

Book Reviews

A Theoretical Physicist

Landau. *A Great Physicist and Teacher.* ANNA LIVANOVA. Translated from the Russian edition (Moscow, 1978) by J. B. Sykes. Pergamon, New York, 1980. x, 218 pp., illus. \$22.50.

Anna Livanova quotes the poet Mayakovsky as saying, "I am a poet. That is what makes me interesting." Lev Davidovitch Landau was a physicist, and, as Livanova says, that is what makes him interesting. This little book, although it is written with a bit too much naïve adulation and Russian schmaltz, is interesting because it presents a true picture of Landau and the attitude toward him in his school.

Landau was as extraordinary a man as he was a physicist. He claimed with characteristic immodesty, ignoring his friends Peierls and Weisskopf among others, to be "the last universalist." He was one of the giants and had the charm, quickness, and fire—and ability to advertise himself—that evoked the kind of adulation that surrounded that other "swami" of physics, J. Robert Oppenheimer. Landau is often compared to Pauli because of their quickness, cocksureness, and stinging tongues, but it is the charismatic Oppy I find myself thinking of. There is even a physical resemblance between Landau and Oppenheimer, and again and again in the book the quality of Landau's personal friendship and his warmth and gaiety in social situations are attested to, as is the case with Oppenheimer but not with Pauli.

These two "swamis" of physics, however, exerted two different forms of moral leadership and had very different effects on their worlds. Oppenheimer tasted power, built the Bomb, and by his own testimony "knew sin," returning to the seminar room only late in his career. In the Soviet Union, the bright, irreverent Jew Landau barely managed to stay in the seminar room but nonetheless built a great school and a far greater edifice of scientific achievement; beside Landau, who is responsible among many other things for modern condensed matter physics, Oppenheimer is merely a footnote in theoretical physics. The kind

of leadership image Landau represented is expressed in a key quotation from Livanova's admiring introduction:

Though seeming to some a person aloof from ethical questions, he became something of a moral paragon by his purely scientific and professional work. . . . In all his actions Landau was essentially defending physics against . . . debasement. . . . Genuine science is essentially moral.

We will never know how much the differences between Landau and Oppenheimer were conditioned by the differences between the two countries.

Livanova's charming book is full of Landau stories; as with those of Bohr, Onsager, or Pauli, Landau's legend was maintained by characteristic anecdotes. But the book concentrates primarily on the physics: half of its all too few pages are a very good popular but historically accurate account of Landau's theory of liquid helium, for which he received the Nobel Prize. Of Landau's parents and childhood, we get one page; of his wife and son, three sentences. His troubles with the regime are all conveyed between the lines; we note the statement that at Kharkov

his closest and dearest friends were experimentalists—Lev Shubnikov and his wife. . . . Shubnikov was "Fat Lev," Landau "Thin Lev."

A page later:

The conflicts in which Landau and some of his friends and pupils became involved led to considerable unpleasantness that was a serious matter. In the end, it was necessary to think of moving to another city.

To interpret these passages properly, one has to remember that Shubnikov was killed by the Stalinists and that Landau had to move. It is perhaps amazing that in a Russian book the evidence is there at all. There is also an easily interpretable account of the kidnapping of Kapitza and his helium liquefier from Cambridge by the regime and Kapitza's later protection of Landau.

Much fuller is the description of Landau's teaching methods, of the informal atmosphere of his seminars, at which the audience joked and roared and the speakers quaked in fear of being dismissed with "What next?" Reading of

the atmosphere around him, one begins to find almost plausible the incredibly great school of pupils and associates he built up in the most miserable conditions, surrounded by incompetence and cut off from the world of physics by barriers erected by a barbarous regime.

Livanova is open enough to document a few of the weaknesses of Landau's cocksure, ad personam, open-and-shut judgments, but she fails to mention the most important: his refusal to accept the relevance of Bose condensation to superfluidity, probably because it was suggested by minds he could not tolerate—notably that of Laszlo Tisza. Perhaps this was behind the famous incident, documented in Abrikosov's London prize lecture, of Landau's advice to Abrikosov which led him to put away his theory of Type II superconductivity for seven years.

Nonetheless, this is a minor fault when compared to the admiration evoked by a man who could say things like the following:

You ask . . . which branches of theory are the most important. . . . One must have a rather ridiculous immodesty to regard only "the most important" problems of science as worthy of one's interest. [A] physicist should . . . not embark on his scientific work from considerations of vanity.

In the end, I am as committed a member of the Landau cult as any of his pupils and as sensible to the loss of him, far too early, from an auto accident. I am also sensible to the loss, caused by the Soviet regime's policies, of the West's communications with the superb Landau school, which was just beginning to recover from the death of its leader.

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Internationalism in Denmark

The Early Years. The Niels Bohr Institute 1921-1930. PETER ROBERTSON. Akademisk Forlag, Copenhagen, 1979. 176 pp., illus. \$12.20.

The creation of quantum mechanics in the 1920's, one of the main intellectual achievements of this century, was primarily the work of a small band of young and brilliant, well-bred European physicists who trained and traveled among a handful of European centers of physics, such as Munich, Göttingen, and Cambridge. But it was in Copenhagen, in Niels Bohr's Institute for Theoretical Physics, that they and their science were

pushed to maturity. Founded in neutral Denmark amid the upheavals during and after the First World War, the institute quickly became one of the international focal points of education and research in atomic physics. It was here that the new generation of atomic physicists studied, argued, and developed together much of the foundation of the new theory, the best-known contribution being the Copenhagen Interpretation of quantum mechanics, worked out by Bohr and Heisenberg.

