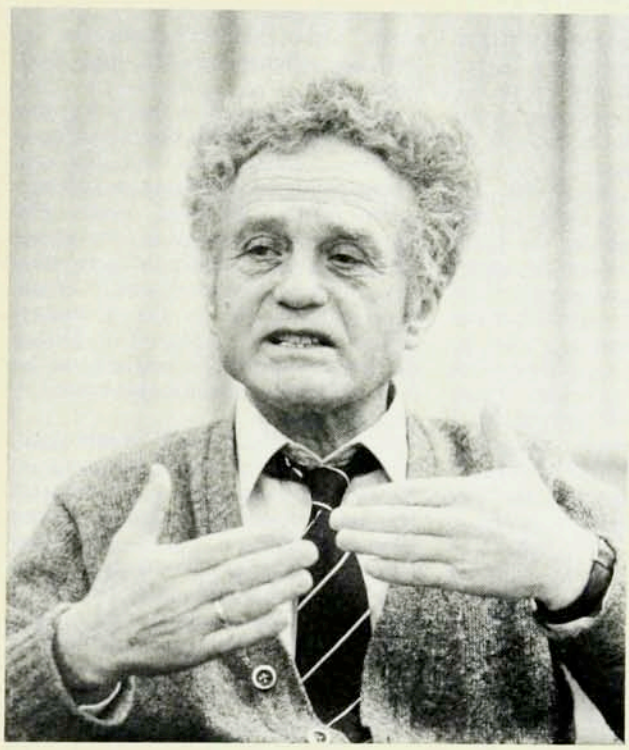
Orlov provides perspectives on Gorbachev's reforms

Because of Yuri Orlov's central role in the Soviet human rights movement, his intimate acquaintance with the Soviet political system and his international stature as an accelerator theorist, PHYSICS TODAY asked for an interview with him shortly after his arrival in the United States last October. He agreed in principle, and following a trip he made to Europe in the fall, the interview finally took place in Manhattan on 21 January. Bertram Schwarzschild and William Sweet represented the magazine, and Larissa Vilenskaya, an emigrée from the Soviet Union, served as translator.

Instead of concentrating on Orlov's work as a cofounder of the Moscow Helsinki Watch group and his years in prison and exile, episodes that have been amply covered in the US daily press, we found ourselves gravitating instead to his earlier career in accelerator physics, his assessment of Soviet work in the field, the origins of his political activism, his attitudes about the reform phases in recent Soviet history and his opinions about scientific exchanges. We found him to be frank and forthright throughout.



Yuri Orlov currently is a senior scientist at Cornell University in the Laboratory of Nuclear Studies, with affiliations to the program in the history and philosophy of science and technology and the Center for Radiophysics and Space Research. His main responsibility is to conduct independent research. While in internal exile in the Soviet Union, Orlov was applying quantum theory formalism to certain problems in psychology.

When we arrived for the interview at an address in west Greenwich Village, we found Orlov comfortably settled in a garden apartment ordinarily occupied by somebody named Banker, according to the name on the bell, adjacent to another apartment occupied by somebody called Bakunin. The names struck us as suggestive, and as it turned out, we did not have to wait long to find out where Orlov placed himself on the scale defined by the group Marx considered his principal enemy on the right, the international bankers, and his leading adversary on the left, the anarchist Mikhail Bakunin.

In 1944, during World War II, Orlov became a candidate to join the Communist Party, believing the official dogma. But his views began to evolve. He burned his notes on Marx and Lenin in 1946, knowing they contradicted government policy. As a student embarking on studies in Moscow, Orlov said, it was clear to him that his views were those of a social democrat and not consistent with official dogma. However, he became a member of the communist party in 1948 because it would otherwise have been impossible to get his university degree.

Following Orlov's graduation from Moscow University in 1952, he went to work at the Institute of Theoretical and Experimental Physics in Moscow, where he was elected a member of the party bureau responsible for scientific issues. At a meeting of the bureau in 1956, following the so-called secret speech in which Nikita Khrushchev "unmasked Stalin" at the 20th Party Congress, Orlov and three colleagues in the party bureau pressed for a "program of democratization upon the basis of socialism—democratic socialism."

