

atmosphere at a given altitude also increases. The effect of this increased atmospheric density can be profound even on a satellite in low Earth orbit. The increased aerodynamic drag from the 1978-79 solar cycle slowed Skylab, lowering its altitude and thereby exposing it to even denser atmosphere. Ultimately this effect led to Skylab's unanticipated reentry in July 1979.

HST was deployed at an altitude of 611 kilometers, and over the first two and a half years since its launch, during the current solar cycle peak, the orbit has decayed to 590 km. NASA planning has always provided for the space shuttle to reboost HST to a higher orbit as needed to counter orbital decay. Currently reboost is planned for every servicing mission if there is residual fuel for the shuttle after rendezvous. (Servicing missions are to take place at roughly three-year intervals.) During the period of minimum solar activity over the next five years or so, orbital decay will be relatively minor, but particular efforts will be made to reboost HST as high as possible prior to the next solar cycle in 1999.

Kepros refers to NASA's announcing that HST's lifetime would be truncated from 15 years to 5 because "the atmosphere had expanded" and then mysteriously withdrawing that announcement. NASA policy has always been that HST is intended to be a permanent space observatory with a planned 15-year mission lifetime. While it remains an exceptionally challenging goal to maintain and regularly upgrade a complex space observatory over that period of time, the effect of the solar cycle on orbital decay is only a small part of the challenge HST faces.

GREG DAVIDSON
NASA
Washington, DC

11/92

Gibbons's Doctoral Adviser Amended

Irwin Goodwin's news story about the new science adviser to the President and head of the Office of Science and Technology Policy, John Gibbons (March, page 73), implies that I was Gibbons's thesis adviser at Duke University, where he received his PhD in 1954. Although he was a student in a course I taught at Duke during the academic year 1951-52, I was *not* his adviser. Rather, Gibbons worked in the experimental nuclear physics program at Duke under the direction of the late Henry W. Newson. There he

was the first student to receive a PhD in the laboratory that later grew into Triangle Nuclear Physics Laboratory.

EUGEN MERZBACHER
University of North Carolina,
Chapel Hill

4/93

A Shortcut to Sending FSU Scientists Journals

From reports such as the one on page 90 of the February 1992 issue, readers of *PHYSICS TODAY* know about the grave situation in the former Soviet Union with respect to subscriptions to foreign scientific periodicals. I would like to suggest a form of relief for this problem that is not burdened by bureaucratic barriers: Let each Western scientist put on his or her mailing list several libraries of leading institutes (or just persons) in the FSU that are working in the same area and regularly send to those addresses copies of his or her latest papers, without receiving any request for them. (Remember that we are completely isolated from periodicals and hence cannot request specific papers.) To cut postal expenses copies could be accumulated in a special box at your institute and posted monthly or quarterly.

Of course this is not a solution to the problem, but at least it is something.

My colleagues and I will be very grateful for copies of papers dedicated to solid Earth physics, atmospheric and hydrospheric physics, and solar-terrestrial connections.

T. CHELIDZE
Institute of Geophysics of the Academy
of Sciences of Georgia
1 Rukhadze Street
Tbilisi 380093, Georgia

7/92

Defense Research Defended

Glenn Cooper's letter (July 1992, page 13) repeats the often heard argument that the secrecy of defense research robs science of access to the products of creative work. Cooper further maintains that scientists should shun defense work in favor of other activities. In support of the first point, he asserts that keeping the results of militarily useful adaptive optics research classified for a period of time has delayed progress in astronomy.

In support of the second point, he maintains that development of high-speed trains and better climate models are more worthwhile uses of scientific talent than improving missile accuracy and developing better command-and-control software.

I suggest that these absolutist positions are shortsighted and dangerous. To be sure, the defense of our country is not free, and it is proper to measure its cost against that of alternative uses for money, talent and knowledge (that is, what economists call opportunity costs). However, having no defense or neglecting to constantly improve our defense is appropriate only in a mythical world that has no threats. In the dangerous world that we actually live in, threats to our nation are both real and ever changing. Though the Soviet Union may have fallen, the continuing conflict with Iraq over that nation's nuclear weapons program (see Jay C. Davis and David A. Kay's article on page 24 of the same issue of *PHYSICS TODAY*) is illustrative of the reality that we face significant hostile powers that are determined to acquire and exploit the most advanced military technology. Likewise, only in a mythical world of unlimited resources can the cost of defense be ignored. Rational analysis of alternatives, not absolutist stances, is needed if we are to progress economically while retaining our freedom.

I propose that adequately protecting our nation and the free world is of importance to scientists in general and to physicists in particular. As a reader of *PHYSICS TODAY*, I know from numerous articles just how bad life is for scientists who live under undemocratic regimes of the sort that would quickly replace our constitutional republic if we neglected our defenses. The technical contribution of physics to defense remains as critical today as it was during World War II. For these reasons, I believe that in addressing public policy issues related to defense, *PHYSICS TODAY*, AIP and its member societies have an obligation to make an informed and reasoned contribution that prudently balances the needs of defense and other uses of science. Likewise, the professional organizations of physics ought to treat defense as no less worthy an occupation than other applied areas.

ROBERT E. LEVINE
Sierra Vista, Arizona

8/92

Correction

August 1992, page 59—Senator Dale Bumpers is from Arkansas. ■