greatly betrayed by these "haves" in the physics community. One well-known university had originally advertised in PHYSICS TODAY for "a junior faculty condensed-matter physicist with experience or interests in biophysics," yet when contacted they indicated that interests in biophysics wasn't the same as five years experience in the field—exit all unemployed, solid-state physicists with a naive interest in becoming biophysicists.

Of course, it's a buyers' market, as anyone who has been seeking a position can readily agree. The AIP Placement Register this last year in New York was an utter fiasco (made a fiasco by the specificity and small numbers of interviewers—not by the AIP, which does a bang-up job as always), but, coming from a "have" generation who sold us this line of "general physics education, applicable to all problems and positions," it is particularly galling.

My advice to all who have not had this experience is as follows. A rigorous, broad training in physics is *not* enough—a good knowledge of materials science (metallurgy, ceramics, polymers, and so on) will help you get some sort of a job until your training, in scattering studies of charged raindrops off green bullfrogs, offers a position, say, sometime before 1997. However, experience on the smoke shifter should also be gotten!

EDWARD SIEGEL
Troy, Michigan

Superconductive tunneling

Friends of Ivar Giaever, Brian Josephson and Leo Esaki, and I also, were delighted with the choice of recipients for the 1973 Nobel Prize awards in physics, and believe that the recipients were truly deserving of this high award.

In writing a history of the development of the field of electron tunneling through barriers between superconductors, it seems that the earlier, pioneering investigations by Hans Meissner (Stevens Institute of Technology) of superconductive tunneling through normal metal films between superconductors ought not be overlooked. See, for example the article in PHYSICS TODAY for December 1973, page 73–75, on the Nobel awards.

In this connection, a comment by P. G. De Gennes in his paper on "Boundary Effects in Superconductors" in the *Reviews of Modern Physics* **26**, 226 (1964) is apropos:

"(c) a thin ($\sim$1000Å) normal slab N separating two superconductors S and S^1 is able to carry a finite supercurrent from S to S^1. *These* SNS^1 *junctions have been studied first in the pioneer work of Meissner (H. Meissner, Phys. Rev.* 117, *672 (1960)* (my italics). Their interest is twofold: (1) from the dependence of the critical current on the thickness of the N slab one may obtain an estimate of V_N, the electron-electron interaction in N. (2) the *SNS* junctions have a wide range of critical currents and critical fields: this could be useful for some low temperature devices . . ."

F. G. BRICKWEDDE
The Pennsylvania State University
University Park, Pennsylvania

Eckart's contributions

I was much saddened to read recently (January, page 87) of the death of Carl Eckart, whom I had known, and who had served as my counselor and inspiration when I was a graduate student at the University of Chicago before World War II.

While I was aware of Eckart's outstanding success in oceanography following his moving to California after the war, I was surprised to find no mention of his prior contributions to theoretical physics. What I recall, without searching through the literature, are his papers on the variational method, and his showing of the equivalence of the Schrödinger and the Heisenberg formulations of quantum mechanics. During my time at the University of Chicago, he was generally considered to be by far the most competent physicist around. He was both loved and admired by the students, whom he was always ready to guide and assist in their research, whether it be in theoretical or experimental physics, geology, or as in my case, biophysics.

FRANKLIN F. OFFNER
Northwestern University
Evanston, Illinois

NSF referees

I agree with the basic argument given by Robert L. Chaplin in his letter (January, page 121) that a change is needed in the method used by NSF to evaluate proposals.

The fact that NSF assumes that referees are infallible and expects them all to be "enthusiastic" in favor of a new proposal is an extremely unfair obstacle. And in a situation where the writer of the new proposal has challenged the orthodoxy of some branch of science, the present NSF policy represents an essentially insurmountable obstacle. If, in addition, the writer happens not to be in an academic position, present NSF policy is *de facto* discrimination, pure and simple. This is because there is "no way" that all the reviewers will be "enthusiastic" to fund a proposal, by someone not in

continued on page 69

continued from page 15

an academic position, that challenges the very orthodoxy that they themselves have helped to develop and promulgate or use in their own research. No way.

To minimize such blatantly unfair bias, I suggest that any researcher with a reasonable proposal should be awarded some minimal support, such as, for example, funds for computer time, so that he or she may pursue his or her research on his or her own time. Such a modification of present policies by NSF and other funding agencies will help salvage some of the productivity of creative researchers that is now either lost or severely limited. Under present policies, Albert Einstein would not have received any form of support while he was developing his Theory of Relativity.

CARL A. ROUSE
Del Mar, California

The primordial proton

E. R. Harrison discusses numerological relations between macro and microphysics in "Cosmic numbers" (December 1972, page 30). I suggest a more quantitative argument that relates the proton mass to the total mass in the universe under the assumption that quarks are spinning quantum blackholes of Planck mass 10^{-5} gm. The result is

$$m/m^* = (m^*/M)^{1/3} \qquad (1)$$

where m = proton mass, $m^* = 10^{-5}$ gm, and M is the total mass in the universe as estimated from Sandage's measurement of q_0 the deceleration in the expansion of the universe; i.e., $M = 10^{56}$ gm.

To understand equation 1, suppose the early universe at cosmic time $t = 0$ consists of $N = M/m^* = 10^{61}$ blackholes of spin ½ h. Using Cartan's "torsion" correction to general relativity, and assuming all blackhole spins aligned, we find the minimum size of the universe at $t = 0$ to be

$$R_{\min} = N^{1/3}\, h/m^*c = 10^{-3}\ \text{cm} \qquad (2)$$

Harrison has described a "particle barrier," which says that the Compton wavelength must be smaller than the size of the universe; otherwise different parts of the same particle will recede from each other at superluminal velocities. Therefore

$$h/mc \leq R_{\min} \qquad (3)$$

Combining equations 2, 3 and the definition of N gives equation 1. Thus, the smallest possible mass for a gravitational bound state of blackholes is $t = 0$ is of order 1 GeV. This bound