Letters

Letter to Pravda

Science (News and Comment, 21 Sept., p. 1148) recently printed the cable sent by Philip Handler, president of the National Academy of Sciences (NAS), to Mstislav V. Keldysh, president of the Soviet Academy of Sciences. The cable dealt with the "heightening campaign of condemnation of [academician Andrei D.] Sakharov" and was prompted by a letter that appeared in the 29 August issue of *Pravda*—signed by 40 Soviet academicians, five of whom are foreign associates of the NAS.

Sakharov is himself a foreign associate of the NAS. His "crimes" are that he wrote an essay in 1968 entitled *Thoughts on Progress, Peaceful Coexistence, and Intellectual Freedom* (*1*), in which he presented, among other ideas, the argument that rivalry between the two superpowers in an age of thermonuclear weapons was extremely dangerous to the whole world. This essay has been printed in the West but has never been published in the Soviet Union. Ironically, it is quite likely that some of the Soviet scientists who signed the anti-Sakharov letter in *Pravda* may never have read Sakharov's essay.

On 21 August, frustrated by his inability to make a public statement in a closed society with government-controlled newspapers, Sakharov held a news conference in his apartment for some Western journalists. He pointed out that it would be dangerous for the West to reach a détente with the Soviet Union as long as the Soviet Union remained a secret, repressive society closed to the rest of the world.

As many readers of *Science* do not have access to *Pravda*, they may be interested in the following translation of the letter and the names of the Soviet academicians who signed it.

We consider it necessary to bring to the attention of the general public our relationship to the behavior of academician A. D. Sakharov.

In recent years, academician A. D. Sakharov has given up active scientific activity and has come forward with a series of announcements which defame the governmental regime and the foreign and internal politics of the Soviet Union. Recently, in an interview given by him to foreign correspondents in Moscow and published in the Western press, he went as far as to come out against the politics of the Soviet Union in the relaxation of international tensions and against the strengthening of those positive improvements which have taken place recently in the whole world.

A. D. Sakharov tries to justify these announcements, deeply alien to the interests of all progressive peoples, with vulgar distortions of Soviet reality, and with fictitious rebukes to the socialistic regime.

In his utterances, he essentially identifies himself with the most reactionary, imperialistic circles, actively coming out against the policy of peaceful coexistence of nations with different social systems, against the line of our party and government on the development of scientific and cultural collaboration and on the strengthening of peace among nations.

To all intents and purposes, A. D. Sakharov has become an instrument of hostile propaganda against the Soviet Union and other socialistic countries.

A. D. Sakharov's action is radically alien to Soviet scientists. It appears especially ugly against the background of the concentration of efforts of all of our people towards the solution of the vast economic and cultural problems in the building up of the U.S.S.R., in the strengthening of peace, and in the cleaning up of international situations.

We express our indignation at the announcements of academician A. D. Sakharov and emphatically condemn his action that defames the honor and dignity of a Soviet scientist. We hope that academician Sakharov ponders on his actions.

[The letter was signed by] N. G. Basov†, N. V. Belov, N. N. Bogolyubov*, A. E. Braunshtein, A. P. Vinogradov, S. V. Vonsovskii, B. M. Vul, N. P. Dubinin*, N. M. Zhavoronkov, B. M. Kedrov, M. V. Keldysh‡, V. A. Kotel'nikov, G. V. Kurdyumov, A. A. Logunov, M. A. Markov, A. N. Nesmeyanov, A. M. Obukhov, Yu. A. Ovchinnikov‡, A. I. Oparin, B. E. Paton, B. N. Petrov, P. N. Pospelov, A. M. Prokhorov† ‡, O. A. Reutov, A. M. Rumyantsev, L. I. Sedov, N. N. Semenov* †, D. V. Skobel'tsyn, S. L. Sobolev, V. I. Spitsyn, V. D. Timakov, A. N. Tikhonov, V. M. Tuchkevich, P. N. Fedoseev, I. M. Frank, A. N. Frumkin*, Yu. B. Khariton, M. B. Khrapchenko, P. A. Cherenkov, and V. A. Engel'gardt*.

If Moscow protests, could Siberia be far behind? On 3 September, in *Pravda,* a letter condemning Sakharov from scientists of the Siberian division of the Soviet Academy of Sciences was also published. It was signed by 13 corresponding members of the academy and seven academicians, including M. A. Lavrentiev, the director of the Siberian division, and G. I. Marchuk‡, a deputy director.

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‡ Visited the United States and the NAS in October and November 1972.

References

1. A. D. Sakharov, *Progress, Coexistence, and Intellectual Freedom* (Norton, New York, 1968).

Smoking and Air Pollution Standards

Since the advent of the Surgeon General's report on smoking and health (*1*), everyone is aware that smoking may be harmful to health. What is not generally understood, however, is how the quantity of pollutants inhaled and placed in the local environment by smokers is related to air pollution standards.

The carbon monoxide (CO) content of a single puff (34.1 cubic centimeters) of cigarette smoke is 1.626 milligrams (*2*). If we assume that an average smoker takes eight puffs per cigarette and smokes 20 cigarettes in a 16-hour period, he would inhale 260 milligrams of CO in 16 hours. An average person inhales approximately 10 cubic meters of air per day. This air would have to contain 39 milligrams of CO per cubic meter or 33.6 parts per million for an average person to receive an equivalent dose of CO in 16 hours. A CO concentration of 30 parts per million averaged over an 8-hour period is defined as an air pollution warning situation according to the National Ambient Air Quality Standards (*3*).

