state & society

Soviets reject National Academy warning on Sakharov

Mstislav V. Keldysh has taken the US National Academy of Sciences stand on Andrei Sakharov to task in an open letter to NAS president Philip Handler. Keldysh, president of the Soviet Academy of Sciences, issued his rebuttal to a cablegram he had received from Handler warning that US–USSR scientific cooperation could be jeopardized by continued harassment of the Soviet physicist. Sakharov has recently been criticized in the Soviet press for being outspoken against further US–USSR détente without increased civil freedom for Soviet citizens. Sakharov has also met with foreign newsmen despite governmental warnings.

Handler's cable stated, "If the benefits of science are to be realized, if the dangers now recognized are to be averted, and if the full life which can be made possible by science is to be worth living, then, in the words of Academician Sakharov, intellectual freedom is essential to human society—freedom to obtain and distribute information, freedom for open-minded and unfearing debate and freedom from pressure by officialdom and prejudice."

The NAS cable cited the case of J. Robert Oppenheimer as an example of how the scientific community in the US failed to protect one of its own though the Sakharov case "is far more painful for the fact that some of our Soviet colleagues and fellow scientists are among the principal attackers when one of the scientific community courageously defends the application of the scientific ethos to human affairs."

In conclusion, the message stated, "Were Sakharov to be deprived of his opportunity to serve the Soviet people and humanity, it would be extremely difficult to imagine successful fulfillment of American pledges of binational scientific cooperation, . . ."

A number of letters denouncing Sakharov's position have appeared in the Soviet press signed by members of the USSR Academy of Sciences. The physicists who have signed include N. G. Basov, N. N. Bogolyubov, S. V. Vonsovskiy, B. M. Vul, G. V. Kurdyumov, A. A. Logunov, M. A. Markov, A. M. Obukhov, A. M. Prokhorov, D. V. Skobeltsyn, A. N. Tikhonov, V. M. Tuchkevich, I. M. Frank, Yu. B. Khariton, P. A. Cherenkov, G. I. Marchuk, A. N. Skrinskiy and R. I. Soloukhin.

Keldysh, responding to the NAS statement, said, ". . . my colleagues and I cannot help but express resolute objection to its content and tone, which do not correspond either to the nature of the affair or to the spirit of relations between our two academies . . . A. D. Sakharov slandered Soviet reality and the aims of our country in international relations by having ascribed aggressive intentions to it. By such actions, academician A. D. Sakharov causes harm to the interests not only of the Soviet Union but also the people of other countries, which sincerely strive for relaxation of tension and international cooperation."

Keldysh continues, ". . . you suggested that we, Soviet scientists, should not condemn the actions of Sakharov and more than that, should protect him. Let us say directly that we think your claims are groundless and it would be useless to continue the exchange of letters on this matter."

Keldysh also states, "As is known, Sakharov was not subjected and is not subjected to any discrimination. Until now he has full opportunities for active scientific work."

SAKHAROV

APS considers plan for energy study

Three studies designed to identify what physics can contribute toward long-range solutions to the nation's energy problems were proposed to the Council of the American Physical Society at its 26 October meeting. The proposals were prepared by the APS Energy Study Planning Committee, which met at Los Alamos Scientific Laboratory in late August (see PHYSICS TODAY, August, page 65).

The committee decided to examine three different facets of the energy situation. The titles of the proposed studies are: "The physics of energy: specific applications," "Technical aspects of energy conservation" and "An investigation of technical aspects of nuclear safety." All three studies, which would take place during the summer of 1974, are intended to yield definitive reports. To maintain objectivity, independent review of the reports would be solicited.

The energy-study meeting was divided into two parts—an initial four-day session of briefings, organized by Frank Von Hippel of Argonne National Laboratory (on leave at the National Academy of Sciences), followed by three days devoted to working out proposals the APS could effectively undertake. Jack Sandweiss of Yale University was chairman at the meeting.

"The physics of energy" would review and analyze fields of physics relevant to energy technology, attempting to identify roadblocks to the use of physics-related technologies, both available and yet to be developed, and to suggest promising lines for future research. Subjects assigned high priority include catalysis, two-phase heat transfer and fluid dynamics, high-voltage breakdown, radiation effects on materials, superconductivity technology, geophysical energy sources, reaction dynamics (especially combustion), photovoltaic and photochemical processes, and friction and lubrication. The report concluding the study would aid in the identification of particular physics problems for which support—through funding, through the or-

ganization of conferences, and through innovations in education—would contribute to progress in energy-related technology.

