well as ours. I do not know how rapidly ATP concentrations change after death, but it is clear that such changes are rapid and drastic after ischemia (3). I urge that rapid putative changes in ATP concentrations with their consequences be taken into account when postmortem observations are interpreted.

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References

1. H. M. Roder and V. M. Ingram, *J. Neurosci.* **11**, 3325 (1991); H. M. Roder, P. A. Eden, V. M. Ingram, *Biochem. Biophys. Res. Commun.* **183**, 639 (1993); H. M. Roder, R. P. Fracasso, F. J. Hoffman, *Research Advances in Alzheimer's Disease and Related Disorders*, K. Igbal *et al.*, Eds. (Wiley, New York, 1995).
2. M. L. Bush, J. S. Miyashiro, V. M. Ingram, *Proc. Natl. Acad. Sci. U.S.A.* **92**, 1861 (1995).
3. M. Szatkowski and D. Attwell, *Trends Neurosci.* **17**, 359 (1994).

Multidisciplinary Activities at the National Science Foundation

In Jeffrey Mervis's article (News & Comment, 3 Feb., p. 615) about the creation of the new Office of Multidisciplinary Activities (OMA) within the National Science Foundation's (NSF's) Directorate for Mathematical and Physical Sciences (MPS), Frank Shu, president of the American Astronomical Society, is quoted as saying that OMA was created without input from the community. Nothing could be further from the truth. The MPS Advisory Committee has believed for some time that an office like the OMA was needed to both engender and address growing research and educational activities involving other research and development agencies and the private sector, as well as to coordinate MPS activities within the NSF. While many were responsible for NSF multidisciplinary activities, the Advisory Committee saw the need to have an office that was specifically *accountable* for these important activities.

Following on these beliefs, the Advisory Committee worked with the MPS directorate's senior staff, as well as with many members of the community, to help draft the OMA. We sought broad input on the need for OMA and got strong, broad support for it. [We should also note that the Grant Opportunities program (GOALI) was approved before the existence of the OMA and is based on a rather successful model within the Division of Mathematical Sciences.]

Those with disciplinary-oriented interests are understandably concerned about the loss of resources to those who are interested in working with others in different disciplines. In our judgment, however, the creation of the new OMA represents a bold move on the part of the NSF—done in concert with the scientific community—to respond to the changing reality of today's research enterprise.

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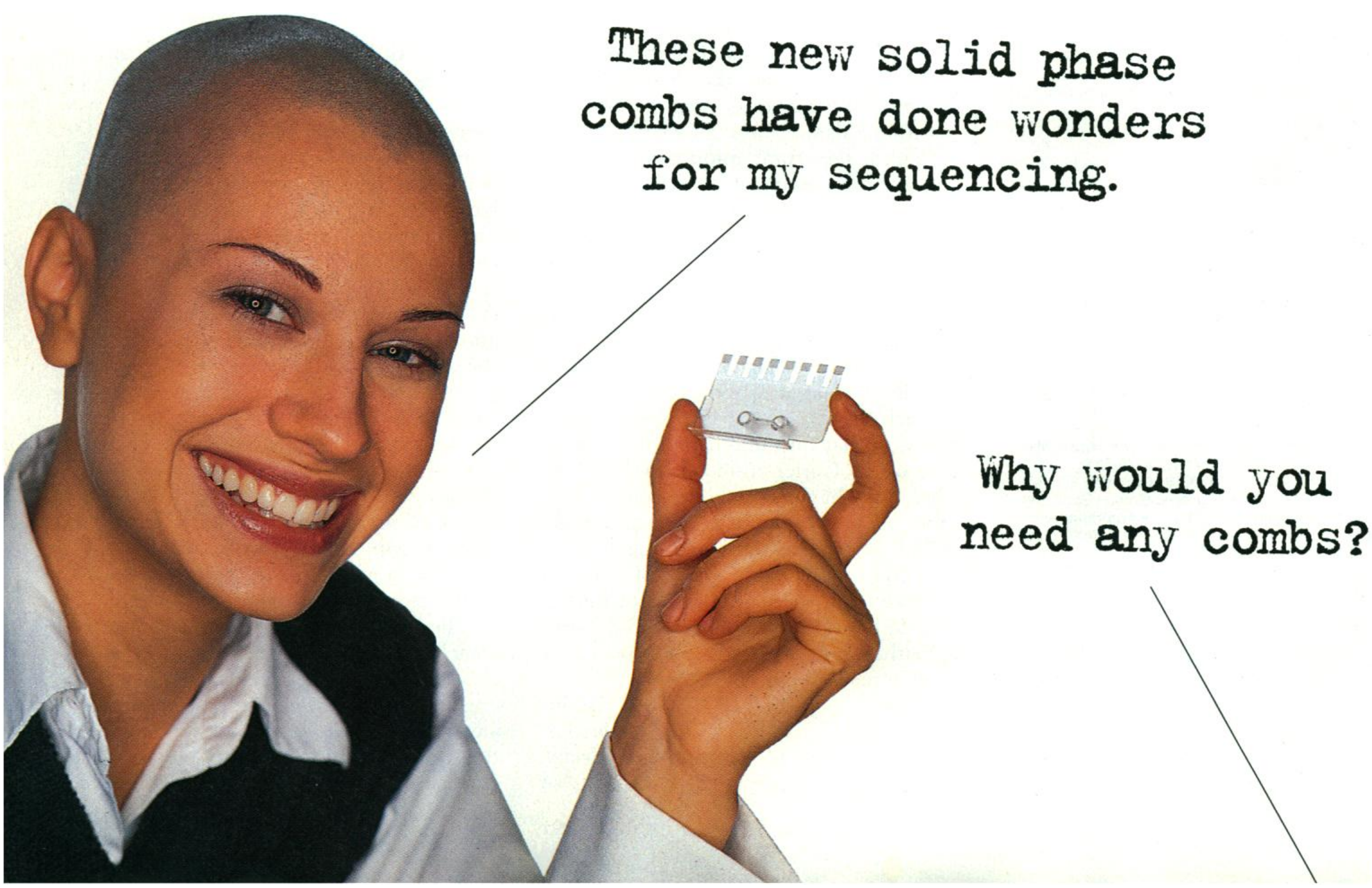
Three-Dimensional Molecular Graphics

