

CURRENT SCIENCE

Volume 59 Number 1

10 January 1990

Andrei Dmitriyevich Sakharov (1921–1989)

A life full of concern for fundamental issues, and an optimistic and often visionary viewpoint.

One of the most striking chapters in the history of the struggle for human rights came to an end with the death of Andrei Dmitriyevich Sakharov. His sudden, unexpected death was announced by two young men running down the street, wailing 'Comrade Sakharov is dead! Comrade Sakharov is dead!' Thousands of Muscovites, not believing their ears, gathered to pay tribute to this great man—as did millions of people all over the world, who acknowledged him as the conscience of humanity. On the television tens of thousands of people were seen to weep without restraint at his funeral. One could feel the influence he must have had on his people. He was definitely the most respected figure in the Soviet Union. Two thousand delegates at the Kremlin stood in silence to honour the man whom the Communist Party had reviled a few years before as a traitor and a slanderer.

Such was his moral position that once, when during an address to the Kremlin Congress he was asked 'Don't you respect this Congress?', he replied: 'Yes, but I respect the country and the people more. My mandate extends much beyond the bounds of this Congress.'

Born in Moscow on 21 May 1921, he was recognized early as an outstanding physicist. He himself wrote, without any fanfare, 'In 1948 I was included in Igor Tamm's research group which developed a thermonuclear weapon.' When he helped develop the Soviet hydrogen bomb, his country attained the status of a superpower. This brought him enormous privilege. He became the youngest member of the prestigious Soviet

Academy at the age of thirty-two. He received the Lenin Prize, the Stalin Prize, three Orders of the Hero of Socialist Labour, and many other recognitions. His scientific genius also brought him international renown.



Together with Igor Tamm, a Nobel laureate, he gave the theoretical basis for the use of thermonuclear energy for peaceful purposes. About this collaboration Sakharov wrote, 'In 1950 I collaborated with my teacher in some of the earliest researches in the control of thermonuclear reactions.'

Sakharov proposed the principle of magneto-thermal isolation of plasma using the principle of toroidal magnetic bottles, which later became famous under the name Tokamak. In 1952 he initiated experiments on magneto-implosive generation devices to transform the energy of a chemical or nuclear explosion into the energy of a magnetic field. He was able to achieve an ultrahigh magnetic field of 25 million gauss, corresponding to a pressure of 25 million atmospheres. The use of thermonuclear reactors to produce fissionable materials as fuel for atomic power plants was another of his important research programmes.

Sakharov and Zel'dovitch were the first to recognize and to pursue the amazing potential of mu mesons to catalyse fusion reactions in cold deuterium. Writes Harold P. Furth of Princeton University, 'The energy balance of the mu meson-catalysed reaction is so remarkably close to being economically attractive that the quest for some practical solution has not been abandoned and might even succeed in the long run.'

Perhaps the most remarkable paper that Sakharov

Perhaps the most remarkable paper that Sakharov

wrote is on the baryon asymmetry in the universe. In traditional cosmological models baryons and anti-baryons are created in pairs. In the so-called 'symmetric' cosmologies there is a phase transition near 1 GeV, which results in the separation of nucleons and antinucleons. The basic difficulty with this theory is that there is no evidence for the presence of large amounts of antimatter in the universe. In this paper (1966), entitled 'Violation of CP invariance, C asymmetry and baryon asymmetry in the universe', Sakharov anticipated research by twelve years! What is remarkable about this paper is that it completely and correctly states all the essential points of the *current thinking* on this issue. He also understood the role of the CPT theorem and the need for rapid expansion of the universe during the baryon-producing era. He also suggested that superheavy particles (which he called maximons) must play a primary role. These correspond to the *X* bosons of more modern theories. Says L. Susskind of Stanford, 'I would like to re-emphasize the boldness and the essential modernness of Sakharov's astonishing 1966 proposal and to state again that this work was the first to give cogent reasons for the belief that the proton might decay.'

He extended the 1966 work in 1980 in Gorky, where he had been so cruelly banished. About this, H. J. Lipkin of the Weizmann Institute says, 'It is remarkable that Andrei Sakharov has been able to produce such work under conditions in which he did not even have access to the literature.'

Summarizing Sakharov's work J. D. Bjorken of the Fermi National Accelerator Lab writes:

While the world at large respects and honours Andrei Sakharov for his vision and courage in dealing with fundamental problems of contemporary society and of basic human rights, the physics community has great reason to honour and respect his scientific contributions. . . . These contributions exhibit, on the whole, an approach which parallels what we see in his work on social issues—a concern with fundamental issues, an optimistic and often visionary viewpoint but a viewpoint nevertheless tempered with pragmatic elements as well.

Sakharov had money, he had privilege, and in fact, as he himself said, he had everything. Yet he was dissatisfied. From 1953 onward (from the time of his election to the Soviet Academy) many things troubled him. He began to contemplate on the many moral issues associated with science and its application. Slowly the change in his social and political views took place. He started a new career in the service of not just science or the State but of the universal ideals he felt science had neglected and the Soviet ideology and Soviet State had abused. The human rights issue became an obsession with him.

He joined the Lake Baikal Committee organized to protect the largest freshwater lake in the world from

industrial pollution. This work was tolerated by the Soviet Union for some time and the lake was cleaned up. He then felt that the thermonuclear tests already conducted would mean unacceptable genetic damage and further tests would be contrary to humanity and international law. He therefore began to campaign to halt or limit the testing of nuclear weapons. It is said of him that the first half of his life was spent making nuclear weapons and the second half in unmaking them!