The second study, "Technical aspects of energy conservation," would seek to identify unresolved technical problems of energy conservation, as well as to bring to light available technologies that, for one reason or another, have not become widely used. It would also provide for critical review of recently proliferating "systems" studies of energy use, and for the preparation of new curricular materials for physics courses at all levels. Although the committee's proposal recognizes the widely held view that energy conservation depends primarily upon curtailment of demand—a solution that is a function of social and economic, not scientific, factors—the study would actually focus on the technical aspects of conservation *at the point of use*. Development of more efficient phosphors for fluorescent lighting, for example, could result in substantial energy savings on a nation-wide scale.

The study on the technical aspects of nuclear safety would make no attempt to resolve the numerous technical issues. Instead, its goal would be to define the unanswered questions, to analyze their potential significance and to describe an experimental program to answer them. The committee felt that this study could be of considerable benefit to the physics community because, unlike similar studies in the past, which have not always been conducted in a manner to command public confidence, this study provides an opportunity for the APS to sponsor a definitive and a trustworthy report.

The nation is currently experiencing a tight energy situation complicated by two related factors: the substantial delay in operation of nuclear power plants and the passage of the Environmental Protection Act of 1970. In 1966 the nation's power companies had estimated that 31 nuclear plants, producing an average of 800 megawatts each, would be on line by the end of 1972. But only ten of them were actually in operation by that time. Further compounding the energy shortage is the Environmental Protection Agency's ruling prohibiting the burning of high-sulfur coal by power companies. Over the last five years this has caused their consumption of fuel oil to skyrocket, from approximately 1.5 to 10 per cent of the nation's total annual oil consumption. Although the committee recognized the need for quick solutions to this problem, throughout their deliberations they took the point of view that it would not be feasible for an organization such as the APS to attempt short-term answers.

All three proposals call for both physicists and non-physicists to participate. Staffs for the studies on the physics of energy and on energy conservation would be composed of senior and junior members working together during an initial month-long session. A shorter meeting at the end of summer would provide for preparation of the final reports. The junior staff members would continue their investigations during the interim summer period and possibly after the conclusion of the summer study proper. These continuing studies might take the form of postdoctoral fellowships.

SANDWEISS

The staff for the nuclear safety study, which would last from six to twelve weeks, would be assisted by a group of visiting consultants. These consultants would give briefings during the first two weeks and would later assist in the analysis of specific technical areas such as fuel-rod failure, flow phenomena and computer code analysis.

If the proposals are approved by the Council, funding would be obtained and final proposals submitted by January 1974 so that staffs could be selected and other necessary preparations completed before the start of summer. —JG

1972 statistics reveal trends and attitudes

In an effort to reveal the strengths and weaknesses of US science and technology, the National Science Board has released *Science Indicators 1972*. The 145-page report is the fifth annual report of the board and should, according to board chairman Herbert E. Carter, "assist in improving the allocation and management of resources for science and technology, and in guiding the nation's research and development along paths most rewarding for our society."

On the international scene, the US and the UK spent less of their GNP on R&D in 1971 than in 1963; West Germany, Japan and the USSR have increased their proportion of R&D spending. By 1971 the US was spending 2.6% of its GNP on R&D as compared to an estimated 3% in the USSR, 2% in the UK and West Germany and 1.8% in Japan and France. The proportion of the US population engaged in R&D has remained constant from 1963 to 1971 (25 per 10 000 population) while it has increased in other major scientific countries (the proportion increased from 19 to 37 per 10 000 in the USSR for the same period).

In seven of eight scientific areas under study, the report shows, the US publishes a larger share of the literature than any other country, including 42.4% of the world's physics and geophysics literature in 1971. The US share in most areas has remained nearly constant from 1965 to 1971. In addition US scientific literature is the most frequently cited in most scientific areas including physics and geophysics.

The US "patent balance" continues to be favorable, but the proportion of foreign patents awarded in the US is growing in comparison to the number of patents of US origin granted overseas. The US, however, has increased its sale of "technological know-how" from 1960 to 1971. Since 1967, Japan has been the largest customer. Overall, the trade balance for high-technology products for the US has been favorable, with developing countries and western Europe being the largest purchasers. Since the mid-1960's, however, more high-technology goods have flowed from Japan to the US than from the US to Japan.

Changes in US science and engineering personnel took place during the 1960's. The number of active scientists and engineers rose to 1 731 000 in 1970, about 50% more than in 1960. Over the same period the number of PhD scientists and engineers has almost doubled (to 171 800 in 1970). From 1960 to 1970, the proportion of scientists and engineers employed by private industry dropped from 74% to 70%, while the percentage employed by universities and colleges increased from 10% to 14%.

Declines in federal funding per investigator have hit most of the sciences in during the period 1968 to 1972. Hardest hit was physics with a $16 073 allotment per scientist or engineer in 1972, down 32% from 1968.

Two surveys included in the report