Letters

Nuclear Proliferation

Robert Gillette's account (News and Comment, 25 July, p. 267) of the Bechtel Power Corporation's efforts to capture the Brazilian enrichment gear market was fascinating. While this may arouse the ire of the censorious, it must be recognized that the failure of the United States to meet the demand of many nations for domestic enrichment facilities is actually contributing to the proliferation problem.

The attitude of Washington is strange, in view of the fact that the Administration has made an obsessive fetish of the nonproliferation issue. From the security standpoint, Washington is still living in the 1950's; policy is still dominated by political considerations, and the age-old tendency to equate secrecy with monopoly still prevails.

A brief review of the characteristics of enrichment gear is illuminating. With gas diffusion, the size of the units and barrier tubes depends on the pressure-volume parameters at each stage. Thus, a plant that is designed for fuel enrichment only cannot be used to produce explosive-grade uranium in appreciable amounts. There simply will not be a sufficient volume of the material to recycle through the large low-enrichment units on a regular basis.

Suspicious minds may be prone to the belief that the purchaser can break the barrier tubes open and find out how they are made; it is no secret that the barriers are made out of sintered nickel. The catch is that the metal is sintered in the precise way necessary to achieve the desired uniform porosity. This information naturally is not exported with the plants.

Thus, the standard gas diffusion plant is relatively safe, from the "proliferation" standpoint. "Export" model gas diffusion plants can be turned out and leased or sold under conditions of International Atomic Energy Agency inspection; however, the situation with the West German Becker gear, which involves constant volume, is much less certain. The efficiency depends to some extent on blade settings, but because there is no great difference between the volumes needed throughout the stages from low to high enrichment, the recycling potential with the Becker blades is obviously much higher.

While Washington was contemplating its political belly button and pondering the higher mysteries of nonproliferation, American developers who could have provided an essentially nonproliferatable form of enrichment were beaten to a foreign market by West German developers who had perfected a substantially more proliferatable method.

The real policy question that remains to be settled is not whether the export market shall or shall not be satisfied, but whether we will allow the export of known and controllable hazards, or maintain our negative and censorious attitude about nuclear equipment. Withholding enrichment gear solves no problems; it can only become a provocation to many nations to fund large-scale research efforts under the banner of "energy independence," which may lead to unpredictable and potentially dangerous results.

One of the first principles of effective political negotiation, taken for granted in the ward days, but almost forgotten by the current generation is "Never attempt to control anyone by threatening to withhold something from him—he may find out he can get along without it."

This principle should be kept in mind when further developments in enrichment technology are evaluated.

JAMES J. GLACKIN
19½ North Fair Oaks Avenue, Pasadena, California 91103

Indian Corn Cultivation

Contrary to the views presented in Lynn Ceci's article "Fish fertilizer: A native North American practice?" (4 Apr., p. 26), a review of the history of southern New England Indian corn cultivation reveals that Indian use of fish fertilizer is a well-authenticated fact. In the spring of 1621, at newly settled Plymouth on Massachusetts Bay, the Indian Hobomock introduced the Pilgrims to Squanto, the only surviving native of the Indian village site which the Pilgrims had taken over for their own. Able to communicate in English, and well-versed in local agriculture, Squanto instructed the agriculturally illiterate Pilgrims how to plant the maize or Indian corn seed they had earlier gotten on Cape Cod. He had them seine quantities of the teeming herring run in Town Brook and throw up the soil of 20 formerly Indian-tilled acres into mounds. Then he taught them to place beneath each hill several of the fish as fertilizer before planting the seed.

Plymouth Governor Bradford's graphic account (*1*) provides this testimony: "Squanto stood them in great stead, showing them both ye manner how to sett it [the Indian corn seed] and after how to dress and tend it. Also he told them except they got fish and set with it (in these old grounds) it would come to nothing."

Winslow, later to become Plymouth's governor, records the auspicious outcome (*2*). "We set the last spring some 20 acres of Indian corn and according to the manner of the Indians we manured the ground with herrings or rather shads which we have in great abundance." By the time of writing, 21 December 1621, the Pilgrims had gathered their first harvest. Manured and cultivated as Squanto had advised, the crop of Indian corn had done well, and Pilgrims and Indians celebrated Thanksgiving. By contrast, the field of English grain alongside, with no manuring mentioned, was an almost complete failure.