Regular cigarettes contain an average of 23 milligrams of condensable tars (*1*, pp. 51–62). Although filters remove as much as 50 percent of this amount, this effect is partially negated by the extra length of most filter cig-

arettes. Cigarettes with advertised value of 14 milligrams of tar are considered "low tar" cigarettes. These values are for the mainstream smoke, that is, the smoke actually inhaled by the smoker. Smoking one package of regular cigarettes per day produces 460 milligrams of tar particulates per day. For an average person to receive an equivalent dose, the 10 cubic meters of air per day he inhales would have to contain 46,000 micrograms of tar particulates per cubic meter, more than 50 times the air pollution emergency level of 875 micrograms per cubic meter, and more than 600 times the level considered safe according to the clean air standards (*4*).

A single cigarette when smoked produces approximately six times the mainstream smoke in the form of secondary smoke which goes into the local environment. In a room of 40 cubic meters in which the air is exchanged in 8 minutes (a typical office), a cigarette smoked in 4 minutes will raise the count of tar particulates to 2700 micrograms per cubic meter, 36 times the level considered safe according to the clean air standards.

It is clear that the enforcement of clean air standards is wasted on smokers; however, it also appears impossible to maintain clean air standards in the presence of smokers. If we are really serious about clean air, the use of tobacco must be controlled as well as pollution from automotive and industrial sources.

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References

1. Advisory Committee to the Surgeon General of the Public Health Service, *Smoking and Health* (Public Health Service Publication No. 1103, Government Printing Office, Washington, D.C., 1964).
2. R. J. Phillippe and M. E. Hobbs, *Anal. Chem.* **28**, 2002 (1956).
3. *Fed. Reg.* **36**, 6679 (7 April 1971).
4. *Ibid.* **36**, 1502 (3 January 1971).

Resolution on the Panama Canal

The following resolution concerning the maintenance of the existing freshwater barrier in the Panama Canal was unanimously approved by the Council of the Biological Society of Washington on 22 May 1973 (*1*).

Whereas, Gatun Lake forms an effective freshwater barrier against the interoceanic migration of a vast majority of the stenohaline biotas at either end of the Panama Canal, and

Whereas, there is an ever-increasing number of ships passing through the Canal and a concomitant increase in the amount of water required for the lockages of these ships, and

Whereas, the Panama Canal Company is beginning a series of studies that would culminate in the pumping of sea water into Gatun Lake within the next thirty years, and

Whereas, such action would inevitably drastically modify the Gatun Lake environment by creating a brackish or marine lake, which would have effects similar to those of a sea-level canal in allowing the mixing of Atlantic and Pacific organisms with potentially dangerous results, and

Whereas, such a saline canal would constitute a more rigorous barrier to the net north-south movement of fresh water and terrestrial forms, as well as destroy the present populations in and immediately around Gatun Lake and the Canal,

Therefore, be it resolved that the Council of the Biological Society of Washington condemns this plan as being ecologically irresponsible, and strongly urges the adoption of other alternatives available to the Panama Canal Company.

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Notes

1. Similar resolutions have been passed by the American Malacological Union, the American Society of Ichthyologists and Herpetologists, the First International Congress of Systematic and Evolutionary Biology, the Western Society of Malacologists, and the Association of Island Marine Laboratories of the Caribbean.

Science and Society

Dorothy Zinberg (Editorial, 23 Mar., p. 1187) proposes that a major thrust of science education be to develop social awareness among scientists. While I agree that science has failed many of its responsibilities to society, the failure of science education, both for the scientist and the public, involves more than a failure to impart social awareness. The deficiencies in science education have roots which extend to the earliest years of each individual's development.

It is part of our culture to overreact to social movements; because of this overreaction to the demand for relevance, differences between science and technology, even for many scientists, are rapidly being blurred. One result is that the satisfaction and excitement involved in the search for knowledge has become irrelevant to many.

Education has played a major role in shaping society's present attitudes toward science. Science education, as Zinberg points out, is important for the public as well as the scientist. However, she suggests that one must educate the scientist first. This is the major fault of science education today—an artificial separation of scientist and public; in any mature society, science should be a completely integral part of the society.

Is there any reason why the excitement and fullfillment that the true scientist receives from his or her quest for knowledge cannot be shared by everyone? I don't think so. Many scientists avidly follow developments outside their areas of specialization in such exciting fields as cosmology and the origin of life, mind research, and geophysics and paleontology. Everyone, scientists and public, shares an interest in these questions.

I can see no reason why the general public, if science has been integrated into their education from childhood, shouldn't follow scientific developments as a leisure activity almost as avidly as they follow professional football, tennis, or chess tournaments. I have devoted a great deal of my time since childhood to athletics, as a participant and an observer, with great satisfaction; yet I find science equally as exciting. If Joe Namath and Billie Jean King, to say nothing of Bobby Fischer, can become popular heroes, why not some present-day Einstein or Watson and Crick?

A continuing quest for knowledge, even as an observer, adds immeasurably to the quality of life, so there is no reason why basic research need be justified. However, we seem to find ourselves in precisely this position today. It would be a tragic mistake, in the quest for social relevance, to put aside the one attribute which makes man unique from other species—his desire to understand (rather than control) the universe in which he lives. True, our survival depends upon continued progress, both social and environmental. However, loss of the instinct for knowing and understanding could be the first step toward a sterile society with frightening similarities to the stereotyped societies of the social insects.

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