end a hopeless effort, the letter suggests that one of the impediments may be the government official who "will not usually discontinue [a hopeless project] because the originator does not like to admit faulty judgment." On the contrary, in my twelve years of experience on government-sponsored research, I have found it is much more likely that the researcher will continue to convey unwarranted enthusiasm about the promise of his project to gain continued support.

I think the advice given in the letter under the heading "specific rules" is quite sensible, and it moves me to attempt to add some of my own. I suggest that an industrial researcher who wishes to have his labors appreciated (and rewarded) should begin by trying to gain a mature appreciation of the motivations and expectations that moved some decision-maker to support him in his research. In other words, he should use his best judgment to determine what will satisfy the needs of his customer (boss or outside sponsor) and use that understanding to help define his own priorities and goals on the project.

MARVIN KING
Riverside Research Institute
12/9/76 *New York, N.Y.*

THE AUTHOR COMMENTS: Marvin King is entitled to "question my ability to judge . . ." but a more specific justification for his opinion would have been useful.

When I stressed the importance of choosing a good project it did not occur to me that this could be interpreted as applying to young people just out of college. I obviously referred to people who have worked in research for five, ten, or more years.

King apparently had happier experiences with government agencies during his 12 years than I have had during 40 years.

I probably missed the point of the last two sentences. To me they seem to be an expanded version of my suggestion to pick the right project.

ALFRED H. SOMMER
12/9/76 *Wellesley, Mass.*

New letters journals again

The cases made in response to the criticisms of N. D. Mermin and K. G. Wilson by the editors of the two new letters journals *Communications on Physics* and *Letters in Mathematical Physics* in the recent correspondence in your columns (March, page 11) are not very convincing. While the incontrovertible dominance in this market of *Physical Review Letters* may be somewhat irksome and inconvenient for non-US scientists, the remedy, as Mermin and Wilson point out, is surely to build up the existing array of competitive letter facilities rather than to launch new ones. The option, suggested by A. W. Kenneth Metzner, of creating special high-speed sections within existing journals has, in fact, been implemented in the British IOP *Journal of Physics* series since their inception in the present form in 1968.

The existence of these special letters sections would seem to weaken considerably the main arguments stated for starting the new journals. To take the points of David Caplin et al in turn (December, page 43) and speak for *Journal of Physics A: Mathematical and General*, since 1968 our letters section:

- has allowed Europeans to feel that they are part of the refereeing community;
- has resolved problems by quick telephone calls;
- has not levied any page charges or had publication delays or had difficulties with reprints, and has had a wide circulation and readership;
- has used European (and even American!) editors and referees outside our national boundaries, and accepts letters in a variety of European languages, and
- has combined the virtues of careful refereeing with rapid production (the median publication time in 1975 from receipt of manuscript to publication was 7.6 weeks, the mode was 5 weeks, and the rejection rate was almost 60%).

In addition, we are not unreasonably stringent on length, and we employ properly set-up type and an attractive format. On the face of it, therefore, none of the arguments put forward by these authors can be entirely substantiated.

Most of M. Flato's arguments (October, page 75) for *Letters in Mathematical Physics* are similarly dubious. If he is aware of the *Journal of Physics A* letters section he must believe it not to be suitable for his sort of mathematical physics, for it would appear to satisfy all his other requirements. This would be a fine point to sustain because our policy puts no bar on any area of mathematical physics, as has been discussed in recent correspondence in the IOP *Physics Bulletin*.

Most European ventures have to be centered in one particular country; in our case the parent organization is located in Britain and operates in British currency. *Journal of Physics A*, like all the Institute's journals, is a Europhysics journal recognized by the European Physical Society as meeting the Society's criteria as an international European journal, with the appropriate provision for ensuring high standards of international scientific research journalism.

The appearance of these two new journals must to some extent, however, have indicated a deficiency in the existing facilities for letters publishing in Europe, and it would be interesting to understand more exactly why the IOP, for instance,

continued on page 100

letters

continued from page 15

was not felt to be providing suitable services and how the Mermin and Wilson "remedy from within" for any deficiencies might have been or might be implemented.

E. R. PIKE
Honorary Editor
J Phys A: Mathematics and General
Royal Signals and Radar Establishment
12/2/76 *Great Malvern, UK*

International agreement

I read with interest the letter of Jay S. Huebner (May 1976, page 9) suggesting that the last page of articles be incorporated in references. There lies, in my modest opinion, a much more Herculean task ahead for the AIP: international standardization. As you are well aware, there are small, but irritating and useless, differences in the way articles are referenced. For instance, British journals and SIAM journals use alphabetic reference systems, *Physica* puts the year after the volume rather than at the end of the sequence. I am sure that every editorial board has a logical justification for its choice, and who would dare to ask the Royal Society to change its archaic ways? Not me! Nevertheless, life would be easier on the author and his faithful typist if there would be an international agreement. The book publishers appear to have come to some kind of international system.