Additional evidence of fish fertilization as a customary native Indian practice was provided by a distinguished Puritan, John Winthrop the Younger. He arrived in Massachusetts Bay a decade later, became a founder of coastal Ipswich, and for years was governor of Connecticut. The first resident American member of the Royal Society of England, he described in a detailed and illuminating communication to the Society in 1666 (*3*) how maize is grown. Of fish manuring he states flatly: "The English have learned this good husbandry of the Indians and do still use it in places where the Mooses (herring) come up in greate plenty."

He also mentions that the English put both codfish garbage left near fishing stations and cattle dung, well-rotted, under the maize hills. After the maize crop was harvested and the land plowed, the soil became "well fitted for English Corne, specially Summer graine, (as Pease or Summer Wheate)." Two centuries later, seaboard New England farmers still held to this "good husbandry."

Ceci theorizes that Squanto had learned fish manuring, not as a child working with his mother and the Indian women, but rather in the course of his foreign wanderings, as a captive in Spain and later in England and Newfoundland.

However, Europe's farmers for centuries had sown their grain broadcast or in drills, and on plowed fields, not in hills. Then they

lightly plowed or harrowed the seed under. In backward areas poor peasants might have hacked it in by hand after a fallow, without manure. Manuring was sometimes provided by "folding" sheep on a different acre each night. Otherwise any available manure was spread broadcast or "sprinkled" aboveground before seeding (*4*).

Moreover, in war-torn, hungry, 16th- and 17th-century Europe, the practice of manuring land with whole fish, unless spoiled, appears highly improbable. Food for humans was too scarce. It was for food, oil, and profit, not manure, that Basque, Breton, and English fishermen undertook the laborious and dangerous voyage to the Grand Banks. Out of their return cargo, fishheads and fins might have been spread on the land; in the case of pilchards (sardines), once the valuable oil was extracted, the waste may have been "laid upon the fields to enrich them." Yet few are the agricultural writers of the period who even mention fish as manure.

Where in his travels could Squanto have learned fish-in-hill fertilization of maize or Indian corn? Only in Spain's recently conquered Peru was fish manuring practiced. Is it conceivable that the Spanish Conquistadors had brought back fish-in-hill maize culture from South America's Pacific shore and somehow taught it to captive Squanto; that he was so impressed that on recrossing the Atlantic he in turn taught the Pilgrims?

Could Squanto have learned it in cool, damp England, where maize was not grown, or in northerly, often fog-shrouded, Newfoundland? Maize requires week upon week of hot sunshine for its grain to mature. One could easily be misled by the habit of English writers of using the word "corn" in a generic sense for all small grain—wheat, rye, barley—adding the prefix "Indian" only if maize was indicated. The documents that Prowse's *History of Newfoundland* (*5*) quotes show that the "corne" that fisher-farmers attempted to grow there was rye, oats, barley (and in one case, wheat), not Indian corn. As late as 1845 the island's crops were reported as only oats and hay (*6*).

Ceci's suggestion that Squanto might have picked up his knowledge of fish-corn fertilization from the early agricultural attempts of sailors visiting the New England coast appears unlikely. Of the seven recorded stirrings of New England soil previous to 1620, Captain John Smith's appears to have been the lengthiest. His Monhegan Island garden off the Maine coast, so he says, "served us for sallets in June and July" (*7*), too early for Indian corn.

As Ceci points out, on rich, newly

cleared soil the Indians did plant without fertilizer. As Wood (*8*) recorded, some who were lazy might trust its fertility too long. Like European farmers, Indian farmers practiced fallowing, allowing long-used fields to lie idle, so that their chemical and physical deficiencies could be restored, or even abandoning the fields.

