



Physicists

Epoch and Personalities

E L Feinberg

 World Scientific

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Preface

From the Author

In a phantasmagoric sequence of happy and tragic events, joyful and depressingly grieving feelings which one calls life I have by no means faced only misfortunes but was also astonishingly lucky. Leaving aside even the fact that a nonchalant and soulless ‘red wheel’ for some reason did not come over me although passed nearby and heavily influenced lives of people close to me, I was lucky in two more most important situations that determined my life. One of them is of a too personal nature to make it appropriate to describe it here. Another one — a lucky ticket that I got in a lottery is a reason for writing this book.

The thing is that at a young unwise age I somehow got attracted to physics which at those times was of little interest to anybody beyond the school walls. After overcoming some difficulties characteristic of those times (and, strangely, to a certain extent due to them) I finally became a student of the physics faculty of Moscow university (at hard times both for the country as a whole and for a student who did not have “working experience”). Luckily from there I went directly to FIAN, the P.N. Lebedev Physical Institute of the Academy of Sciences. For the whole life to come I found myself in an atmosphere of high science, true intelligence, honesty and moraling that was close to me. This atmosphere was determined by people from the generation of my teachers (as well as by some of my coevals). During decades that were tragic for our country and its great culture these people were able to withstand fear and temptation and preserve themselves as persons.

Of course at those times one met many such people: In other sciences, in arts, in literature, among bearers of our culture — ‘ordinary’ people who were not very noticeable and among the intelligentsia that withstood everything.

It is precisely due to such people that a broad flow of our culture which in the horrible atmosphere of the epoch did at times narrow and become more shallow did not disappear completely under the pressure of ignorant and cruel rulers and imposed 'ideology' befuddling millions. It is precisely thanks to this hunted intelligentsia despised both by authorities and half-educated masses and thanks to an ever living talent of people feeding this culture it survived until nowadays (albeit with some mercilessly torn out sections) and again promises to become an ennobling and refreshing stream.

A poet, Nikolai Glazkov, wrote¹:

I watch the world from beneath a table
The twentieth century, the unusual
The more it is of interest to historians
The more grieving it is for contemporaries.

Thanks to the above-mentioned people I did not have to observe the terrible world 'from beneath a table.' Therefore I find it necessary to tell what I know about them, what I was a witness of.

I was close to some of these people, to some — very close. I observed others somewhat sideways for time long enough to understand their salutary influence and at the same time to keep an ability of an individual judgment (they taught me this themselves — of course not by edification and admonition but, without unnecessary words, at an example of their behavior). This does not mean that I did not notice their human weaknesses but all this was of secondary importance with respect to the main feature — their ability to preserve one's personality in a really too 'unusual century.'

Unfortunately totalitarianism was present not only in our country. Therefore it was important for me to compare what we lived through with what happened in Hitler's times. In such a way there appeared an essay on Heisenberg. Here a "memoir content" is naturally more scarce. Nevertheless I gathered this material persistently and for a long time. Therefore it is of more a research character and goes beyond a declared general topic. It describes reasons for Hitler's coming to power, a failure of the German "uranium project" and other questions. It turns out all of them are interrelated.

Almost all the essays and memoirs have already been published in some form. However, a new epoch gave a possibility of their significant enrichment with materials to which previously it had not even been possible to

¹Translated from Russian by A. Leonidov.

allude. In addition new, sometimes astonishing facts and documents were uncovered. Therefore much has been written anew or significantly rewritten.

I have to apologize to the readers for the fact that in some cases the material of one of the essays appears in another one. I tried to diminish a number of such cases but with only partial success. At the same time one should take into account that in the book of this sort the essays are not always read one after another, sometimes even not all of them, and are often chosen according to one's taste.

I allowed myself a little liberty and included into the chapter on A.L. Mintz memoirs of my wife V.D. Konen describing the features of this person that were not touched by myself.