Armed with only his conviction he braved the awesome police powers of the Soviet State when he also turned his attention to the measures taken by the State to suppress free opinion. His first appeals on behalf of victims of oppression date from 1966. He courageously wrote a letter to Brezhnev condemning the arrests of Aleksander Ginzburg and Yuri Galanskov. He then wrote the famous tract *Thoughts in Progress, Coexistence and International Freedom*, which was circulated underground in Moscow and appeared in excerpts in the West. This was going too far: he had, according to the Soviet State, crossed the limits of its endurance.

For his courage he suffered terrible retribution at the hands of a frightened Kremlin. He was stripped of his security clearance and banned from working on secret projects. He was muzzled and exiled to Gorky, with no opportunities of meeting fellow scientists, excommunicated from many of the privileges of the Soviet establishment, and deprived of all the awards that a proud State had presented to him earlier. To some extent, his stature shielded him and his membership of the Academy was never terminated. And because he sought it not, Sakharov attained a type of political power that even the topmost politicians might envy.

Sovietism had reached a dead end. It was clear that, for sheer survival, the Soviet people had to be led back a long way. The leadership of President Gorbachev promises to fulfil some of the ideals Sakharov championed. Sakharov gave Gorbachev credit for the historically essential *perestroika* and agreed that, at this point of time, there is no alternative to Gorbachev's leadership. Sakharov's remarkable fifteen-point appeal to Brezhnev bears an uncanny resemblance to Gorbachev's *perestroika*. The very word *glasnost* was inducted into Soviet polity by Sakharov fifteen years before Mikhail Gorbachev made it his word. Sakharov stated in no uncertain terms that the attempts to make the Soviet economy work could not succeed without *glasnost*.

What sort of a man was he—this man who almost shook the world? His perceptive science brought him renown, his humanism and suffering made him wise—but the two together gave him an awesome reach within his society. There was no doubt that he was the most respected public figure in the Soviet Union.

When he was awarded the Nobel Peace Prize in 1975

he ended his speech (read out by his wife as he was not permitted to receive the prize) with 'I would ask you to remember that all prisoners of conscience and all political prisoners in my country share with me the honour of this Nobel prize', and went on to give, one by one, the names of many of these prisoners. And when he heard the voice of Gorbachev on the telephone saying that his forced exile was over and that he could return to Moscow, his first words were again to plead for those who were under greater persecution than he, asking that all political prisoners be released. In an era of repression and silence his was a lonely voice for human rights, for political freedom, and the end of nuclear terror.

There is only one other man of this century who has ever commanded so much moral authority over his fellow men—Mohandas Karamchand Gandhi. Sakharov himself acknowledged the immense influence Gandhi had on him. They were similar in their gentleness and personal manner, their being driven by the ethic of deep kindness and consideration towards their fellow men, their incomparable physical and moral courage, their

embracing individual conscience and responsibility. Because they took on other people's troubles on their own shoulders humanity looked up to them as saints. Yevgeny Yevtushenko says in his poem 'The heart on strike', 'His death has left a terrifying void in the moral life of the Soviet Union and the world.'

There is understandable anxiety whether Sakharov's death will diminish the cause of human rights in the Soviet Union and in the world. But there are others who feel it is unlikely as he has converted thousands, including Gorbachev, to take up much of his work.

We end this essay with a quotation from Sakharov himself:

Yet we should not minimize our sacred endeavours in this world, where, like the faint glimmer in the dark, we have emerged for a moment from the nothingness of dark unconsciousness into material existence. We must make good the demands of reason and create a life worthy of ourselves and the goals we only dimly perceive.

Yes, of him it can truly be said that when he died he left the world the poorer.

The quality of research in *Current Science*

What kind of research papers in life sciences should be published in Current Science? The pride of a scientist cannot be compromised with attempts to publish poor-quality papers based on mistaken justifications. In this and the next few issues, Current Science offers opinion.

Beginning this issue, *Current Science* will appear in a new format. Earlier announcements have already outlined the features that would find place in the journal. In addition to these features, it is obvious that original research will continue to be reported. Since a majority of papers received are in the broad area of life sciences, it is imperative to evolve some norms to identify original contributions. I feel a clear perception should be there as to what this premier Indian journal stands for. Over the years *Current Science* has acquired a 'human touch' in seemingly maintaining the quality of research papers published. The argument runs as follows: In India there are a limited number of well-endowed research institutions with competent people; these scientists are able to publish in the best of international journals; but what about the majority languishing in impoverished laboratories, university departments and, in particular, colleges? their career uplift also needs publications; *Current Science* with its wide circulation and popularity can provide a forum for these publications. In such a situation the referees tend to give a concession to papers submitted to the journal.

The time has come to re-examine the situation. There is a new-found urge to achieve in India. Everybody talks about evolution of Indian journals with high credibility and international standards, so that Indian scientists would be enthused to publish good papers in them. And yet, unless

good papers are published the journal cannot acquire credibility and international standards. It is clear that this circular argument brooks a solution. The only solution is that the journal should set high standards for publication. This should make the majority of scientists in less-fortunate circumstances fight the system and achieve despite the odds. It is well recognized in the country that the reason for poor standards of research is not just lack of facilities, but also the lack of a will to achieve. This is clear from the fact that, even in an impoverished environment, there are pockets of spark and research activity of high calibre. How is this possible? I feel that the pride of a scientist cannot be compromised with attempts to publish poor-quality papers based on mistaken—even harmful—justifications resting on reasons such as lack of facilities.

One can argue over what kind of research should be published in *Current Science*. It is difficult to evolve a norm except to state that the findings should be new, novel and of significance. It is perhaps easier to state what kinds need not be published. A large number of notes appearing in *Current Science* concern one or the other of the following:

1. Description of a 'new' species or a strain of an organism with some morphological data. It is usually stated that this is the first report. The evidence for a new species is far from