For soil conditions the Indians had three terms: new land, old or planted land, and abandoned land. A single Indian word (corrupted to menhaden), had the dual meaning of small fish and fertilizer. To save labor with their hand tools, they used the same cornhills season after season. Eventually, as the English were later to discover, continued use of fish as manure brought on soil imbalance, and the build-up of fish oil may also after a time have made the soil soggy, almost sterile.

Since the native peoples of the Western Hemisphere were sufficiently competent to develop from wild plants so large a proportion of the world's present-day food sources, including Indian corn, should it surprise us that one of their many peoples, inhabiting an area with soil far from rich, should have taught themselves how to fertilize their cornhills?

HOWARD S. RUSSELL
14 Nob Hill Road,
Wayland, Massachusetts 01778

References and Notes

1. W. Bradford, *Bradford's History "Of Plimoth Plantation"* (Wright and Potter, Boston, 1898), p. 131.
2. H. M. Dexter, Ed., *Mourt's Relation* (Boston, 1865), p. 132.
3. F. Mood, *N. Engl. Q.* **10**, 121 (1937).
4. For England, see M. E. Seebohm, *The Evolution of the English Farm* (Harvard Univ. Press, Cambridge, Mass., 1927), pp. 69, 89, 112, 164–165, 172, 230, 264, 356.
5. D. W. Prowse, *History of Newfoundland* (Macmillan, New York, 1895), pp. 106, 128, 129.
6. *Chambers's Encyclopedia* (Chambers, Edinburgh, rev. ed., 1878), vol. 6, p. 745.
7. G. P. Winship, *Sailors' Narratives of Voyages along the New England Coast, 1524–1624* (Houghton Mifflin, Boston, 1905), p. 236.
8. W. Wood, *New Englands Prospect 1634* (Microprint, London).

Ceci's article about the alleged failure of Indians to use fish fertilizer in early 17th-century New England raises, but fails to answer, important questions about the ecological conditions and historical sources of the period.

The author (and almost all of the references cited) neglects to mention that, before 1615, there were at most about 4000 Indians in southeastern New England; after 1616, because of a disastrous plague (introduced by the English), there were only about 1500 Indians left—a population density ranging from 0.10 to 0.20 people per square mile. There was very little danger that the small number of Indians at any time would have exhausted their natural resources (fish, game, and fowl) or depleted the soil nutrients needed for corn cultivation. Nor was there any need for the Indians to adopt fixed settlements, domesticated animals, labor-intensive agriculture, and European manuring techniques suited to ecosystems of limited resources, overpopulation, and poor socioeconomic allocation management.

The author overestimates the sophistication of technology needed for fishing and using fish fertilizer. The fish used for fertilizer in New England—alewives, shad, and herring—spawned in abundant numbers in sluggish river pools and ponds (before the English fouled the waters) where catching was easy, even without the Indian fish weirs which (the author neglects to mention) archeologists have found in abundance. The hoe, stick, and basket used by the Indians sound much more efficient than the clumsy, expensive, manufactured implements used by Europeans for spreading manure from domesticated animals.

The author also fails to mention an important legal technicality affecting the historical sources which denied or did not mention Indian use of fertilizer. The English had no defensible legal title to the lands of New England; the colonists had not conquered the land or purchased it, nor was it vacant—the usual standards for appropriation. The promoters of colonization resorted to a flimsy and preposterous justification for dispossessing the Indians: they had violated the Biblical injunction to make the earth "fruitful," by not manuring and cultivating in the European manner; therefore, the first (English) taker could dispossess the Indians at will. It is little wonder then that the English sources are silent on the matter or deny that the Indians used fertilizer.

Ceci does not prove conclusively that the Indians of southeastern New England were ignorant or incapable of using fish for fertilizer. If, as she alleges, the Indians knew nothing of fish fertilizer which was so well known among Europeans, why did the Pilgrim chronicler have to "invent" the story that fish fertilizer was the Indian manner? Contrary to the author's implications, the Indians had the resources and the technology to use fish fertilizer, even though there was no compelling ecological necessity for them to do so most of the time. And, in terms of cultural adaptiveness, should the Indians be invidiously compared with the Pilgrims, who literally did not know where they were going in 1620, did not plan ahead enough to bring necessary animals with them, and somehow managed to starve while fish and game abounded all around them?

