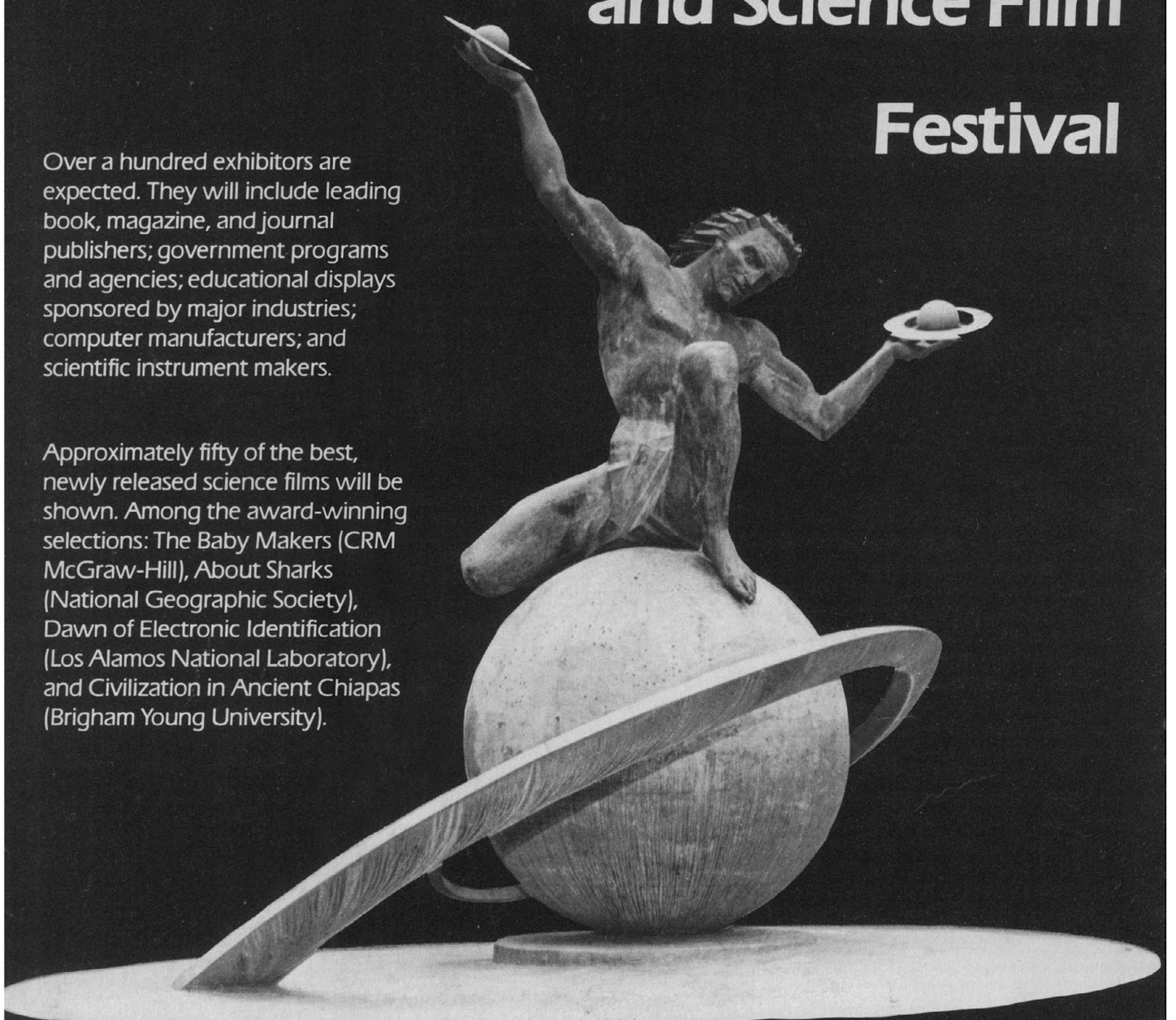
The report itself concludes: ". . . our research both in this and in other studies in the sociology of science indicates that concerning work currently in process there is substantial disagreement in all scientific fields."

In this situation there is less than meets the eye. It is not in the least amazing that opinion varies in every scientific field on the most promising avenues for investigation. Nor is it surprising that differences surface in the evaluation of proposals which are, at best, an impermanent and imperfect reflection of the scientist's thoughts about the logical next step.

Despite our best efforts to reduce the inherent unfairness of life and to minimize errors, some risks and some faults will remain. We want to spend our tax dollars wisely. The nation needs scientific research, but we cannot buy it by the yard and return the unused portion to get our money back. We cannot know for sure what research will pay off. We must accept the fact that uncertainty is inherent in the system.—ALLAN H. CLARK, *Dean, School of Science, Purdue University, West Lafayette, Indiana 47907*

*J. R. Cole and S. Cole, with the Committee on Science and Public Policy, *Peer Review in the National Science Foundation: Phase Two of a Study* (National Academy of Sciences, Washington, D.C., 1981).

There's a world of science waiting for you at the AAAS Exhibit and Science Film Festival



Over a hundred exhibitors are expected. They will include leading book, magazine, and journal publishers; government programs and agencies; educational displays sponsored by major industries; computer manufacturers; and scientific instrument makers.

Approximately fifty of the best, newly released science films will be shown. Among the award-winning selections: The Baby Makers (CRM McGraw-Hill), About Sharks (National Geographic Society), Dawn of Electronic Identification (Los Alamos National Laboratory), and Civilization in Ancient Chiapas (Brigham Young University).

AAAS Annual Meeting 3-8 January 1982
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