letters

ticular second be made by a quantum process providing the same probability, $\frac{1}{2}$, for the lighting of each lamp. Let the sequence in which the lamps are lit in an experiment be automatically recorded.

To study the existence of some correlation between a human subject's state of mind and the random target generator, one may ask a human subject to concentrate on the flashing lamps and to wish strongly for, say, the red lamp to flash on more frequently than the green one. Such experiments,[2] done sometimes with other forms of display, have shown with high statistical significance (5.3 standard deviation from chance in a recent experiment with 12 800 trials) that with some subjects the desired lamp does flash on consistently more frequently than expected by chance.

As a practical hint to the physicist who wants to repeat such an experiment one might point out that, although some outstanding subjects have performed consistently above chance through long test series, also rather ordinary people can be used to demonstrate the effect, provided that the subjects are strongly motivated to perform well and provided the experiment can generate a friendly optimistic atmosphere. On the other hand, significant deviations opposite to the subjects' wish have been obtained under conditions where the subjects were systematically discouraged.

I am well aware that this, as well as the results of other tests in which subjects did successfully predict the lamps to be lit next, sounds to many physicists who have not studied critically the corresponding literature rather like science fiction, and it would certainly be necessary to have similar experiments performed by several independent groups, before the theorists may want to consider the role of the experimenter from this angle.

References

1. H. Schmidt, J. Appl. Phys. **41**, 462(1970).
2. H. Schmidt, J. of Parapsychology **34**, 175(1970).

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The N–scholar problem

There is a theorem due to Joseph E. Mayer, APS vice-president elect, that complements well the points of Robert Leighton's article on panel discussions (April, page 30). Although Mayer never sought publication of the theorem, it has been available as a private communication. Known as the "Principle of Unknowability," Mayer describes it briefly as follows:

"Suppose that N scholars are asked a single question which appears on the surface to have a yes–no answer. Each of these scholars by virtue of the fact that they are according to the initial assumption, scholars, will have (at least) one other question that must be answered in conjunction with the first. This creates $N+1$ questions, each with a possible yes–no answer, or in all 2^{N+1} possible answers. There are only N scholars to give answers. The probability that two or more answers will be identical is then approximately $N^2/2^{N+2}$. Now for sufficiently large N this probability approaches zero in value; indeed for $N = 100$ it is of the order 10^{-26}. Since, however, no answer can be judged correct (except by the man giving the answer) unless it is concurred in by at least one other scholar it follows that, in principle, no answer can be obtained to any question by asking a large assembly of scholars. Since, further, only scholars can be trusted to give a correct answer, and since from them no answer can be obtained, it follows that no reliable answer to any question can ever be found."

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National physics fund?

In recent months there have been a large number of letters and articles in *physics today* regarding employment of physicists. At the very least these writings have made all physicists (both presently employed and unemployed) aware that the job market for physics PhD's is dismal. Those of us who are presently employed shoulder a big responsibility, and as such should invent ways to curb the present trend. Time and again it has been said that the production rate must match supply-and-demand criteria, and it is pointless to repeat it here. In what follows I shall put forward a suggestion which, if acceptable to my fellow physicists, may provide a short-range solution and prevent physics PhD's from accepting jobs where their training is either not adequately utilized or not needed at all.

I propose that a fund-raising campaign should be started and that this fund should be supported by all physicists who are currently employed, to the extent of 1% of their annual salary. Those making below a certain minimum (say $6000 p.a.) may be exempt and the contributions should be purely on a voluntary basis. For lack of any better words, I shall call this fund the "National Physics Fund" (NPF). If any other organizations wish to support this fund, we should graciously accept their contributions. The NPF can be administered by AIP or by some *ad hoc* committee.

The NPF could be used to support postdoctoral fellows at various universities and in industry, according to the applicant's choice. The fellowship stipend could be set at $6000 p.a. or at some other reasonable value, depending upon the number of applicants and the amount of money available. In addition, the NPF could be used to advance interest-free loans to such physicists who are temporarily unemployed.

I am sure those physicists who benefit from this fund would not mind supporting it after they have found a suitable job. In this way the NPF could be self-sustaining. I feel that a 1% contribution from fellow physicists is not too much to ask to perpetuate our own discipline. After all we spend more than 1% on many luxuries that could be easily suspended "temporarily."

I would very much appreciate readers' reaction to my proposal.

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Antimatter cosmic rays?

The article by Hannes Alfvén on "Plasma Physics Applied to Cosmology" (February, page 28) made very interesting reading. Suppose a neutron antimatter star would collide with a koinomatter star. The resulting fireworks would be spectacular! It may be that most of the matter locked up in the neutron star would thereby be released.

There is one question that people have about Alfvén's theory that equal amounts of koinomatter and antimatter are present in the galaxy. According to current measurements, cosmic rays consist solely of koinomatter. This fact seems to be a crucial objection.

·Sanford Aranoff
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The author comments: The experimental fact that cosmic radiation in the energy range of 10^{10}–10^{11} eV consists almost exclusively of koinomatter is *either* an objection to the matter–antimatter symmetry of our galaxy *or* to the current views on the diffusion of cosmic radiation. The Larmor radius of a 10^{11}-eV particle in a magnetic field in space of, say, 3×10^{-6} gauss is only 10^{14} cm or 10^{-4} light years. It is usually *assumed* that the space density of these particles has the same value in the whole galaxy as near the earth. Whether this is true or not depends upon the structure of the magnetic field in the outskirts of the solar system and in the heliosphere. We know practically nothing about these and have at present no possibility to decide whether particles with small Larmor radii can diffuse easily through these regions or are screened off. Hence we are not in conflict with any observational fact if we assume—as originally suggested by R. Richtmeyer and E. Teller—that cosmic radiation in the energy range below the "knee" at about 10^{14} eV is a "local" phenomenon, accelerated for example at the outer shock front of the solar wind.

Cosmic rays above 10^{14} eV have such large Larmor radii that they cannot be confined in the heliosphere. Hence if it is shown that such high-energy cosmic radiation consists exclusively of koinomatter, this would be an argument against the existence of antimatter in our neighboring parts of the galaxy. But so far nothing is known about the sign of these particles.

Hannes Alfvén
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Cost of Saclay linac

In a news story in the May 1970 issue (page 57) you report that the expected cost of the 400-MeV MIT linac is $6.3 million compared to $25 million for the 600-MeV linac now in operation at Saclay. I do not know exactly the final cost of the Saclay linac to the CEA (French equivalent of the AEC), but the original estimates were $8 million for the linac, $8 million for the experimental equipment and $2 million for the building. It has been said that the building costs exceeded the original estimates, but $25 million must include the wall-to-wall carpeting in the control room! I think the $6.3 million for the MIT linac should be compared to the total cost for the Saclay linac of $6.8 million (not including state taxes) for design, hardware, installation and testing required to provide the full 100-kW beam with 0.3% energy resolution.

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Corrections

July 1971, page 15—Reference 1 should have been to *Phys. Rev. Lett.* 24, 1188 (1970).

June 1971, page 69—Our item on the appointment of J. Reginald Richardson as director of the TRIUMF project at Vancouver, Canada failed to make clear the fact that he will be on a two-year leave of absence from the University of California at Los Angeles.

June 1971, page 58—NCRP Report No. 39: Basic Radiation Protection Criteria is $2.00 a copy, not $20.00 as stated. □