G. B. WARDEN
Department of History,
Yale University,
New Haven, Connecticut 06520

Having lived in the land of Squanto for a number of years, and having traveled the popularly presumed path of "Indian" corn culture with a fish in every hill, I agree with Ceci's thesis that this could not have been the aboriginal way—but for an additional reason.

Planting fish (alewives) with corn in my garden results in the greatest concentrations of skunks, dogs, raccoons, and other nocturnal marauders I have witnessed outside of public campgrounds in our national parks. Things that go bump in the night manage to disinter my small corn plot totally within 2 or 3 days of planting. What surprises me is not that the Algonquins didn't use fish as fertilizer, but that colonists did. Perhaps their larger acreage and firearms were the answer—or then again, perhaps they weren't as wise as the Indians.

SANFORD A. MOSS
398 River Road,
Westport, Massachusetts 02790

My reply to the arguments presented by Russell and Warden is confined to those points not already discussed in the original article or references cited.

Russell insists that it is a "well-authenticated fact" that use of fish fertilizer was a "customary native Indian practice." As evidence of this claim, he quotes a sentence of John Winthrop the Younger which serves to authenticate the practice for the English: "The English" is the subject of the verb "... do still use" (fish fertilizer), not "the Indians." The aboriginality of Indian "husbandry" would still be questionable even had "Indians" been the subject, because by 1666 considerable technological as well as religious conversion to European ways had taken place (*1*). The value of Winthrop's 1666 statement is further diminished by his own specific denial of the practice written earlier, in 1636 (*2*): the Indians he had seen grew "corne without fish" (and fallowed their fields).

That an Indian, Squanto, had informed the Plymouth farmers of the value of fish fertilizer was never questioned by me. What was questioned was the apparent syllogism of Winslow (*3*) in 1621, and now Russell, that since (i) Squanto knew of the practice and (ii) Squanto was an Indian, it could be concluded that the practice was a "manner of the Indians." As a logical deduction it is attractively simple but invalid. As an ethnohistoric "fact" it remains uncorroborated by either documentary or anthropological evidence.

Russell's most troublesome argument concerns the point that "fish-in-hill fertilization of maize" was a linked technological complex that could only be learned as a whole. From this, he then ar-

gues that Squanto (and later the Pilgrims) could not have learned the value of fish fertilizer earlier in locations where a hilled and nonbroadcast seeded plant like maize, or maize itself, was not also present. However, the notion of a complex imposes restrictions on learning processes that seem arbitrary, and Russell's survey of European husbandry is insufficient to conclude that, without exception, Squanto could not have seen one or more of these features on European farms. His point that maize may have been grown in Spain is one possible and important example. Mason's 1620 description (*4*) of farming in Newfoundland is another. For here, Squanto could have observed fish fertilizer used not only with "Sommer and Winter corne . . . Wheate, Rye, Barlie, Oats, and Pease," but with nonbroadcast seeded plants such as "Garden herbes . . . Roots: as torneps, Pasnepes, Caretts, and Radishes" (*4*, p. 149).

If Squanto had simply seen how fish dressings generally improved crop productivity in England (*5*) or Newfoundland, couldn't he have learned the critical information necessary for the sound agronomical advice he was to pass on to the next group of English farmers he met?

The original text of Winslow's 1621 letter does not rule out this possibility: "We set the last Spring some twenty Acres of *Indian* Corne, and sowed some six Acres of Barly & Pease, and according to the manner of the Indians, we manured our ground with Herings, or rather Shadds . . ." (*3*). Deletion of the critical passage about sowing barley and pease (see Russell's version) creates the impression that fish fertilizers were restricted to hilled maize plants—a false impression that confirms Russell's notion that the practice was a linked complex. That the Pilgrims used this fertilizer for more general farming, indeed with some of the very same crops grown in Newfoundland, weakens the argument for a complex and for the point that Squanto could not have learned the value of fish fertilizer used with plants other than maize.