It is understandable that the protein crystallographers interviewed by Stephen S. Hall (Special News Report, 3 Feb., p. 620)



emphasized the importance of the program FRODO (*1*) in their work. However, interactive three-dimensional molecular graphics did not begin with FRODO in 1978, but in 1964 with work on the Project MAC display at the Massachusetts Institute of Technology (MIT) (*2*) by the late Cyrus Levinthal (then at MIT) and me (then at Harvard University) (*3*).

The project MAC system was one-of-a-kind, but once commercial interactive three-dimensional computer graphics displays began to appear in 1967–1969, the Division of Research Resources of the National Institutes of Health encouraged both Levinthal and me to establish computer graphics laboratories at Columbia University and Princeton University, respectively. This earlier work had the same motivation as FRODO—to eliminate the use of large and clumsy wire models.

Hall lists molecular graphics programs now routinely used in structural biology and states that "All these programs are, in a sense, the children of FRODO." They are all, including FRODO, descendants of our earlier work.

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References

1. T. A. Jones, *J. Appl. Crystall.* **11**, 268 (1978).
2. R. H. Stotz and J. E. Ward, "Project MAC Internal Memorandum MAC-M-217" (Project MAC, Massachusetts Institute of Technology, Cambridge, MA, 1965).
3. C. Levinthal, in *Proceedings of the IBM Scientific Computing Symposium on Computer-Aided Experimentation* (IBM, White Plains, NY, 1966); R. Langridge and A. W. MacEwan, in *ibid.*, p. 305; C. Levinthal, *Sci. Am.* **214**, 42 (June 1966).

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Three Presidents

Craig Halvorson and his colleagues (Reports, 26 Aug., p. 1215) describe the design and fabrication of a novel and extremely fast optical image processor that uses the nonlinear optical properties of conjugated polymers. The device was demonstrated by optical correlation of an image of U.S. President George Washington, with a second image bearing likenesses of presidents Washington, Thomas Jefferson, a rotated Washington, and John Adams (clockwise from top of illustration, p. 1892). Halvorson and his colleagues conclude that the reference image of Washington is correlated best with the unrotated likeness of Washington in the second image (autocorrelation), as one would expect. However, they also find that the next largest peak in the correlation intensity is between the image of Washington and that of Jefferson, followed by Washington and a rotated image of Washington, and last between the images of Washington and Adams (*1*).

We performed a similar correlation analysis, using conventional computational tools, on the images used in Halvorson *et al.*'s demonstration. We digitized the images appearing in the article and computed the correlation intensity as a function of relative image shift. We found a maximum correlation intensity corresponding to the unrotated image of Washington, as did Halvorson *et al.* However, we found the next largest peak in the correlation intensity corresponding to the image of Adams, not Jefferson, and the smallest peak corresponding to Jefferson, not Adams. This result is reasonable, given that both Washington and Adams are looking to their right and shadowed on their left, whereas Jefferson is looking to his left, and shadowed on his right. For this heavily shadowed black-and-white image, the correlation intensity is more sensitive to the subject's orientation and illumination angle than it is to subtle differences in facial features.

Halvorson *et al.*'s demonstration of their