

Simon Solomonovich Shalyt (obituary)

N. E. Alekseevskii, A. S. Borovik-Romanov, M. S. Bresler, P. L. Kapitza, I. M. Lifshitz, R. V. Parfen'ev, I. I. Farshtein, A. I. Shal'nikov, and Yu. V. Sharvin

Usp. Fiz. Nauk. **123**, 707-709 (December 1977)

PACS numbers: 01.60.+q

Professor Simon Solomonovich Shalyt, doctor of physical-mathematical sciences, died prematurely on January 27, 1977. For over twenty years he was in charge of—at first the low temperature laboratory of the Semiconductor Institute of the Academy of Sciences of the USSR, and later of the kinetic phenomena section of the A. A. Ioffe Physico-technical Institute of the Academy of Sciences of the USSR. By his work Simon Solomonovich Shalyt made a great contribution to semiconductor physics and to low temperature solid state physics; his name is well known to scientists working in this field both in the Soviet Union and abroad.

S. S. Shalyt was born in 1911 in Vitebsk. In 1936 he graduated from the Physico-Mechanical Faculty of the Leningrad Polytechnical Institute (at that time the Industrial Institute). Simon Solomonovich began his scientific career at first in Khar'kov in the Ukrainian Physico-technical Institute under the guidance of the eminent scientist, a pioneer of Soviet low temperature physics, Lev Vasil'evich Shubnikov. In the UPTI Simon Solomonovich carried out a number of investigations of thermal and magnetic properties of anhydrous halide salts of the iron group and in 1940 he defended his candidate thesis.

In 1954 S. S. Shalyt defended his doctoral thesis and was invited by academician A. F. Ioffe into the newly organized Semiconductor Institute of the Academy of Sciences of the USSR in Leningrad. A difficult task lay ahead of him—to create a cryogenic laboratory in a new institution, and Simon Solomonovich completed it successfully. Soon the laboratory became the leading one in the country in the field of semiconductors at low temperatures and S. S. Shalyt became a member of the scientific council on the topic "Low Temperature Physics" of the Academy of Sciences of the USSR.

It is difficult to give a brief account of all the scientific results obtained by Simon Solomonovich and his collaborators; the volume of the work is indicated by the fact that S. S. Shalyt published over 100 printed articles, and his pupils defended 15 candidate and two doctoral dissertations.

Probably the most widely known papers of S. S. Shalyt are those concerned with the investigation of magneto-phonon resonance—a new oscillatory effect in semiconductors predicted theoretically by V. L. Gurevich and Yu. A. Firsov. This phenomenon was studied in detail by S. S. Shalyt and his pupils, and a number of interesting characteristic features was discovered which required a more precise formulation of the theory; ob-



SIMON SLOMONOVICH SHALYT
(1911-1977)

servations were carried out both in static and in pulsed magnetic fields, different kinetic effects and semiconductors of different symmetries were studied.

Another direction of the work of Simon Solomonovich and his collaborators which received international recognition is the investigation of the unique properties of the anisotropic elementary semiconductor—tellurium. Under the guidance of S. S. Shalyt all aspects of this work were developed—from obtaining pure, highly perfect single crystals of tellurium (the best in the world in terms of their characteristics) to detailed, careful investigations which led to significant successes—the establishment of the energy spectrum of the valence band, the first observation of the intraband magnetic breakdown, the discovery of the restructuring of the energy spectrum of the valence band in the case of hydrodynamic compression.

S. S. Shalyt made a big contribution to the study of galvano- and thermomagnetic phenomena in quantizing magnetic fields. Investigations carried out by him aided the elucidation of the characteristic features of the Shubnikov-de Haas effect in semiconductors.

The work of Simon Solomonovich on the investigation of the phenomena of charge and heat transport in semiconductors, semimetals and pure metals received wide

international recognition. This work is characterized by a complex approach which made it possible to bring out new aspects of the mechanisms for the interaction of quasiparticles in a solid.

In recent years without neglecting his favorite experimental methods, S. S. Shalyt turned to the solution of new problems—the investigation of magnetically ordered semiconductors and superconductors and he worked on them until the last days of his life.

The scientific style of Simon Solomonovich as an experimental physicist is characterized by an exceptionally demanding attitude towards reliability and accuracy of experimental results, by clarity of thought, by a tendency to graphic, physically visualizable models, by considerable scientific intuition, by faith in the power of theory, and by respect for the work of theoretical physicists: it is not accidental that many of his papers have been written in collaboration with theoreticians. The striving for clarity, and for a deep understanding of physical concepts distinguished also his lectures in semiconductor physics which S. S. Shalyt presented over a number of years at the Radiotechnical (now the Radiophysical) faculty of the M. I. Kalinin Polytechnical Institute in Leningrad.