Other statements bring into question Russell's methods of interpretation. For example, the above letter continues: "we had a good increase of *Indian* Corne, and our Barly indifferent good, but our Pease not worth the gathering, for we feared they were too late sowne, they came up very well, and blossomed, but the Sunne parched them in the blossome." From this citation, Russell concludes that "indifferent good" for the barley meant "almost complete failure" and that lack (see above) of fish fertilizer was somehow involved in the supposed failure of the barley and the peas.

Many other of Russell's statements cannot be evaluated as evidence because they are either unreferenced or, like that suggesting Squanto had worked in the cornfields with his mother, literary extensions of missing primary data. He ignores the length of the 1606–1607 French colony in Maine and Nova Scotia in the statement about Smith's brief visit having been the "lengthiest" opportunity for New England Indians to learn about European food producing technology. The making of butter and cheese by Indians of Maine in 1605 (*6*) indicates that such "unlikely" possibilities could occur. Given this and the considerable data on early European contact, the many practices assumed to be "native" must be carefully researched before the possibility of European influence can be ruled out.

Warden's arguments for the Indian practice of fish fertilizer are not served by his data. If, as he suggests, a reduced Indian population after 1615 would not have depleted soil nutrients needed for maize cultivation (a questionable hypothesis given the citations for fallowing), then absence of documentation for an Indian reliance on fertilizer reflects the real absence of the practice. Yet later Warden implies that Indians *did* use fertilizers but that its usage went undocumented because observers felt guilty about having no "defensible legal title" to Indian lands. If there is one quality that is uncommon in early settlers' writings, it is guilt concerning the usurpation of Indian lands or ill treatment of Indians. For after all, most settlers believed they had *divine* (if not Royal) title to the lands, and if they did not feel too guilty to describe an illegal use of "fire and sword" (*7*) to destroy whole villages of Indians, whence came the qualms about describing Indians using fish as fertilizer?

Warden's demographic data support my explanation for the absence of documentation. His population density figures—0.10 to 0.20 persons per square mile after 1615 and (by interpolation) 0.27 to 0.53 before 1615—correspond to those estimated for "pre-farming" (*8*) societies, nonsedentary groups who rely primarily on wild foods that may be seasonally distributed in various ecological zones. If maize had comprised as much as half their subsistence, the population density before 1615 should have been more than double (*9*) that given. If the Indian population was then so thin and maize production played a relatively minor role, it would have been unnecessary, if not maladaptive, to establish fixed planting fields (near the coastal sources of fish) that had to be kept permanently productive with annual applications of fish.

That I "overestimated" the "sophistication of technology needed for . . . using fish fertilizer" is quite wrong. Agronomist

R. Lucas (*10*) pointed out to me that my citation of 360 cornhills per acre must be in error since it would have resulted in spacings 11 feet apart—surely too wide. Additional research on cornhill spacing among Indian cultivators produced figures of 2½, 3, 4, and 6 feet (*11*). Spacings of these sizes would produce 1210 to 6970 cornhills per acre. If each were dressed with 2 to 4 fish, the numbers of fish required would not be the 720 to 1440 originally calculated but more like 2420 to 27,880.

With so great an agricultural task before them, I do not understand the basis for the claim that Indian tools "sound much more efficient than the clumsy, expensive, manufactured implements used by Europeans." W. Wood, closer to the relative efficiency of the day, would probably have challenged Warden, for in 1634 he wrote that one plow "could teare up more ground in a day, than the [Indian] Clamme shels could scrape in a month" (*12*).

Most disturbing is Warden's comment that I "did not prove conclusively that the Indians of New England were ignorant or incapable of using fish for fertilizer." To construe that a cultural analysis of native cultivation was an attempt to slur the capabilities of early Native North Americans reveals a basic misunderstanding of how or why anthropologists study cultural adaptiveness. It also unfairly introduces a notion of ethnic bias and nonscientific motivation into my research. My conclusion that fallowing was the more adaptive cultivation practice for Northeastern Indians implies no value judgment on my part regarding the capabilities of Indians, nor should any scholar interpret it as such.

In sum, neither reply to my article contains substantive evidence to show that (i) any early Indians other than Squanto knew about fish fertilizer, or that (ii) the practice would have been adaptive to or even consistent with the known cultural system of the Indians involved. These remain the principal issues to challenge the lovely legend.