Unfortunately I have not been capable (so far?) to write on all equally remarkable people which one has to write about and on whom I can tell a lot, on L.I. Mandelstam, G.S. Landsberg, A.A. Andronov and others. Let it however at least be what it is now.

E.L. Feinberg, 1999

Foreword to the Second Edition

The second edition differs from the first one in two main points. Firstly, in adding two new essays on Leonid Isaakovich Mandelstam (which was completely absent in the first edition) and the new short one on S.I. Vavilov that adds to what was already written before. Secondly, the essay on Heisenberg has been significantly expanded. In recent years there arose a new boom in a vast literature on him (in which one meets radically different opinions on his behavior during Nazi times for which he was subjected to ostracism by Western physicists) due to an appearance of new previously unreachable sources. The author's point of view differs from these opinions expressed by people who did not have a misfortune to live under an inhuman dictatorship. In the second edition this point of view of the author has been further sharpened.

Besides that I looked through the whole text, corrected the found misprints and stylistic errors and amended the text by small comments reflecting those sent to me by the readers. Using this opportunity I express my gratitude to all of them. Unfortunately I was again not able to write about many one has to write about.

E.L. Feinberg, 2002

Editor's Preface

The history of the twentieth century must yet be written. One of the most important elements in it is the tremendous influence of science compared with previous epochs. In particular, its development in Russia played a crucial role in the transformation of the country from agricultural to a highly industrial one, from the defeat in the First World War to the victory in the Second World War, to the production of the atomic bomb immediately following the US, and then making the first transportable hydrogen bomb, the launching of the first Sputnik (artificial satellite) and launching the first man into space.

How could all this happen and which people did it?

This book is written by a physicist who lived during these times and personally knew many scientists. It answers the above questions by describing the characters and fates of many leading Soviet scientists with wide analysis of that epoch and country rulers.

Among them, most prominent in the Western world is Andrei Sakharov, the father of the Russian hydrogen bomb, exiled to Gorky by the Soviet leaders for his quest for human rights and afforded in 1975 the Nobel Peace Prize.

His tutor, the Nobel laureate in physics (1958) Igor Tamm played an important role in the organization of the hydrogen bomb project and, together with Sakharov, was co-author of a means of producing a controlled thermonuclear reaction. Nowadays it is one of the main efforts in attempts to solve the energy problem of humanity.

Another well known person, especially among physicists, is Lev Landau, the 1962 Nobel laureate in physics, the author of the most popular series of books on theoretical physics.

The portraits of these and some other leading Russian scientists are vividly presented in the book within the background of political and intellectual life in Russia, the role of the revolution of 1917 and subsequent regimes, the immense growth of science and its applications in the twentieth century.

Their close relations with world scientists are described in interesting essays on Niels Bohr and Werner Heisenberg, especially in connection with their attitudes toward the atomic bomb project.

The special intellectual atmosphere in Russia, intermixed with personal tragedies is clearly seen in all essays. Many terms and expressions particular to Russian life have been used. The translation of the book posed severe

