able one to predict the approximate potency of a carcinogen with some degree of probability, this would be extremely useful. One would like to be able to do this in drug development and in evaluation of the hazard of complex mixtures (such as water effluents, air pollution samples, and so forth), in which animal cancer tests are impractical. It is clear that by using a simplified system such as a rat liver homogenate and bacteria, one would *not* expect to be able to precisely predict carcinogenic potency in a rat (or a human). If one could predict it with a high probability within ± an order of magnitude this would be extremely useful, considering the range of carcinogenic potency. We believe the test may well be able to do this. Sivak chooses his carcinogenic potency examples from a much too narrow range where one could not see any correlation that existed.

Russell and Meselson (*4*) at Harvard are actively pursuing the area of the degree of quantitative correlation between a chemical's carcinogenic potency in animals and mutagenic potency in the *Salmonella* test, and following their lead we are doing the same. There are some animal carcinogenicity data from feeding experiments of appropriate quality for calculating carcinogenic potency and also some data on humans that meet the requirements.

2) Sivak says that we selected our strains to detect carcinogens and therefore the fact that they detect carcinogens is "self-fulfilling and not a true test." We selected our strains primarily on the basis of maximizing the detection of known mutagens (we did not think about carcinogenicity until much later), and fewer than 10 percent of the 175 carcinogens we actually tested in the validation of the method were used in the development of the strains. [In addition, the test has been independently validated (90 percent correlation) in a blind study of 120 chemicals (*5*).] Very few chemicals in general are mutagens or carcinogens, and the finding that more than 90 percent of carcinogens tested have been detected as mutagens (and that almost every mutagen that has been given an adequate cancer test is a carcinogen) may actually mean something. The chemicals known to be carcinogenic in humans represent an unselected sample, and the test detects almost all of them as mutagens (*2*).

3) Sivak questions the "equivalency" (we would not use that word) of mutation in bacterial DNA with "the multistep, multifactorial process of carcinogenesis in eukaryotic organisms." We have briefly discussed the idea of DNA damage (somatic mutation) as the initiator of most chemical and radiation carcinogenesis (*2*, *6*). This is a coherent theory that is supported by a wide variety of evidence. Sivak does not add any new arguments against it. We would welcome the presentation of a more specific alternative theory.

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References

1. B. N. Ames, J. McCann, E. Yamasaki, *Mutat. Res.* **31**, 347 (1975); J. McCann, E. Choi, E. Yamasaki, B. N. Ames, *Proc. Natl. Acad. Sci. U.S.A.* **72**, 5135 (1975).
2. J. McCann and B. N. Ames, *Proc. Natl. Acad. Sci. U.S.A.* **73**, 950 (1976).
3. P. N. Lee and J. A. O'Neil, *Br. J. Cancer* **25**, 759 (1970); R. Doll, *J. R. Stat. Soc.* **134**, 133 (1971).
4. K. Russell and M. Meselson, in *Origins of Human Cancer*, J. D. Watson and H. Hiatt, Eds. (Cold Spring Harbor Laboratory, Cold Spring Harbor, N.Y., in press).
5. D. Anderson (Imperial Chemical Industries, London), personal communication.
6. B. N. Ames, *Science* **191**, 241 (1976).

Sergei Kovalev: A Colleague in Trouble

Scientists in the United States are often unaware of real threats to their profession—the pursuit of truth—except for incidentals, such as the exigencies of budgets or the snarls of red tape. For some of our colleagues in the Soviet Union, merely raising what their political bosses deem the wrong questions can ruin their careers and threaten their very lives.

We are reminded of this most forcefully by the fate of the biologist Sergei Adamovich Kovalev, as described in an urgent message from academician Andrei Sakharov. If Kovalev had taken a narrow view of his profession, he might still be doing research in cellular physiology at his alma mater, Moscow State University. Instead, he is suffering from serious, untreated illnesses at "corrective labor colony number 36" near Perm.