As a result of those statements, which went much further than anything party leaders were prepared to entertain, the entire party unit at ITEP was disbanded and Orlov and his three colleagues were fired and expelled from the communist party, Orlov told us. Later, when the director of the institute had an opportunity to complain personally to Khrushchev about the firings, Khruschchev told him that the four should consider themselves lucky that they were merely fired and not arrested, because some members of the Politburo had demanded their arrest.

First organized dissidence. The firings led, by a curious route, to what Orlov believes was "perhaps the first instance in the Soviet Union of people almost openly providing material help to people who were ostracized for political reasons."

"There was a paragraph in an article in *Pravda*," Orlov related, "accusing us, the four individuals, of repeating

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Menshevik and social revolutionary ideas. [The Mensheviks vied with the Bolsheviks for leadership of the communist movement before the Russian Revolution.] There also was . . . an attack on us in a secret letter of the Central Committee that was circulated in all party organizations of the Soviet Union. It provided us with quite some publicity. . . . Our colleagues at scientific institutions in Moscow and Leningrad collected some money for us because we were unemployed and, as you know, in the Soviet Union there is no unemployment allowance."

'It was perhaps the first instance in the Soviet Union of people almost openly providing material help to people who were ostracized for political reasons.'

After being unemployed for six months, Orlov went to work in late 1956 for A. I. Alikhanian at the Yerevan accelerator center in Armenia, where he did theoretical work for the electron synchrotron being built there. In 1960, on the occasion of a visit by Khrushchev to Armenia, Orlov received his security clearance back. ("Oh yes, it's time to forget all this," Khrushchev had replied when A. I. Alikhanov, the director of Orlov's former Moscow institute, said, "I want my guys back.") Upon completion of the Yerevan accelerator in 1967, Orlov was given to understand that he could be reinstated as a party member. He was tempted to accept because he would have liked to be eligible for foreign travel, but he declined after Alikhanov by now the ex-director of ITEP, advised him not to "give in to this shit."

In 1968 Orlov was elected a corresponding member of the Armenian Academy of Sciences and in 1972 he was permitted to return to Moscow. Until 1973, however, when he helped found an Amnesty International group in Moscow, he was not involved in any kind of organized political activity. In May 1976 he announced the founding of the Moscow Helsinki Watch group, he was arrested in early 1977, and in May 1978 he was sentenced to seven years of "strict-regime" labor camp plus five years' internal exile.

Looking back on the events that led to the founding of the Helsinki Watch group, Orlov is "quite convinced" that it was "a cynical move" when the Soviet government signed the Helsinki Accords in 1975. "They were convinced that the West would not demand anything, any adherence to any provisions," he said.

Reforms under Khrushchev. Asked to comment on the origins of political dissidence in the Soviet Union, Orlov reminded us that 1956 was a year of political activity, "activity within the framework of the Communist Party." In addition to the incident involving Orlov and his colleagues at the institute, there were similar though less publicized examples of people openly advocating political change. "But to be exact," Orlov said, "it's possible to say that Khrushchev was the first dissident."

Orlov commented on the extent and limits of Khrushchev's liberalization as follows: "Khrushchev initiated and conducted the mass freeing and exoneration—rehabilitation—of people who were in labor camps. Many thousands of people were rehabilitated, and many camps were liquidated, and Khrushchev put an end to the practice—widespread under Stalin—of letting thousands of people be convicted on the basis of false denunciations invented by private citizens."

"During Stalin's time," he explained, "many people were sentenced because of slanders, testimonies and contacts that were literally invented. Under Khrushchev, there was no such thing. For example, at my own trial, you can speak about the trial itself, the conclusions they made—that's one thing—but I did really carry out some kind of activity."

"During Khrushchev's time," he continued, "some branches of science that had been suppressed under Stalin were allowed to develop—cybernetics, genetics, quantum chemistry. . . .

"Another important step taken by Khrushchev was the beginning of contact with the West, and especially with groups of scientists abroad. . . . And he was the first to start buying wheat abroad.

"Khrushchev also started the first real program of improving and constructing apartments to alleviate a terrible housing shortage.

'But to be exact it's possible to say that Khrushchev was the first dissident.'

"There was a period of some relaxation of restrictions,—to a certain extent, freedom of the press. But it was just a small step. Even less than is going on now.