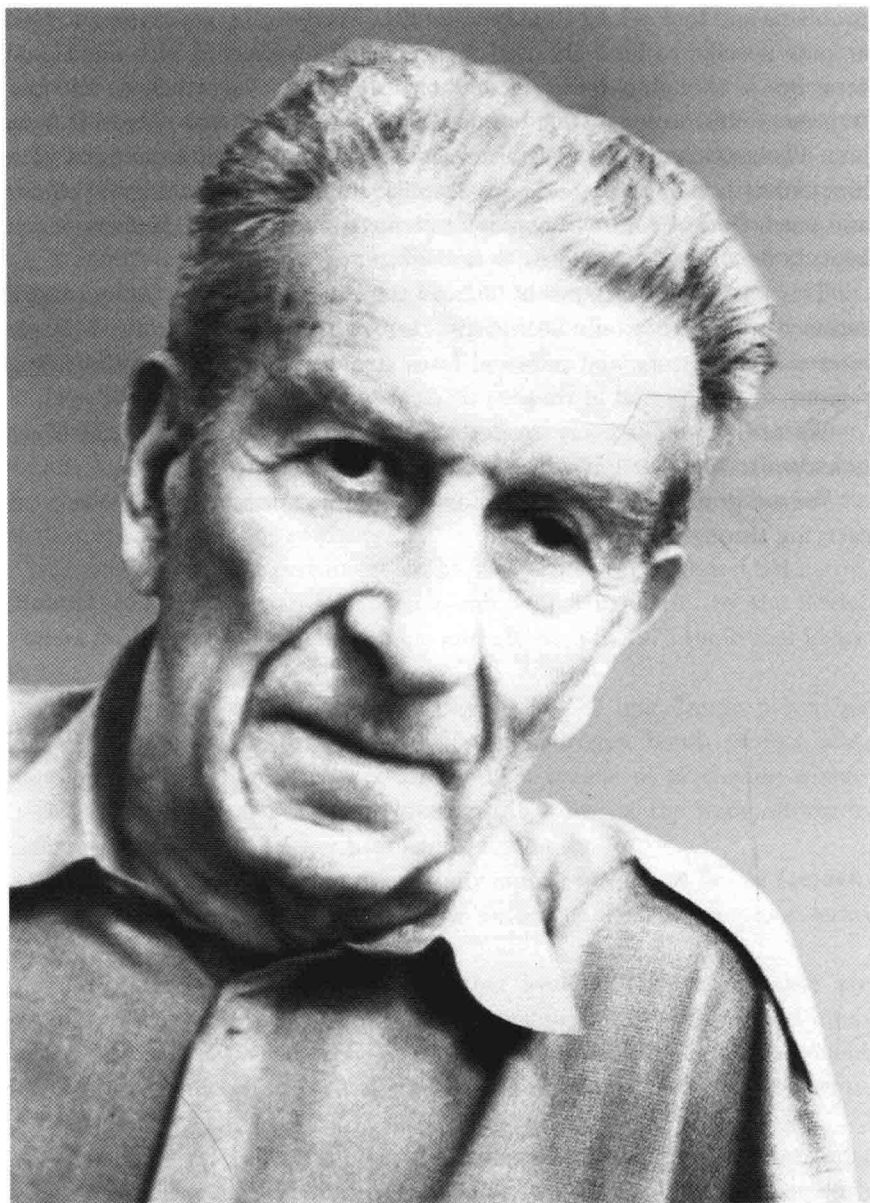
problems and took a long time because E.L. Feinberg's style of presentation is quite specific to him. He used rather lengthy sentences with additional branches of thoughts, quite uncommon in English. Nevertheless, we tried to preserve his personal style because for us it sounded as we heard it from him. We hope that many Western scientists who were well acquainted with him understand our wish and have a similar impression. It took great efforts and much time of Andrey Leonidov to translate the text in the form which kept its flavor and satisfied us.

This intellectual analysis of life and the role of science in the twentieth century is aimed not only at scientists but at the wide spectrum of people interested in history and personal fates strongly influenced by the ruling regimes of that period of time.

We are sure that every reader will find in this book facts which are unknown to him/her but which are extremely interesting.

We are grateful to Elena Nash and Igor Konstantinov for their help on carrying through this translation.