LYNN CECI

Department of Anthropology, Graduate School and University Center of the City University of New York, New York 10036

References and Notes

1. "In addition to his ministerial labours, Eliot taught them to improve their wigwams, and to fence their grounds with ditches and stone walls." J. Small, in J. Eliot, *The Indian Primer* (Elliot, Edinburgh, 1877), p. xi.
2. J. Winthrop, *Collect. Mass. Hist. Soc.* **6** (Ser. 4), 515 (1863).
3. W. Bradford and E. Winslow, *Journal of the English Plantation at Plimouth* (University Microfilms, Ann Arbor, Mich., 1966), p. 60. This reference is an unedited, photoreproduced copy of the original work.
4. J. Mason, in *Captain John Mason*, J. W. Dean, Ed. (Franklin, New York, 1967).
5. According to C. Jones (personal communication), the practice of using fish fertilizer was "standard"

in East Anglia and probably Cornwall during the 16th century.
6. J. Rosier, in *Early English and French Voyages 1534–1608*, H. Burrage, Ed. (Scribner, New York, 1932), p. 392.
7. W. Bradford, *Of Plymouth Plantation*, S. E. Morison, Ed. (Knopf, New York, rev. ed., 1952), p. 269.
8. J. Steward, in *Man the Hunter*, R. B. Lee and I. Devore, Eds. (Aldine, Chicago, 1968), p. 331; C. M. Cipolla, *The Economic History of World Population* (Pelican Books, Harmondworth, 1962), p. 77.
9. S. Cook, *Addison-Wesley Modul. Publ.* **16**, 27 (1972).
10. R. Lucas, personal communication.
11. I. DeRasieres and D. DeVries, in *Narratives of New Netherland 1609–1664*, J. F. Jameson, Ed. (Scribner, New York, 1909), pp. 107, 219; A. VanderDonck, *A Description of New Netherlands*, T. O'Donnell, Ed. (Syracuse Univ. Press, Syracuse, N.Y., 1968), p. 31.
12. W. Wood, *New Englands Prospect 1634* (Microprint, London), p. 78.

Defending the Defenders

In an essay in the *New York Times*, Harrison Salisbury remarked that Russian intellectuals traditionally have taken responsibility for the well-being of their society to a degree not as common in the West. Scientists everywhere can be proud of the extent to which scientists play this role in the Soviet Union. They set standards of responsibility and civic courage of the highest order, and are suffering for it. The least we can do is to try to help them.

All the world knows about the nuclear physicist Andrei Sakharov, and that, to a degree, protects him. He is a noble and courageous person who loves his country and has no desire to leave it. His wife, Yelena, suffered eye injuries while serving as an army nurse in World War II and is classified as a disabled veteran. She is now threatened with total blindness that might benefit from treatment abroad, but she has been refused permission to leave. [The Boston *Globe* of 19 July reports that she has now been granted this permission.]

Not all Soviet scientists display Sakharov's courage. Apparently under government pressure, 60 members of the Soviet Academy of Scientists signed an adverse statement about him. They could almost surely have found safety in numbers had they instead drawn together to defend his—and their own—rights of free speech, publication, assembly, and travel abroad.

It is poignant to realize that some of our Soviet colleagues who are most pressed at home formed in 1973 the first group of Amnesty International (AI) in the Soviet Union. It is a rule of that organization that its units never assist their own nationals; so the Moscow group was assigned prisoners of conscience in Spain, Yugoslavia, and Sri Lanka. The original 11 founding members—the group is now said to number 24—included four physicists, three engineers, two biologists, and one psychologist (the eleventh is a priest).

Although such an organization is legal—in the Soviet Union three observers from it were invited to the Congress of Peace-Loving Forces in Moscow in October 1973—in the past few months the government has arrested three of its members and subjected two others to drastic searches and confiscations.

