

5. P. D. Kruss, *Z. Gletscherkd. Glazialgeol.* **19** (no. 2), 43 (1984).
6. S. Hastenrath and P. D. Kruss, *Ann. Glaciol.* **16**, 127 (1992).
7. S. Hastenrath, in *Proceedings of the International Symposium on Seasonal and Long-Term Fluctuations of Nival and Glacial Processes in Mountains, UNESCO-IUGG-IASH-ICSU, Tashkent, Uzbekistan, September 1993*, in press; S. Hastenrath, A. Nicklis, L. Greischar, *J. Geophys. Res. Oceans* **C11**, 20219 (1993).
8. World Glacial Monitoring Service, *Glac. Mass Balance Bull. No. 2 (1990-91)* (1993).
9. Supported by NSF grant EAR-9217211.

Response: Hastenrath is right in pointing out that factors other than air temperature affect the mass balance of glaciers. First of all, solar radiation forms the most important source of energy for the melting process on most glaciers. This implies that changes in cloudiness are potentially important. Latent heat transfer, related to humidity, is another factor. Also, changes in precipitation can greatly change a glacier's mass budget.

My view—that, on the global scale, air temperature is the most important factor—is based on calculations with a mass balance model (1). For a typical midlatitude valley glacier, a 40% decrease in cloudiness or a 20% decrease in precipitation would have the same effect as a 1°C temperature rise. Such changes in cloudiness or precipitation may occur locally or even regionally on a decadal time scale, but most climatologists would agree that global trends of this order on a century time scale are unlikely. This justifies the statement that the observed retreat of valley glaciers is first of all a result of rising air temperature.

The mass balance of tropical glaciers has different characteristics. There is no well-defined melting season and changes in precipitation are probably larger than anywhere else, implying that the climatic interpretation should be done with great caution. I agree with Hastenrath that the record of Lewis glacier is unique and should be continued by all means.

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References

1. J. Oerlemans, *Z. Gletscherkd. Glazialgeol.* **27-28**, 63 (1991).

UNESCO's Role

I support the ideas expressed in the Policy Forum "Back to the future with UNESCO" by Rita R. Colwell and David Pramer (19 Aug., p. 1047). Among the many activities of UNESCO, where it is unique as a worldwide organization, is its role in the bridge between science and culture, as reflected by

the encouragement of fundamental science on a worldwide scale.

I have sought the assistance of UNESCO on a project to construct large detectors covering 5000 square kilometers to study the highest energy cosmic rays (energies $\geq 10^{20}$ electron volts, ≥ 16 joules) with the strong support of its director general, Federico Mayor. UNESCO is currently helping us with the formation of an international group that will meet at Fermilab (in Batavia, Illinois) in early 1995 to make a technical design for such a detector.

It is clear that, in the future, large and expensive science projects will require international collaborations. Their success will depend on international participation in the design stage of the project. In the formation of such collaborations, there is an opportunity to seek the intellectual contributions from developing countries or from countries emerging from the cold war era. UNESCO is the ideal organization to aid in finding such qualified scientists and engineers. After the technical design, UNESCO can be of great assistance in bringing scientific representatives of countries together to form the worldwide collaboration that will construct the apparatus which has been designed by the international group.

Such a role for UNESCO is nothing new. In the early 1950s, UNESCO was instrumental in the foundation of CERN (the European Organization for Nuclear Research) with the leadership of I. I. Rabi and Pierre Auger. As Colwell and Pramer suggest, the United States should rejoin UNESCO. Several years ago I signed a petition to that effect. I can state in a most concrete way that UNESCO has been, and will continue to be, an effective catalyst for our efforts to study the highest-energy cosmic rays.

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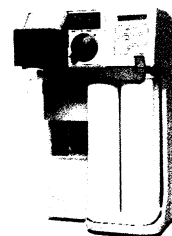
Strategies for Research

"Reorientation of research objectives" is currently much discussed, as in an editorial of that title by Philip H. Abelson (6 May, p. 755). The editorial cites opinions from a representative of the Council on Competitiveness and from a recent official of IBM, but the questions involved are more extensive than these opinions suggest.

On the one hand, there are now insistent calls from the U.S. Congress for attention to strategic research, often following specified initiatives chosen by government officials. This has meant that scientific projects that fit these initiatives are often well funded, but it is not clear that the selected initiatives take

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