I.M. Dremin



E. L. Feinberg

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L.I. Mandelstam

Chapter 1

MANDELSTAM, Leonid Isaakovich (1879–1944)

1.1 Progenitor

A right-hand door under a dust-laden bust of Newton opens in a massive wall of a big physics auditorium in an old building of the Physics Faculty of Moscow University (still standing in Mokhovaya!). A relatively tall, slightly stooping, still dark-haired but already aging man in a dark suit enters the auditorium together with a group of people. Under an unbuttoned jacket which is hanging, due to his round-shouldered figure, one sees a waistcoat. In the waistcoat pocket the man has a watch that he will later check. On the nose he has frameless pince-nez which clip on to the nose bridge. He has soft cheeks and chin with rare but massive deep folds on the cheeks. A flat bag in the hands, he hastily stops behind the end of a ten meter long desk that separates the audience from the lecturer. Behind him are two big blackboards covered by black calico, which one can move, with a slight bow, by rotating by handle a glittering wheel below to the right, and a moving giant white screen between the two blackboards. The entourage (Igor Evgen'evich Tamm, Grigori Samuilovich Landsberg, Mikhail Aleksandrovich Leontovich, Boris Mikhailovich Gessen [philosopher and historian of science, a dean of the faculty at the beginning of the thirties until his, characteristic to these times, death], some more people) rush to their places in the first row. This is a row of chairs specially placed for today in front of the steep amphitheatre which, having altogether about four of five hundred seats, is full and buzzes, but sharply falls silent — a usual accompanying sound of the beginning of a lecture of a respected lecturer. Mandelstam starts at once.

Although he speaks with quite precise phrases, but he begins somewhat awkwardly. Something apologetic in his tone and even pose will also burst open later. However, he gradually warms up and reaches the state in which the only thing that is relevant for him in the world are the words spoken, the thought expressed. His voice is slightly nasal, not loud, and only the wonderful acoustics of the auditorium (subsequently reconstructed and now, unfortunately, non-existent), a clarity of the structure and contents of every phrase make this voice understandable, even for listeners in rear rows. Mandelstam does not make slips while speaking, does not need to correct himself, he pronounces only something he is sure upon and has been thought of. But, until the end of the lecture, he does not leave the saving spot between the end of the desk and the blackboard behind him. On the desk he places his lecture notes which he sometimes bends over or which he, having taken off the pince-nez and holding them with a hand somewhat aside, brings closer to near-sighted eyes. This combination of clarity and firmness in something important and softness of behavior is, as we shall see, characteristic of him. His entire appearance is a variant of that of a Russian-European intelligent¹ of a pre-revolutionary epoch. His entire behavior is that of such an intelligent, unbending in important matters, understanding and yielding in minor. An extraordinary mind power and a high spiritual, moral culture allows him to understand, better and clearer than others, what is truly important, and what is not. Niels Bohr behaves in the same auditorium in the same way a few years later. And, although the facial features of both are very different, and although in comparison to Mandelstam, Bohr is big-headed with bushy eyebrows and looks somewhat like a clodhopper, common generic features are evident.

This was one of the famous Mandelstam 'optional courses' of the thirties. They continued for many years — on theory of relativity, physical optics, theory of oscillations, quantum mechanics. The very word 'optional' always contains a shadow of being not really obligatory, not really useful. It was however sufficient to start thinking on what Mandelstam was talking about to understand its necessity for a physicist striving to 'get to the very essence'.

Mandelstam lectured in a somewhat 'chamber' manner. His formation as a person took place during an epoch in which science in general and physics in particular was the destiny of only a few. An audience of half a thousand

¹The word 'intelligent', widely used in this book, means belonging to intelligentsia, a social layer for which education and moral values are equally important. This term is specifically Russian and is in some way related but not equivalent to 'intellectual'.

people which, together with a lecturer, contemplated on fine details of a basis, historical and logical, of relativity theory or quantum mechanics was something new. The issues discussed were, in addition, an arena of loud fighting among ourselves. Although a whole generation of young scientists had grown up, for whom the ‘paradoxes’ of these disciplines were as non-existent as ones of a round form of the Earth or heliocentricity of the world for those that came after Copernicus, an influence of old concepts in scientific community was still strong. And in Russia an “authoritative” support which some (few in number, but loud-voiced) physicists, anti-relativists and anti-quantumists, got from some high-ranked (but too submissive to an official hard ideology) philosophers heated the atmosphere. Mandelstam did not argue, he quietly clarified. He was not afraid of evoking doubt and then having the pleasure of dispelling it by finding exact argumentation. The wide scale of thought, the boldness of following through an argumentation overrode the ‘chamberness’ and softness of speech, smile and gesture.