"Also, Khrushchev increased pensions, retirement benefits. Before, for example, my mother received a pension of just 20 rubles per month.

"There were some changes in criminal law; in particular, the 25-year sentence was abolished. Now the maximum sentence given down was and is 15 years, but of course, on the bad side, there was and still is capital punishment. And a political article of criminal law was reformulated at that time, Article 70, which [concerns] anti-Soviet agitation and propaganda."

Suppression of science. We asked Orlov to expand on his remark about Khrushchev's rehabilitating quantum chemistry. Orlov said that scientists who followed the chemical theory of Linus Pauling had been labeled "cosmopolitans" in the Stalin era. The authorities also had an active campaign against geneticists and were preparing a similar ideological campaign against relativity theory and quantum physics in the late 1940s. According to a story Gersch I. (Andrei) Budker told Orlov, I. V. Kurchatov talked Stalin out of the move by explaining that "the whole of nuclear physics would be stopped."

We asked Orlov whether the situation was similar to Nazi Germany, where opposition to relativity and quantum physics was closely linked to anti-Semitism and established physicists such as Johannes Stark and Philipp Lenard provided racist attacks with an intellectual respectability. Orlov's impression was that there was no *official* anti-Semitism in Soviet Russia before and during World War II. After the war the attacks against genetic, cybernetics, relativity theory and quantum theory came mainly from "party functionaries and many Marxist philosophers because of the political and philosophical education they received in the Soviet Union—quite narrow and dogmatic." These attacks were sometimes anti-Semitic (as in the case of attacks on Einstein), and sometimes simply anti-religious (as against Mendel's theory) or anti-American (cybernetics).

After the war, also, attacks against Jews generally became more open. When Orlov was studying at the Physical Technological Department of Moscow University, it was reorganized as the Moscow Physical Technological Institute specifically so that Jewish students could be excluded and sent to less prestigious provincial universities. "The department was organized ac-

cording to a personal directive from Stalin," Orlov said. And toward the end of Stalin's life, several of the greatest Jewish physicians in the USSR were falsely accused of poisoning Stalin and were arrested.

As for Khrushchev's attitude, Orlov thought he reversed the very extreme anti-Semitism of the late Stalin period. But the issue ultimately came to be linked with Middle East politics. When the government finally decided to take the Arab side, anti-Semitism arose again in education and jobs, Orlov said.

Accelerator physics. Asked to account for why the Soviet Union has not been more successful in getting more good physics out of its high-energy accelerators over the last 20–30 years, Orlov mentioned several factors.

"First, the size of accelerators at the start was chosen less for reasons of science than of political prestige, especially the desire to simply have bigger accelerators than those abroad. An accelerator is not a factory for producing, for example, tractors, so that you can build the eleventh exactly like the ten previous ones.... You have an accelerator of 10 GeV, and just to set energy records you construct an accelerator of 15 GeV. You have an energy of one-and-a-half times more, but in the center of mass system on a stationary target, it's [only] a 20% increase. Then there are no new data.... One should use an exponential scale and make large changes from one energy to another." Scientists often had to pretend to be designing less powerful machines than they really intended to build, Orlov said. Thus, the stated design energy for the Yerevan electron synchrotron was 3 GeV, but really they were shooting for 6 GeV.

Second, the national planning procedures have helped make accelerators out of date before they were built. "As you know, there is a planned economy in the Soviet Union, and the plan is done for each five years. And now, if you design something and want to get it implemented fast, you can't do anything during the current five-year plan because all funds are already allotted. Therefore you can plan only for the next five-year plan. If let's say, it's now the first year of a five-year plan, then you have to wait for four years just to get funds to cover just the next five years."

The cumbersome planning process partly accounts for why it took so long to build the 60-GeV Serpukhov proton synchrotron, Orlov said. By the time it came into operation around 1967, it had only twice the GeV of the alternating gradient sychrotron at CERN and contributed little new physics.

Third, the size of accelerators has been limited by a shortage of funds. Today, Orlov thinks, there are insuperable difficulties in getting enough money and good technology for accelerator physics.

'It's quite obvious that liberalization of the Soviet Union is necessary for scientific development. It is important for all areas of Soviet life. And therefore those who struggle for liberalization consider themselves patriots and are patriots.'

