

LETTERS

must it be done simultaneously? Anyone who is part of academia must know that academia doesn't change easily. Meanwhile millions of children are hostage to the low level of math and science teaching. If you influence one teacher, you affect thousands of children. Should we abandon our efforts until this, that and the other precondition, sensible as they are, are satisfied? The point of my column was to urge fellow physicists to go out and get involved in the schools—at any level, in any effort. Each effort is a ripple, and enough ripples can make a tidal wave.

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6/92

Can a Tokamak Breed Enough Tritium?

The article "Progress Toward a Tokamak Fusion Reactor," by J. Geoffrey Cordey, Robert J. Goldston and Ronald R. Parker (January 1992, page 22), left me puzzled. The breeding of tritium reminded me of the story of Baron von Münchhausen's pulling himself out of a swamp by his own hair. My reasoning, based on the descriptions in the article, is as follows: For one $D + T$ reaction you get one neutron. One neutron can produce one tritium nucleus during breeding. Since according to the article a 1000-MW station requires on the order of 1.5 tons of tritium a year, and the inventory of tritium is a few kilograms, this tritium inventory would have to be recycled several hundred times a year. Even with a breeding efficiency of 90% you would run out of tritium well before the first year of operation was over. I know that the above calculation must be wrong, because too many scientists work on a reactor of this kind, but I can't see the error.

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1/92

CORDEY, GOLDSTON AND PARKER REPLY: Apparently our description of how tritium fuel is to be regenerated from fusion neutrons was not detailed enough. In fact the reactor blanket will include *neutron-multiplying* materials such as beryllium or lead so that the net "breeding ratio" can be greater than 1; typically one will be aiming at an adjustable ratio of up to 1.1. The yearly tritium burn-up in a 1-GW_e D-T reactor would be about 170 kilograms. (The 1 tonne per year of deuterium quoted in the article is for a 1-GW_e D-D reactor.) In contrast

to a fission breeder, in a fusion reactor the fuel inventory is very modest, so the time it takes to produce the extra tritium required to start up a new reactor can be made quite small.

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'Japan: Not an Energy Efficiency Model'—Not!

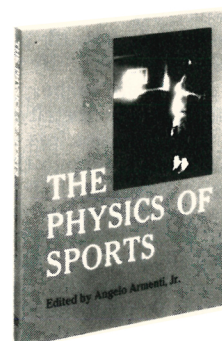
I suspect you will receive a flood of letters in response to the Opinion piece in February 1992's issue (page 95); still, "Japan: Not an Energy Efficiency Model," by Milton Searl and Chauncey Starr, proved too provocative for me to resist adding to that presumed deluge.

Searl and Starr attempt to convince the reader that although the US uses 2.4 times as much energy per capita as Japan, there is really no reason nor even a viable course of action to reduce this ratio substantially. The numbers quoted in their column actually make it worth reading; it is the interpretation—the "spin"—they give those numbers that makes it so objectionable. In short, the "reasons" they give for each form of massive energy waste in this country, and even more their attempts to reinterpret the data until they look agreeable, are worthy of a public relations team trying to whitewash an industry with a bad reputation (maybe a fair description of the goal of the column).

Let me give some examples: Searl and Starr first point out that the conversion from primary to secondary energy forms is the largest single sector of energy use in the US, and that this conversion is done more efficiently here than in Japan. That may be true, but is of course completely besides the point: This part of the energy budget is, after all, proportional to the sum of all other sectors and thus should be factored into them. (If we waste energy in transportation, we're also wasting a proportional amount in the conversion process needed to produce the fuels in the first place.)

From that perspective, the second-largest sector of energy use in the US cited by Searl and Starr, namely transportation, is really the largest one. And it is this sector where indeed most of the waste occurs: 3.6 times as much energy per capita is

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