whose only crime has been to speak out for human rights. There is also more than enough proof that just wanting to emigrate from Russia brings on the wrath of the government in a most pernicious manner, such as loss of employment resulting in the crime of "parasitism," publication rights removed, name removed from previously published papers, and in some cases imprisonment or exile to Siberia.

Perhaps as a Jew I am more sensitive to these issues because of the rampant antisemitism within Russian officialdom. Perhaps Toohig doesn't see this as his problem, but he should reflect in the words of a fellow theologian, Martin Neimoller:

"... then they came for the Catholics, and I didn't speak up, as I was a Protestant. Then they came for me. By that time, there was no one to speak up for me."

GEORGE GLASS
Texas A&M University
3/3/80

THE AUTHOR COMMENTS: Eric Hamp is, of course, correct. There are many aspects of Soviet culture that are different from ours. Many have dwelt at length on these differences, particularly those we would view as negative. I deliberately chose to emphasize the similarities, because I believe they are too often passed over. If we see the faces of ordinary men, women and children instead of an abstract "the Russians" it is much harder to tilt towards war, which is unthinkable.

Incidentally, Hamp is not quite correct about equality of treatment, as any unskilled Caribbean black or Latino trying to enter the United States will tell him. Our universities are staffed with professors who are welcomed to our land while the black or Latino is sent back to the grinding poverty of his native land. It makes it hard for us to throw stones.

TIMOTHY E. TOOHIG
Fermi National Accelerator Laboratory
Batavia, Illinois
4/21/80

Sartre's Black Hole

Inspired by C. Krishna Kumar's letter (June, page 13) in which he quoted from Mark Twain's short story, "Jim Baker's Bluejay Yarn," the experience of a "black hole" by the little bird who tries, in vain, to fill it with acorns, I would like to share with your readers an equally exciting and vivid account of a "black hole" by another celebrity in literature, Jean-Paul Sartre, in 1938.

As a matter of fact, in Mark Twain's passage, the hole is described as anything ("a perfectly elegant hole," "a mighty long hole," "a totally new kind of a hole," "a long hole and a deep hole and a mighty singular hole altogether") but *black*.

Sartre's "Nausea" (translated by Lloyd Alexander, *New Directions*, 1964) presents a more intimate description of the black hole through the eye of Antoine Roquentin:

"... I enter the black hole. Seeing the shadow at my feet lose itself in the darkness, I have the impression of plunging into icy water. Before me, at the very end, through the layers of black, I can make out a pinkish pallor..."

He also depicts the personal experience of being in the black hole:

"... I stop to listen. I am cold, my ears hurt, they must be all red, but I no longer feel myself; I am won over by the purity surrounding me; nothing is alive, the wind whistles, the straight lines flee in the night..."
"... I am so happy: this cold is so pure: am I myself not a wave of icy air? With neither blood, nor lymph, nor flesh. Flowing down this long canal towards the pallor down there. To be nothing but coldness..."

He presents an existentialist's view of the black hole by saying that:

"... (it) is inhuman. Like a mineral. Like a triangle..."

I remember that, in an amusing article entitled "A theory of Ghosts" (*Physics Bulletin*, December, 1972), D. A. Wright tried using elementary ideas of wave mechanics to explain some "human experiences" of ghosts. It would be interesting to see if any of our black-hole theorists could explain this *petit rapport* of the black hole by Sartre!

ALBERT WONG
Cantab College
Toronto, Ontario
4/9/80

Oppenheimer

My wife and I thank you sincerely for your excellent article in the April 1980 issue on the career of Robert Oppenheimer, who was a close friend of ours during the late 1940's, the formative period of atomic energy. We had met Oppenheimer when he was directing a series of technical lectures at the Cooper Union in New York. He had organized the lectures around various prominent scientists of the region. We met Bob one night in the green room of the hall, after the program, and found him a brilliant and cheerful person. His first greeting was to ask us if we could take him to the Pennsylvania Station to catch a last train. After this first encounter we made sure not to miss any of the lecture series, which he was kind enough to let me join toward the end. Many of the series were done by Oppie himself, others from Princeton and other nearby universities. Harvard's President Conant was there, and Oppie appointed me later as series' secretary. Bob had organized the whole series himself; he fully deserved the praise your article gave him. We had found in the first few minutes what a brilliant young man he was.

Bob Oppenheimer's portrait in the April issue is a corker, and we saw much of him as time went on. How many times we found him there at the hall, and again, later, at Princeton, smiling and vigorous, no-end knowledgeable and brimming with enthusiasm as he lit his inevitable pipe. On one occasion Oppie invited us to have lunch with him at the restaurant in Princeton's Institute of Advanced Study, of which he had taken over the administration. On this occasion we were highly impressed when Niels Bohr turned up with P.A.M. Dirac in tow; we kept carefully quiet. But the end of that day was loaded even more, for we intercepted and bowed to Einstein himself, climbing the hill outside.