Science secrecy. The fourth factor Orlov mentioned was secrecy. "It's quite unlike the United States. Almost everything connected with accelerators was at that time secret in the Soviet Union. I was the main person in Yerevan who did all the calculations, all the theoretical work. But after 1956 I lost my security clearance. And so every time I finished my own calculations, I had to give them to the Special Department of Secret Information, and then I could not get them back because I didn't have the necessary clearance. When we went to Leningrad, where the technological part was done, I went together with a colleague who had the necessary clearance. My colleague went to the Scientific Institution, discussed all the questions, and... then he came back to the hotel, discussed everything with me and then went back to make corrections."

Fifth, foreign contacts: "I could use scientific journals—in our lab were the *Physical Review* and others. [But] doing science is quite difficult without personal contacts with scientists abroad, and it's one of the reasons science is done so slowly in the Soviet Union. As you know, what is published [in journals everywhere] is only a concentrated version of material. Many details are left out... and can be discussed only in personal contacts. Also, you need personal contacts to learn about work that has not yet been written up."

Sixth, outright political repression: "A mathematician at the Institute of Experimental and Theoretical Physics in Moscow, who is still living in the USSR, signed a petition in defense of the persecuted mathematician Yesenin-Volpin, who is now in Boston. The director of the institute, Alikhanov, was ordered to fire that person for signing the petition, which he refused to do. Three years later Alikhanov was fired from his job as director.... Of course such events don't contribute much to the free development of scientific research."

And finally, computers: "One more point about the Soviet Union is that it is seriously backward in accelerators because it's backward in computer technology. And if you ask why it's behind in computer technology, that goes back again to all these factors, which I would summarize as political interference with science."

Western pressure. "It's quite obvious," Orlov went on to say, "that liberalization of the Soviet Union is necessary for scientific development. It is important for all areas of Soviet life. And therefore those who struggle for liberalization consider themselves patriots and are patriots."

Orlov disagrees with those in the West who say "that we shouldn't irritate, shouldn't bother the Russian bear, and so on."

For example, when the Soviet authorities regularly refuse permission for some invited Russian scientists to attend conferences abroad and instead try to send substitutes, Orlov thinks that "a scientific boycott is justified."

"There could be other kinds of actions not so drastic. If, for example, as often happens, they want to send scientists other than those who were invited, then American scientists could take steps not to accept them.

"[Or] if there is a conference in the Soviet Union, and American scientists, Western scientists, invite some dissident scientists to participate, and they are not allowed to participate, then the American scientists could refuse to participate as a protest."

After all, Orlov explained, "it's the first time in Soviet history that the Soviet government has admitted that it really cares about Western public opinion. Before, they pretended that they didn't care at all. They just laughed."

'[The dissidents] threw themselves on the barbed wire in the hope that someone could cross later, moving over their bodies.'

Gorbachev. Recalling that Orlov had referred to Khrushchev as the Soviet Union's first dissident, we asked him to comment on the views that liberaliza-

tion started with Yuri Andropov and that both Andropov and Mikhail Gorbachev came to power in close alliance with the KGB. Orlov emphatically took issue with the first view.

"The KGB tries to pretend that what Gorbachev is doing now started under Andropov. What was under Andropov was strengthening the borders and strengthening the Russian discipline. You can't call this liberalization."

As for KGB support for Gorbachev, Orlov said, "The KGB has long thought was that all problems encountered by the Soviet Union, or all the reasons why the Soviet Union is behind the West, are due to the middle-level workers, the bureaucratic level. As long as Gorbachev tries to struggle with this middle bureaucratic level, the KGB supports him.

"But it's evident that Gorbachev transcends this simple idea and goal. Or maybe it's not his goal to go further; the current of events makes him go further.

"We have to remember public opinion in the Soviet Union—some things which several years ago were discussed only among dissidents now are discussed among very broad circles of the intelligentsia. [And] in circles of Western public opinion, while ten years ago only a very few individuals in the West spoke about human rights in the Soviet Union, now it is a subject of discussion almost everywhere, and that also is a very important influence on the Soviet Union.

"Now the issue of human rights is a part of official policy in many countries and many states, and it started in the United States during the Carter Administration. This process leads to improving the human rights situation in all countries in the world."

