

letters

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and that of the so called "free-electron laser." The laser relies on a population inversion created by a pump but the "free-electron laser" produces synchronously emitted synchrotron radiation by tuning the light frequency to achieve synchronism with electrons of an "inverted" part of the electron-beam energy distribution.

References

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HANS MOTZ
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8/14/79

Neutrino paradox

There is an apparent consequence of neutrino physics that introduces the spectre of a paradox (at least to me). The articles I've studied tell about prodigious production rates in stellar interiors and various atomic reactions; about how the interaction cross section allows neutrinos to zip through a light year of lead like a hot awl through a pat of oleo, and about the sleuthful, imaginative experiments that have been performed to perceive them.

A most interesting entity, this elusive particle of Wolfgang's.

I am beset, however, by a question that begs understanding.

If neutrino generators are as prolific as is theorized, and if neutrino interaction with matter is the ultimate paranoia as is evidenced by experiment, then, if one assumes time-independent (on a universal scale) creation rates, why is it that present background population from all sources, since time immemorial, is not overwhelming? After all, the universe is not lead or chlorine-37. What, I ask, is the mechanism that negates the existence of an Olbers's Paradox for neutrinos?

Do they age? Is there an unknown absorption mechanism in interstellar space? Or perhaps, do Stephen Hawking's mini-black holes gobble 'em up?

With assumed license, my tongue in cheek, and a wee touch of assertiveness, especially since there be no negation precedence (of which I am aware), I propose Mohler's Paradox to the more nimble minds about me.

SAILOR H. MOHLER
Columbia, Maryland

We asked John Bahcall of the Institute for

Advanced Studies to comment on Sailor Mohler's letter. He agrees that there is indeed an Olbers's Paradox for neutrinos, just as there is for photons. Both apparent paradoxes, have the same resolution—namely the red shift resulting from the expansion of the Universe. The more distant a source of photons or neutrinos, the more these are Doppler shifted to lower energies.

EDITOR

Physicists and energy problem

I think that it is time for The American Physical Society and the American Institute of Physics to re-publicize and re-inforce their 1975 study of *The Efficient Use of Energy*. It could profitably be updated, especially with respect to the costs of energy, as well, although the basic conclusions stand now as they did then.

In the year the study was published, I, a physicist, began to teach the energy-related subjects in the School of Architecture at California Polytechnic State University, San Luis Obispo, which is the largest school of architecture in this country. First, I want to emphasize the study's strong recommendation of the disciplines of classical physics, and to point out that there is, in the British Commonwealth, a specific discipline of the applied sciences with respect to architecture: architectural science. I educated myself first with a bachelor's degree in physics, second with a long tour in a defense laboratory, third by attending a good school of architecture for two years, and fourth by taking the Master of Architectural Science at the University of Sydney. Departments of physics in this country—especially those in universities having schools of architecture—could very profitably institute master's programs in architectural science. The program at Sydney, which is a world-class university in many fields, was developed under the far-sighted leadership of Henry J. Cowan. Frankly, "modern physics" always has seemed hopelessly muddled to me, aside from the junctures effected with the classical disciplines by Einstein, de Broglie, and Gabor; no student ought to be permitted to study quantum mechanics until he has mastered acoustics, which scarcely is taught nowadays!

My point is that we seem to be drawing farther and farther away from the efficient, let alone intelligent, use of energy. Recently, I testified before my city's council on the subject of its vaunted "energy policy." Our late mayor, who at the time had been tapped as Secretary of Transportation, took umbrage when I introduced the findings of the APS study, partly, as he said, because he didn't understand technical matters, and partly, undoubtedly, because he had conceived the policy as a mandatory insulation program for home-owners; the chief

beneficiaries of the policy would be the electric utilities, who could substantially shave their peak loads, which in this region are due to electric space heating of homes. Any attempt to do this more directly, by restricting space heating with electricity, was rejected as "politically unacceptable" by the policy's coordinator. The policy had been studied and developed for more than a year by a very large committee, yet my introduction of the APS study came as a complete novelty to all those concerned with it.

Are physicists really having any effect on energy consumption? If not, why? There is evidence that "quality of life" only marginally increases when the installed electric capacity of a society exceeds 2 kW per capita; in this region the figure is nearly 5 kW per capita, and those who govern are clamoring for more. Here we have extinguished the most concentrated food resource in the world, the Columbia River's salmon runs, in our quest for electric power; we could restore a substantial fraction of the runs by removing the first four dams on the river (or reducing their operating heads) at the cost of 10% to 15% of the installed capacity. Yet the Corps of Engineers is aggressively expanding its hydropower program. The aluminum industry uses 21% of our electric power, yet provides only 0.5% of our employment; the cost of a large commercial airplane would increase only by a few percent if electric power were charged at its present replacement value, yet we subsidize the manufacture of energy-wasting aluminum window-frames by suppressing real costs. And so, *ad infinitum*.

Aden Meinel, past president of the Optical Society, who together with his wife, Marjorie, kept the idea of solar energy alive when it was extremely unfashionable, used to start his lectures with a gigantic projection of the Sun, saying "Nature long ago discovered the correct scale and distance for thermonuclear fusion." We physicists have the knowledge to contribute a great deal to this, the critical problem of our times. It is evident that we need much more than mere knowledge to influence policy effectively.

One can do no more than quote the finest "politician" this country has yet produced: "We must disenfranchise ourselves, and then we shall save our country."

