

LETTERS

fair and balanced.

The detrimental results of the Congressional decision to proceed with the manned space station at the expense of all kinds of unmanned scientific explorations, especially within NASA, have already become evident. In this decade, a focal point for discussions on the formulation of science policy will continue to be the balance between broad-based, smaller-scale individual research projects and large-scale megaprojects dominated by considerations of national prestige and vested industrial interests.

NICOLAAS BLOEMBERGEN
American Physical Society
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11/91

DALRYMPLE REPLIES: My 1 May 1991 testimony was to the Government Activities and Transportation Subcommittee of the House Committee on Government Operations, not to the subcommittee named by Eugene McKannan. My comments were based on an official position of the American Geophysical Union—namely that in view of the limited usefulness and extraordinary cost of Space Station Freedom, AGU has reservations about the wisdom of proceeding with its construction. The AGU council adopted this position in 1989 after a poll of a random sample of our membership and extensive deliberations by a panel of experts. At each step of the process the membership was informed and invited to comment. AGU has testified five times so far on Space Station Freedom, and the membership has been informed of the nature of the testimony each time. Based on the information received, it is clear that an overwhelming majority of the 28 000 members agree with the AGU position on the space station.

My testimony was restricted to those areas in which AGU has expertise, namely geophysics, space science and education. Contrary to McKannan's assertions, I did not comment on particulars of life science research.

As for the composition of the panel, I refer McKannan to the chair of the subcommittee, Barbara Boxer, and her staff, who issued the invitations.

Finally, McKannan perpetuates the myth that the cost of Space Station Freedom will be \$30 billion. The Government Accounting Office estimated the true cost of the space station to be \$118 billion over its 30-year projected lifetime, but GAO did not include all of the costs. The AGU estimate, which I presented to the subcommittee, is a minimum of \$180 billion. When one compares the very

limited research for which the space station is essential with the research that could be done in terrestrial laboratories and by unmanned spacecraft for a lesser sum, it seems highly unlikely that construction and utilization of Space Station Freedom can be justified.

G. BRENT DALRYMPLE
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11/91

Atom Interferometry's Prior Patent

The Search and Discovery story entitled "Atoms Are the New Wave in Interferometry," by Barbara Goss Levi (July 1991, page 17), describes a fascinating application of quantum mechanics. Atom interferometers demonstrate that a composite structure like an atom can be made to move coherently in two separate directions and then recombined to interfere with itself. But we are disappointed that Levi was not informed that this atom interferometer concept is not new. Nearly two decades ago, when we were at TRW, we originated it in a 1973 US patent (3761721) entitled "Matter Wave Interferometric Apparatus." This patent discusses several potential applications in considerable detail, namely rotation rate sensors and gravity sensors, as well as magnetometers using ions instead of atoms. It also suggests the application to atomic wave holography.

SAUL ALTSHULER
LEE M. FRANTZ

Physical Science Interests
Manhattan Beach, California

9/91

Inventors' Rights Make America's Might

To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries.

—Article I, section 8(8), of the US Constitution

Article I, section 8(8), of the Constitution creates a "right" that is trebly unique:

▷ It is conferred only on certain individuals—namely, authors and inventors. Almost all other Constitutional provisions generally referred to as "individual rights" are deemed "natural rights," or rights sanctioned by custom, and the Constitution safeguards them for everyone. Or it denies them to everyone, as with patents of nobility.

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▷ It is time limited.

▷ It is the only place in the Constitution where the word "right" occurs. Remarkably enough, this right was overlooked by Alexander Hamilton in his enumeration of Constitutional rights and has therefore perhaps been neglected ever since as a right of profound, general significance.

Article I, section 8(8), is also unique in that it is the only clause in the Constitution or in its amendments that directly encourages any branch of learning. And it represents a precocious appreciation of the importance of science to the useful arts, which today we take for granted.

The role of this trebly unique "right" in encouraging self-expression and as an incentive to economic development can be particularly gauged today in comparisons with contemporary systems that lack this right or have it in varied and often diminished forms. By providing the basis for various forms of intellectual property (patents, copyrights and trademarks), article I, section 8(8), laid the Constitutional basis for the creativity and viability of the American experiment, for its material and scientific progress, and for its military security. The results of its incentives now extend to the entire globe through trade and technology transfer, and in the last 200 years they have produced benefits to health and well-being without parallel in the history of man on this planet.

Nothing appeared in PHYSICS TODAY in the year of the bicentennial of the Constitution about the relationship between science and the Constitution except for one news story (November 1987, page 43) in which it was asserted that "the Constitution doesn't mention" science and technology! During the bicentennial year the distinguished patent attorney Tom Arnold, of Arnold, White and Durkee in Houston, Texas, and I urged the Bicentennial Commission to publicize the impact the Constitution has had on science and invention. The only effect we had was the incorporation in the registry of the commission of an abstract of a 2000-word paper by me titled "Science, Invention and the Constitution." I will be happy to send copies of the paper to interested parties.

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In Science Education, What's Fair is Fairs

I was very interested in your September special issue on pre-college educa-

tion. Though a wide variety of aids, tools and programs for teachers and students were described therein, one activity was not mentioned: the ever growing arena of student science, engineering and invention fairs held each year from grade school levels through to international competitions among high school students. As a product of the science fair system, I can say that it was highly motivating, challenging and rewarding. I chose science as a career based on those extracurricular science activities. The science fair process uses many of the instructional concepts described in the September issue: It offers hands-on experience, is self-paced, is available each year for refinement and advancement of projects, and affords a competitive opportunity for recognition and reward. It allows me, as a scientist today, to contribute to pre-college education without teaching by being a judge, encouraging students with good presentations and serving on science fair committees. Judging by the growth of fairs over the years, I believe they will continue to prosper and expand as scientists, technical corporations, teachers and the media discover the tool and educational outlet they offer.

G. L. DYBWAD

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10/91

Greenhouse Effect Evidence Debated

I have just read in the July 1991 issue (page 82) Raphael Kazmann's response to readers' letters concerning his earlier letter on global warming (July 1990, page 13). The lack of detailed agreement among global circulation models, the dispute over the effects of different types of cloud, the disagreement among various local temperature indicators and so on are often used as fuel in arguments not to proceed with expensive programs to control the release of greenhouse gases. Kazmann states that "the world's people have already had enough trouble... without embarking on worldwide economic changes based on a hypothetical cause [increasing greenhouse gas concentrations] and effect [rising global temperature]."

While the presence of a correlation cannot be taken as proof of cause and effect, the practically one-to-one relationship between CO₂ concentration and atmospheric temperature during approximately the past 150 000 years¹ cannot be ignored. Whatever

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Cryo

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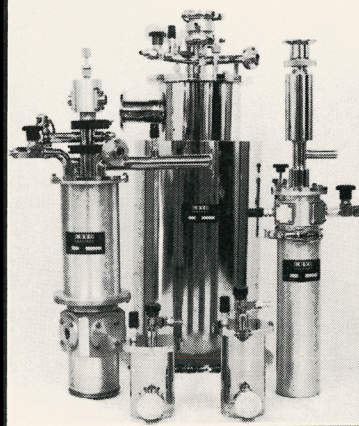
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