Marchenko. We asked Orlov whether he would like to say something about Anatoly Marchenko, who died last 8 December in the 6th year of a 15-year prison term for spreading "anti-Soviet propaganda." Marchenko was a worker–dissident who wrote an account of the post-Stalin era labor camps and joined the Helsinki monitoring group in 1976.

"Yes of course," Orlov said. "Marchenko joined the Helsinki group when he was in exile, and this is very unusual because usually people are more inclined to conduct human rights activities either when they're free or when they're in the camp. Exile is a kind of situation where people understandably find it hard to risk being imprisoned.

"Marchenko was a very bright and courageous person. Many people did not understand his position in relation to emigration. He believed that every Soviet citizen should have the right to leave the Soviet Union and return to the Soviet Union. But for himself personally, he didn't want to leave the Soviet Union. He wanted to continue human rights activities inside the Soviet Union."

Referring to the element of self-sacrifice in the conduct of the Moscow dissidents, Orlov said, "They have thrown themselves on the barbed wire in the hope that someone could cross later, moving over their bodies. So that then we can overcome."

—WILLIAM SWEET

Advances in superconductivity challenge APS communications

Page 381 of the March *Bulletin of the American Physical Society* contained the following four-line announcement: "Special panel discussion of the division of condensed matter physics: High T_c superconducting materials. Trianon Rendezvous." That and an equally terse announcement on page 744 were the sole references in the 632-page *Bulletin* to the meeting on superconductivity, but they were enough to attract the attention of thousands of physicists, who found themselves crowding the corridors of the New York Hilton late in the afternoon of 18 March. "Doors will open at 6:45," signs said, reinforcing an atmosphere that was more like a Broadway opening than a normal APS session (see PHYSICS TODAY, April, page 17).

Organizing on extremely short notice what turned out to be an eight-hour session with 53 presentations was a formidable challenge for APS officers and officials. Even before the special superconductivity session was arranged, 3300 invited and contributed papers had been sorted and scheduled for 330 sessions at the March meeting. The March meeting on condensed matter physics generally has set a record for numbers of papers and sessions in recent years, and this year's meeting was no exception.

The initiative for the high-T_c superconductivity session came from Paul Chu of the University of Houston and Neil Ashcroft of Cornell University, the outgoing chairman of the APS division of condensed matter physics. About a week after returning to Ithaca in early December, having just presided over the exhausting job of sorting and scheduling papers, Ashcroft received a call from Chu asking him what he would think "if I said I had a 41-K superconductor." Ashcroft said, "Incredible, tell me more," and Chu proceeded to tell him about the major advances achieved in Switzerland, China, Japan and at AT&T Bell Labs.

Ashcroft discussed the situation with members of the division's executive committee and decided to squeeze in a panel on high-T_c superconductivity, followed by a discussion period in which anybody would have the opportunity to report results. "I wanted to avoid disenfranchising anybody," Ashcroft says. Chu assisted with the selection of the initial speakers.

Ashcroft asked M. Brian Maple of the University of California, San Diego, the incoming chairman of the division of condensed matter physics, to head the panel. As soon as they made their plans known, Ashcroft and Maple were inundated with phone calls, and by the end of January it was apparent to Ashcroft that the session "might go off like a rocket."

By this time, Ashcroft and Maple were in almost daily contact with James Spellos, the APS meetings manager, who had the foresight to schedule the session for a large room in the Hilton and then to move the session to the still larger Sutton Complex as it became apparent that attendance would be enormous. Participants in the APS meeting were polled during registration on whether they intended to take in the superconductivity session.

The breakthroughs in high-temperature superconductivity, which were being compared in the corridors to the inventions of the transistor and the laser, were a windfall for the organizers of a historical session on "75 years of superconductivity," which was scheduled for the day before the session on high-T_c superconductivity. A very large crowd packed itself into the Trianon Rendezvous to hear presentations the evening of 17 March by Per F. Dahl (Brookhaven National Laboratory), Gordon Baym (University of Illinois), Robert Schrieffer (University of California at Santa Barbara) and Philip W. Anderson (Princeton University).

Videotape. APS has made available a videotape of the 53 presentations made during the evening session on high-T_c superconductivity. Six hours long, the videotape is a complete recording of all the speakers at the session, including all the slides and graphs presented. The tape has been edited to remove long pauses between speakers, and speakers and their institutions are