JAMES B. LEE
Portland, Oregon

Science policy

I read in the August (page 72) that Lewis Branscomb, APS President, was greeted with "gales of laughter" at a science-policy meeting at New York University when he set forth his ten "outrageous proposals"

for US science policy. At almost the same time, in the Spring 1979 issue of *Research Corporation Quarterly Bulletin*, Branscomb suggested an eleventh outrageous proposal, to the effect that "the single most important thing for government to do right now is to get rid of the marginal institutions that are draining support for the best and most productive universities." I hope that this statement was also made with tongue in cheek; if it was, I might appreciate the irony of it and join in the general merriment. I fear, however, that it was dead serious. If so, it seems to run counter to the interests of the vast majority of APS members, and needs to be explained and clarified.

So far as I know, APS has had no official policy on how government research support ought to be distributed, other than to encourage its allocation in line with the society's general purposes directed toward the advancement and diffusion of the knowledge of physics. Are we now presented a more specific policy, or is Branscomb's statement a purely personal opinion? And, in the latter instance, has he considered its possible impact on the members of his APS constituency? Also, which institutions are marginal, and which are "the best and most productive?" How shall the productive universities be defined; by the top ten, the top twenty or the top fifty—and by whose judgment? Some of these questions are clearly not easily answered.

It seems to me that in allocating funding from federal sources, proposed research should be judged primarily on its merits. Original and important work deserves support whether or not it stems from a top-ranked department. By the same token, continued funding, year after year, of uninspired, mined-out projects is undesirable, even though they may be proposed by top-ranked investigators or institutions. Also, too heavy a concentration of funding toward a relatively small group of institutions tends to discourage originality, innovative thought and diversity of approach and would promote a national science establishment even more inbred and incestuous than the one we now have. What is at stake here, after all, is the distribution of federal tax dollars, not money from a private foundation.

While I do not suggest that the best-known institutions be deprived of merited research funding, I believe that the best interest of science as a whole, and of the public at large would be served by a pattern of funding more diverse and less highly concentrated than what we now have. Good educational institutions assist the cultural, commercial and industrial development of their regional constituencies in countless ways. Strong regional institutions, with active research and graduate education programs, are therefore inherently no less worthy of

federal support than older and more prestigious institutions.

If Branscomb was just kidding, after all, I apologize for my underdeveloped sense of humor. Otherwise, for the reasons given above, I fear that his prescription for federal research funding policy will do US science as a whole more harm than good.

JOHN P. MCKELVEY

Clemson University

Clemson, S. C.

THE AUTHOR COMMENTS: As John McKelvey knows from our personal correspondence, his letter, which contains a number of very reasonable observations, was stimulated by an out-of-context press quotation of a remark made during a discussion of someone else's paper at an APS meeting. The remark is not only taken out of context, but is to a degree "tongue in cheek" as he suspects. In any case, the discussion in which this remark was imbedded has absolutely nothing to do with APS policy. As I told McKelvey, I do hold the personal view that the quality of scientific research is generally more important to the nation than the quantity. Accordingly, I am a strong believer in project grant support, competitive unsolicited proposals and peer review.

Let me reassure McKelvey and any others who may be nervous that I have no plan for dismantling the American system of popular education, or for attacking the proposition that research is an essential component of quality education.

LEWIS M. BRANSCOMB

Armonk, New York

Exchange with China

I am extremely disturbed about the lack of understanding of history and the self-interest of the US, evidenced by the editorial in August (page 88). I disagree totally with your position that it would benefit this country to increase technological exchange with Communist China.

Such an exchange would be almost totally one-sided, resulting in a rapid increase in the capability of a government of proven inhumanity and instability to wage a war and kill even more innocent people.

Consider the danger of training these people in the areas emphasized in their eight-year plan—materials, technology, computers, laser, and space technology, high-energy physics and, God forbid, genetic engineering—each an area potentially exploitable to the detriment of humanity. We would never consider (I hope) placing technology that is potentially convertible to sophisticated weaponry in the hands of madmen like Kaddafi in Libya or the unlamented Amin in

Uganda. (How we can continue to supply spare parts and ammunition to the fanatic in Iran eludes my comprehension.) How, then, in view of Communist China's proven disregard for individual lives and basic human rights, can we place in their hands tools of such enormous destructive potential. I conclude that we cannot, and we should not.

Rather than the position of one-sided exchange and cooperation called for by Harold Davis in his short-sighted August editorial, I suggest instead a more prudent policy of intelligent case-by-case control of all technological exchange. Any exchange might possibly be linked to the PRC supplying us with oil and should be decided on the basis of America's self-interest and security and the potential of the technology transferred being exploited militarily.

DANIEL F. SUCHMAN

Goleta, California

Sexist error

In July you published a letter from Steven Barrowes (page 13) in which it is recommended that women pay higher insurance premiums because they live longer. By the same logic, the premium for my APS group insurance, which has recently been increased due to my reaching my fiftieth birthday, should actually have been decreased. Please arrange for an immediate refund of the overpayment. You may, if you wish, donate it to establish a research institute for mathematical logic in Starkville, Mississippi.

PAUL F. ZWEIFEL

Virginia Polytechnic Institute and State University

Blacksburg, Virginia

The fault lies not in Starkville but in our editing process which converted Barrowes's "women pay lower insurance premiums" into "higher insurance premiums."

EDITORS □

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