On 27 December 1974, Sergei Kovalev (Kovalyov), 43, a distinguished heart and nervous system physiologist, was arrested in Moscow and flown to imprisonment in Lithuania, ostensibly for circulating a *samizdat* journal, the *Chronicle of the Lithuanian Catholic Church*. One reason for this charge may have been to get him out of Moscow, where his coming trial would have received more foreign attention. He is a close associate of Sakharov, with whom he issued last December a New Year's Appeal, telephoned from Moscow to London on the very day Kovalev was arrested.

Kovalev had been a senior scientist at Moscow State University until 1969, when he was forced to resign because of his activities in the newly formed Initiative Group for the Defense of Human Rights. He then worked at the Institute of Hydrobiology on the use of chemical mutagens in fish culture. He has published over 60 papers, mainly on cellular interactions and conduction of excitation in heart muscle, the nervous system, and epithelial tissues.

On 18 April, the KGB arrested two more members of the AI group—its secretary, the physicist Andrei Tverdokhlebov, and Mikola Rudenko, a Ukrainian writer who was released 2 days later to await trial. Officers of the KGB also searched and confiscated documents from the apartments of Valentin Turchin, a mathematical physicist and chairman of the AI group, and Vladimir Albrekht, a mathematical biologist.

Tverdokhlebov, 35, had been an editor of the *Abstracts of Theoretical Physics* at the All-Union Institute of Scientific and Technical Information. He was discharged in 1972 because of his activities on behalf of accused and imprisoned Soviet citizens and their families. He then worked on problems of mechanical vibration at the Experimental Laboratory for Concrete. He has published papers on elementary particle physics and electrodynamics. He was a founding member of the AI group, the Committee on Human Rights, and Group 73, devoted to helping political prisoners. On 11 October 1973, *New Scientist* published his letter about Leonid Plusch, the Ukrainian mathematician who has been confined to a psychiatric institution since 1973. His book *In Defense of Human Rights* has recently been published in Russian by Khronika Press (New York).

Tverdokhlebov's apartment was searched by the KGB in August 1973 and again in October 1974, when they confiscated virtually all of his papers (including his copy of Solzhenitsyn's *Gulag Archipelago*), his typewriter, and tape recorder. He ends his account of this episode: "However, for the time being at least, they have left me my fountain pen." Now, he is apparently being held for trial in Moscow's Lefortovo Prison.

There has been great interest in the plight of Soviet Jewish scientists who have lost their positions and been otherwise harassed as the result of having applied for visas to emigrate. The persons discussed above regard the freedom to move about and live where one wishes as a basic human right and have done what they could to support their Jewish colleagues. On 16 January 1974, Tverdokhlebov published with Aleksandr Voronel, the Soviet Jewish solid state physicist recently permitted to emigrate to Israel, a letter protesting the denial of an exit visa to Aleksandr Galich, who has also since emigrated. During 3 years of enforced unemployment in Moscow, Voronel organized a weekly scientific seminar held in his three-room apartment and attended eventually by about 50 scientists, among them, Andrei Sakharov.

On 30 April, 60 Soviet citizens, mainly writers and scientists, appealed to the world on behalf of Tverdokhlebov, thereby risking their jobs and careers and setting an example for the Soviet Academy of Sciences. When our Soviet colleagues risk so much, can we who risk nothing be deaf to their pleas and withhold our help? We can help greatly merely by speaking out, by keeping public attention upon the plight of these, our fellow scientists. The Soviet government is as anxious as any other to keep its good name, to be thought decent and just. It is sure to listen if the international scientific community expresses its concern.

That can be done through our scientific organizations, the National Academy of Sciences in the United States, the Royal Society in England, and the professional societies of physicists, biologists, and engineers in all countries.

Such procedures usually take time however. It is exceedingly important for as many persons as possible to do what they can individually. Amnesty International will gladly offer guidance. Its office in the United States is at 200 West 72 Street, New York 10023; its central office is at 53 Theobald's Road, London WC1X-8SP. Also write or call the Soviet Ambassador in your country.

A Scientists' Committee for Tverdokhlebov has recently been formed in the United States (Letters, 20 June, p. 1164).

GEORGE WALD

Department of Biology,
Harvard University,
Cambridge, Massachusetts 02138