PAUL H. E. MEIJER
The Catholic University of America
12/13/76 *Washington, D.C.*

Physics of technology

The letter "Teaching the physics of high fidelity" by Kenneth Johnson et al (November, page 9) brings attention to what is indeed a powerful and successful teaching technique. High fidelity is a fertile technological system for motivating the learning of a broad spectrum of physics topics.

But there are other systems that can also serve. In fact, one might simply offer a course titled "The Physics of Technological Systems," or more generally, "The Physics of Technology," and utilize a variety of technological devices determined by the particular student interests and career goals.

In fact, such a program and course materials already exist. The Physics of Technology program was recently developed under a grant from the NSF and is now available from the McGraw-Hill Book Company. The materials consist of a series of 27 laboratory-based modules, each centered on a technological device.

The following is a list of the modules available, along with their physics-topic emphasis:

The Analytical Balance (measurement, errors and mechanical equilibrium)
Automobile Collisions (momentum and energy)
The Electric Fan (rotational motion)
The Pile Driver (kinematics, work and energy)
The Stroboscope (measurement of motion)
The Torque Wrench (forces, torques and elasticity)
Hydraulic Devices (hydraulics and equilibrium)
The Loudspeaker (sound and wave motion)
The Guitar (sound and wave motion)
The Pressure Cooker (thermal properties of matter)
The Power Transistor (temperature and heat transfer)
The Toaster (heat and energy)
The Cathode Ray Tube (electric fields and forces)
The Multimeter (electrical measurement)
The Automobile Ignition System (electricity and magnetism)
The Solenoid (electricity and magnetism)
The Transformer (alternating currents and the magnetic properties of matter)
The Slide Projector (geometrical and physical optics)
The Binoculars (geometrical and physical optics)
The Camera (optics and photographic measurements)
The Spectrophotometer (spectral properties of light)
Photodetectors (interaction of light and matter)
The Incandescent Lamp (current electricity and photometry)
The Fluorescent Lamp (atomic physics and atomic spectra)
The Laser (modern optics and quantum mechanics)
The Geiger Counter (radioactivity and nuclear physics)
The Cloud Chamber (radioactivity and supersaturated vapors)

The modules are generally divided into three sections, each section representing about one week's class and laboratory work. Thus, an instructor (or student) can select from the library of 27 modules approximately four or five to comprise a one-semester course. The modules include well developed laboratory instructions that guide the student through various experiments to determine the quantitative behavior of the technological system. The results are then used to develop the relevant physical concepts and laws that account for them. Thus, the laboratory experiences are an integral part of the learning process and are not used simply to verify statements made in a lecture.

Further, the laboratory apparatus is a familiar real-life device, not a specially made device that a student will not see anywhere else again. Contemporary measuring instrumentation (thermistors, photocells, amplifiers, oscilloscopes and so on) is used to measure the device behavior. Most of the devices can be purchased from local retailers and at a cost that is small compared to conventional laboratory equipment. Equipment kits are also available, however, from Thornton Associates (37 Beaver Street, Waltham, Mass.) for those whose purchasing procedures encourage that mode.

The Physics of Technology program was designed originally with an engineering and engineering-technology audience in mind. This accounts for the more technical nature of some of the devices employed. However, many of the modules have been found appealing to less technical audiences and have produced favorable reports comparable to those described by Johnson et al.

This general approach represents a significant alternative to the conventional teaching practice. Instead of stating general laws of physics and later showing how they operate in specific instances, this approach starts with the quantitative behavior of a specific and familiar system and uses this to develop the relevant general laws.

It also places the physical device and laboratory experience in a central role. For students in the "concrete" phase of Piagetian development, these may well be essential ingredients to the learning of physics. And it may not be a bad method for teaching physics majors either!

JOHN W. MCWANE
Technical Curriculum Development Project
Massachusetts Institute of Technology
12/13/76 *Cambridge, Mass.*

Newton and de Broglie

In the year 1693 Isaac Newton suffered a personal crisis. He wrote odd letters to friends and experienced severe irritability and insomnia. Profound students of this great inventor of physical and mathematical theories have speculated that Newton's illness was purely emotional. Others have said that vitamin deficiency may have been a contributing factor.

Having studied and contemplated this uncharacteristic breakdown of Newton's it has occurred to me that he may have suffered from mercury poisoning. Newton was a lifelong alchemist. He joked that his hair turned gray prematurely as a result of working with quicksilver. He was engaged in just such work with mercury at the time of his crisis in 1693. I am making a concentrated investigation of this possibility. I would like to communicate with people concerned with the biography of Newton, and with mercury toxicity.