I was privileged to meet Oppie again in Los Alamos, when he asked me to consult with him about an article I was doing on him in *Science Illustrated* entitled, "The Man in the Pork Pie Hat." I did several pieces on him later in other magazines. I doubt if any great man we science writers were privileged to know was so unfailingly kind and agreeable as "Oppie." In my whole writing career there was no personality among the celebrated of the atom, from Fermi on down, who gave us as much inspiration and understanding of the bewildering technical field, as did Robert Oppenheimer, and without being lofty, as some of the others occasionally were.

The PHYSICS TODAY piece brings back to us the charm of a great scientist, and the simplicity of his thought. Please accept our thanks for running your article about a man who may have been misunderstood but was forever charming.

DAVID and INDIA WOODBURY
Ogunquit, Maine
5/1/80

Energy conservation

I was disappointed that Marc Ross's article on energy conservation (February, page 24) stressed "technological fix" solutions rather than changes in lifestyle. It is certainly useful to produce more energy-efficient cars, patch up leaky houses and recycle aluminum cans, but it would lure us into a false complacency to maintain that this would be enough.

As an example, one might note that Americans have developed the peculiar habit of drinking flavored, carbonated water in disposable aluminum cans. We can certainly save some energy by

attempting to recycle much of this aluminum, but we could save even more by legally mandating reusable deposit bottles as has been done in some states. Of course, the most rational solution would be to convince people to abandon their peculiar habit and drink water from the tap. In the same vein people will have to learn to live closer to their place of work, make use of public transportation, travel shorter distances on vacations, live in smaller houses, with less window area and greater ratio of volume to surface area, and generally make due with less throwaway plastic junk. Physicists can set an example by moderating their strident demands for more and larger particle accelerators, by far the most-energy-intensive scientific instruments.

ROBERT JOEL YAES
Memorial University of Newfoundland
3/18/80 *St. John's, Newfoundland*

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Marc Ross makes some statements about combined heat and electric power generation that appear contrary to experience in this field. He states (on page 27 that "The heat provided by cogeneration cannot be transported far, so the best opportunities for cogeneration are largely at industrial sites rather than at central power stations." One of the most successful applications of cogeneration is district heating, which is widely practiced in many European countries. In district heating systems, heat from central combined heat and power stations is distributed over distances up to 20 miles in cities and suburbs. Intercity heat transmission up to 60 miles is under consideration in Sweden.

The statement would be correct if the author had said that *steam* cannot be transported very far economically, the practical limit being scarcely over one mile. Steam extraction systems are commonly used in industrial in-plant power generation, because steam for process is normally the primary product, and electricity the by-product. In district heating, the reverse is true: electricity is the primary product, and heat is the by-product. Both are produced and distributed, with great economy in money and energy, from central stations linked by electric transmission lines and heat transmission mains. In modern systems, the heat distribution medium is invariably hot water, not steam, and the heat is commonly produced from back-pressure turbines, not by steam extraction. The energy consumed in pumping power and line losses is small: only a few per cent.

Some older district heating systems (especially in the US) use steam as the heat distribution medium. These are mostly obsolescent systems, which suffer from poor economy, and employ little cogeneration.

The author states that "the main impediment to a resurgence of cogeneration is regulation." The everyday exploration of in-plant generation by industrial and engineering companies has shown over and over that unfavorable economics (such as, too long a payback period) stops projects from being developed, before any consideration is given to regulatory matters.

Lastly, the statement "Cogeneration . . .is being rediscovered" is surprising. Engineers have been designing in-plant generators and district heating systems for many years. The only thing new is the use of the vogue word "cogeneration." When physicists begin to learn about something that is common knowledge among engineers, does that constitute rediscovery?

RICHARD H. TOURIN
3/20/80 *Flushing, New York*

THE AUTHOR COMMENTS: As I wrote in "Efficient Use of Energy Revisited," I find it fascinating that technological change can make energy use much more efficient and cost effective and in so doing can completely alter energy-supply issues. Robert Yaes advocates instead, or in addition, lifestyle change. I also favor certain lifestyle changes, but saving energy is not the primary consideration in these changes. Thus deposit laws for beverage containers are good because they sharply reduce litter, as shown in my state of Michigan, while requiring very little effort. Public transit is good because it provides mobility for disadvantaged people, and it can lead in the longer run to improved urban design. In neither case is energy the primary issue.

Particle physics requires a lot of energy, as pointed out by Yaes. It is already being influenced by the increasing cost of electricity. Accelerators are being turned off at times of peak electricity use. Use of superconducting magnets is an important longer-term adjustment. As in other areas of energy use, the problem of high energy costs can be met by making the equipment, accelerators and detectors, much more efficient and by adapting operations to the new cost realities.

I find Richard Tourin's comments of interest. My remarks about combined production of heat and electricity were aimed at industrial process steam applications.

MARC ROSS
The University of Michigan
4/24/80 *Ann Arbor, Michigan*

Correction

May 1980, page 71—Jack Baldwin, the AAS Pierce Prize winner for 1980, received his PhD from the University of California, Santa Cruz. □