Kovalev's "crimes," according to the laundry-list indictment on which he was tried last December, consist of embarrassing inquiries made on behalf of political dissidents in the Soviet Union. He has wanted to know, for example, why the cybernetician Leonid Plyushch was punished for his political heresies by 30 months in a psychiatric prison at Dnepropetrovsk amid violent criminals; why Alexander Solzhenitsyn was hounded from his homeland; why thousands of political and religious dissidents are being brutalized in camps and psychoprisons for attempting to exercise the rights guaranteed in the Soviet constitution.

When Kovalev was denied a defense counsel of his choice, he tried to defend himself against the charge of "anti-Soviet agitation and propaganda." The judge struck all his motions and would not permit the calling of witnesses who could have testified to the truth of the alleged "slander" by the accused. Kovalev declared a hunger strike and left the courtroom, certain of the preordained verdict—guilty—and the sentence—a maximum 7 years in a "strict regime" camp for "especially dangerous state criminals," followed by three years of internal exile.

He was not present to hear the prosecutor's revealing final words: "The Soviet authorities don't care about a man's opinions if only he keeps them to himself and does not engage in criminal activity. In Kovalev's thoughts on liberty as expressed in the documents he signed, one thing is clear—he is trying to portray liberty as something independent from society. We know that liberty is the product of the historical development of society and that each society has its own particular character. . . . Our state forbids actions which are foreign to its nature."

Sakharov, who had himself been barred from testifying for Kovalev, was aghast at such a "blatantly unlawful" trial. He called the defendant "my close friend, a man of great spiritual beauty and force, of limitless altruism, dedicated to the defense of human rights and the struggle for publicity against illegality."

Cornell University's Section of Neurobiology and Behavior recently offered Kovalev an appointment as visiting scholar, citing the more than 60 publications that demonstrate Kovalev's competence as a researcher. Cornell would give Kovalev a chance to resume his scientific work. If the promises of the Soviets and 34 other nations at Helsinki in August 1975 carry any weight, then Kovalev's path would be cleared by the official blessings given scientific exchanges (*1*).

The latest word from Sakharov is that time is running out. He sees Kovalev's survival as dependent on an operation that only the Leningrad central prison hospital is equipped to perform. He asks Kovalev's American colleagues to appeal to Soviet authorities to grant this request, adding their voices to the unanswered pleas of Mrs. Kovalev, Lusya Boitsova.

Because of the international nature of science, its practitioners have a more direct concern—and responsibility—for the human rights of colleagues in other countries. Those who wish to respond on behalf of Sergei Kovalev can send a lettergram, letter, or card to the Medical Administration of the Soviet Ministry of Internal Affairs, Moscow, Petrovka 25a, Medupravleniya, MVD SSSR.

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Notes

1. A resolution has been introduced in the House of Representatives by Matthew F. McHugh (D–N.Y.) expressing the sense of Congress that the President should urge the Soviet Union to allow Kovalev to accept the invitation of Cornell University to be a visiting scholar, in keeping with the Helsinki accord.

Radioactive Waste Disposal

A panel established by the Committee on Radioactive Waste Management of the National Research Council has been assigned the task of evaluating waste practices at the Hanford Reservation in Washington State. Such practices include the partial solidification by evaporation of huge quantities of high-level radioactive liquid waste remaining from plutonium production, the separation of radioactive nuclides from the liquid wastes, the discharge of low-level radioactive liquid waste to the ground, the trapping of gaseous and particulate waste, and the recovery for safer storage of soil into which waste containing actinite elements has previously been discharged.

The panel is seeking information from all possible sources to guide its study. In particular, reports on recent work dealing with ideas or technological innovations that might be applicable to Hanford practices would be helpful. Many reports of this sort have been published and are readily available, but some may exist in unpublished form. The panel would appreciate knowing about unpublished work, and reports describing it can be sent to Dr. John Pomeroy, Executive Secretary, Committee on Radioactive Waste Management, National Academy of Sciences–National Research Council, 2101 Constitution Avenue, NW, Washington, D.C. 20418.

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