The words were pronounced seemingly evenly, but the voice did not sound lulling murmuring. There were some significant pauses. Some words were stressed. Having formulated some objection to a theory he would say slightly triumphantly, ‘But this is not so!’, and on ‘not’ jump softly, apparently vigorously pressed against an invisible spring.

He had his favorite sayings mainly originating from years of studying and working in Strasbourg. “Hier springt der Frosch ins Wasser (here jumps the frog in water),” he said when coming to express an important and sophisticated idea for resolving a difficult paradox. He liked the expression “put a finger on this” that probably replaced the biblical “to put fingers into the wound” (on a doubting Thomas). All this was somewhat old-fashioned for the young people of the thirties but so organic for Mandelstam that did not seem strange. As a witness and participant of great events in science he often did not distinguish between something that was already not worth explaining to the young audience and something that was really difficult. So, giving a detailed explanation of a notion of group velocity of a wave packet he would clarify it by using a complex image: A moving steamboat with “boys and girls” jumping from the water on the stern, running along the ship, and jumping back into the water from the prow. However it was easy to feel sorry for a student who would become so relaxed in the course of this explanation that would miss the subsequent subtle analysis of the “Fleming error” (found by Mandelstam himself in his younger years) or would not be attentive to a discussion of restrictions imposed by causality requirement on a definition of simultaneity in relativity theory. Here something important

would be missed. This is understood in the first row of the auditorium: A.A. Andronov, S.E. Khaikin, S.M. Rytov, G.S. Gorelik and everybody else, all professors themselves, are diligently writing down the lecture — to a future benefit.

And the auditorium was filled by students and Ph.D. students, not only from the university, but from other places, and also lecturers and professors from many institutes. Here they all lived in a high spiritual world, here reigned a passion and a joy of scientific understanding, a unity in comprehending the truth, a delight of belonging to a scientific brotherhood. Behind the walls there laid the dreadful world of the Stalin era: a world of lies and hypocrisy, a horror of “big terror”, an inhumanity. Inside there was a pure honest world of deep thinking and benevolence. A shelter for a person. A temple.

Only after about ten years since that time did I learn how these lectures had been prepared. When working on a five-volume edition of Mandelstam's scientific work I was offered a honorable task of preparing for print a text of his lectures on theory of measurement in quantum mechanics. The original material was in the form of lecture notes, taken by different listeners, of all five lectures given in 1939, in the first place the especially thorough notes by S.M. Rytov (I found my own notes long after these lectures were published). One lecture (the fourth) was taken down in shorthand. Leonid Isaakovich had never seen neither the notes, nor the shorthand and had not checked them. However his extant working notebooks of the period of 1938–1939 were given to me. These were usual thick (relatively disorderly) school notebooks containing much relating to his work in these years: fragments of calculations without comments, some notes with formulae without clarification and, amongst all this, disjoined pieces of the first three lectures that I needed. Leonid Isaakovich wrote them with full phrases, as if preparing them for print. Each such piece existed in several not too distinct variants. One saw that he was essentially writing with ease, with complete, literary perfect sentences. Very little was crossed out or written between the lines. At the same time a multiple reiteration and variation of the whole excerpts, sometimes with mutually exchanging positions in the text, reflected some sort of indecision, a constant doubt in the readiness, in the finality of the written, a constant care on its improvement. A closeness of these texts to the notes made by listeners allowed to trust the notes of other lectures, for which nothing could be found in the extant notebooks, as well.

There exist two types of thinking and writing people. Some are working out, making things more precise, formulating their very thoughts in the