Bohr's efforts to put together a first-rate international scientific institute, the role of the institute in the growth of Danish science, and its contributions to quantum physics during its first decade are the worthy themes Peter Robertson sets out to make accessible to a wide audience in *The Early Years*. With access to important archives, he uncovers valuable new material and data, especially on the founding and funding of the institute. Yet his reluctance to fully synthesize this material, to dig beneath the surface of events, or, most important, to extricate himself from a heroic image of the institute and its founder makes the book more a first introduction than a definitive history. There appears to be much more going on here than Robertson is prepared to bring out.

Bohr stands, as he should, at the center of the book. His personality and vision of how and where physics should be done pervade the entire institute, from his redrawing of the blueprints for the building, to his fatherly concern for his young visitors, to his intense concentration on the physics they produced. Robertson points out that it was Bohr's unique ability to inspire "collective research," his concern for both theory and experiment, his international contacts, and his own years of struggle with quantum theory that enabled him to realize his vision and to push the institute to the forefront of atomic research. Although Robertson does not consider it, his account indicates that Bohr was also a very shrewd politician when it came to his institute. This is suggested by Bohr's submission of his proposal for the institute at the height of competition for physics education in Copenhagen, by his wording of this proposal (quoted in full on pp. 20-22), and later by his successful playing off of foundations against each other when funding was needed (p. 107).

One of the early and central doctrines of the institute was its uniquely unhindered internationalism in an era of world war and nationalist tendencies. This is also one of the central themes of Robert-

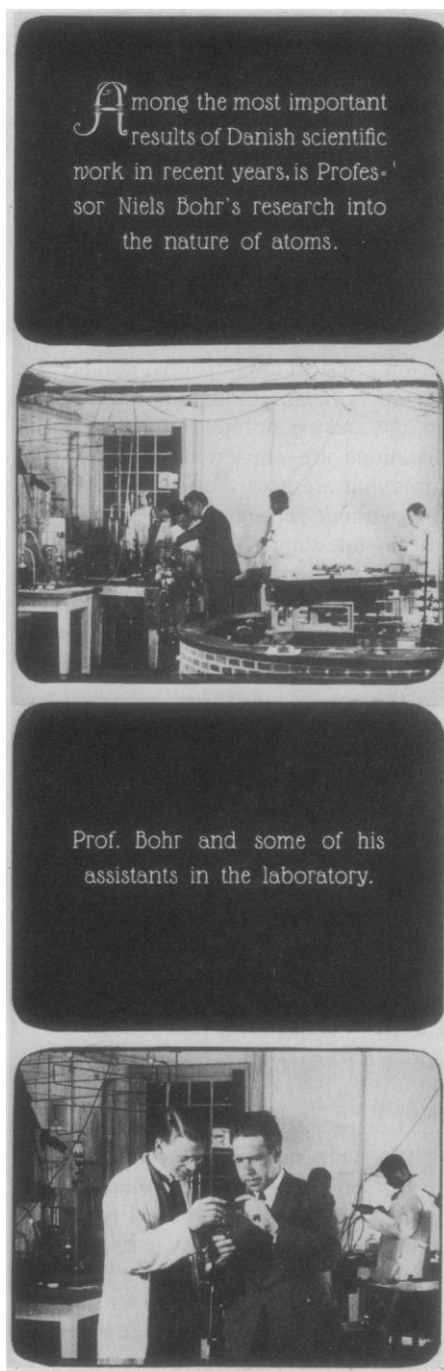
son's history. Not only does he find support for it in Bohr's repeated assertions that science, especially in his institute, was international and objective, he makes the point further with an informative table listing 63 visitors to the institute from 17 nations, along with data on their funding and publications (pp. 156-

159). Certainly the institute was, and still is, an important international scientific meeting place, but in the wake of recent studies of the manipulation of scientific internationalism by the belligerent nations after the First World War any public appeals to scientific internationalism in this period, even in neutral countries, should also be examined at some point within their national contexts. Despite Robertson's reiteration of the argument that Denmark only wanted to repair the damage of the war by reviving international science, his sources hint at the possibility of another side to the story: Danish scientists and officials may also have seen in the breakdown of international relations an opportunity to build up Danish science by supporting international science on Danish soil. This is suggested by the institution of the Rask-Ørsted Foundation beginning in 1917 and by the efforts of Danish scientists to persuade the government to bring Bohr back from England as Denmark's first professor of theoretical physics. That Bohr may have recognized and utilized this attitude is suggested by his application for an international institute in 1917, less than a year after his return, and by Sommerfeld's supporting letter to the Education Ministry after visiting Bohr in Copenhagen. "Together with Germany," he wrote, "almost the whole European continent has become impoverished. But happy Denmark can step into the breach here" (p. 35). That government officials were disappointed with the results and revised their plans in the face of economic difficulties in 1923 might have been behind Christen Lundsgaard's remark in an appeal to the Rockefeller Foundation on Bohr's behalf: "Furthermore, the economic conditions in Denmark are such that it is becoming more and more difficult to obtain money for an institution of purely international scientific importance" (p. 91).

This alternative reading of Robertson's sources indicates both the complexity of events surrounding the early history of this world-famous institute and the stimulating glimpse into that history Robertson provides. His account is a first and welcome step. The next steps toward a full story of the institute and its contributions to physics, international exchange, and Danish science will require a deeper and more critical analysis of the period, the culture, and its science.

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"These four stills were taken from a silent film produced in 1925, and widely distributed overseas by the Danish Government. This film dealt with over sixty aspects of Danish life, including the researches of Professor Bohr. In the foreground, Sven Werner and Bohr are assisted by their collaborators Yoshio Nishina, Bidhubhusan Ray and J. C. Jacobsen." [From *The Early Years*]