Totally devoted to science, a man of high scientific and civic principles, Simon Solomonovich Shalyt will forever be preserved in the memory of his colleagues, his comrades in work, his pupils and his collaborators—of all those who met him and discussed with him problems of his beloved science—physics. The results of his work have already been incorporated in textbooks and monographs, and have become a permanent heritage of science.

BASIC SCIENTIFIC WORKS OF S. S. SHALYT

- ¹Ferromagnetische Eigenschaften einiger paramagnetische Salze, Phys. Z. Sowjetunion **11**, 556 (1937).
- ²Magneto-thermal Properties of Anomalous Paramagnetic Salts, Dokl. Akad. Nauk SSSR **24**, 679 (1939).
- ³Thermal Conductivity of Bismuth Single Crystals at Low Temperatures, Zh. Eksp. Teor. Fiz. **15**, 250 (1945).
- ⁴Thermoelectric Properties of Tellurium at Low Temperatures, Fiz. Tverd. Tela (Leningrad) **4**, 934 (1962) [Sov. Phys. Solid State **4**, 685 (1962)] (jointly with I. N. Timchenko).
- ⁵On the Problem of Quantum Oscillation of Galvanomagnetic Effects in Indium Arsenide and Antimonide, Fiz. Tverd. Tela (Leningrad) **4**, 1233 (1962) [Sov. Phys. Solid State **4**, 903 (1962)] (jointly with A. L. Éfros).
- ⁶Galvanomagnetic Properties of Tellurium. Structure of the Valence Band, Fiz. Tverd. Tela (Leningrad) **4**, 3596 (1962) [Sov. Phys. Solid State **4**, 2630 (1963)] (jointly with R. V. Parfen'ev, A. M. Pogarskiĭ and I. I. Farbshtein).
- ⁷Experimental Confirmation of Magnetophonon Resonance in InSb of the n -Type, Zh. Eksp. Teor. Fiz. **47**, 444 (1964) [Sov. Phys. JETP **20**, 294 (1965)] (jointly with R. V. Parfen'ev and V. M. Muzhdaba).
- ⁸Investigation of a New Type of Oscillations in Magnetoresistance, Phys. Rev. Lett. **12**, 660 (1964) (jointly with Yu. A. Firsov, V. L. Gurevich and R. V. Parfeniev).
- ⁹On the Problem of the Effect of Electron Spin on Quantum Oscillations of the Galvanomagnetic Coefficients in n -InSb, Zh. Eksp. Teor. Fiz. **48**, 1565 (1965) [Sov. Phys. JETP **21**, 1049 (1965)] (jointly with S. T. Pavlov, R. V. Parfen'ev and Yu. A. Firsov).

- ¹⁰Quantum Oscillation of Thermo-E. M. F. in n -InSb, Fiz. Tverd. Tela (Leningrad) **8**, 1776 (1966) [Sov. Phys. Solid State **8**, 1414 (1966)] (jointly with M. S. Bresler and R. V. Parfen'ev).
- ¹¹Quantum Oscillations of Photoelectric Coefficients in n -InSb in a Strong Magnetic Field, Zh. Eksp. Teor. Fiz. **53**, 1571 (1967) [Sov. Phys. JETP **26**, 906 (1968)] (jointly with R. V. Parfen'ev and I. I. Farbshtein).
- ¹²Lattice and Electron Thermal Conductivity of PbTe, PbSe and PbS, Fiz. Tverd. Tela (Leningrad) **10**, 1277 (1968) [Sov. Phys. Solid State **10**, 1018 (1968)] (jointly with V. M. Muzhdaba and A. D. Goletskaya).
- ¹³Photomagnetic Effect in Quantizing Magnetic Fields When Electrons are Heated by Light, Fiz. Tverd. Tela (Leningrad) **10**, 2241 (1968) [Sov. Phys. Solid State **10**, 1764 (1969)] (jointly with R. I. Lyagushenko, R. V. Parfen'ev and I. N. Yassievich).
- ¹⁴On Non-elastic Scattering of the Carriers in Semiconductors, Proc. Ninth Intern. Conf. on Physics of Semiconductors, Moscow, 1968, Vol. 2, publ. by Nauka, Leningrad, (1968), p. 659 (jointly with S. A. Aliev, I. N. Dubrovskaya, L. L. Korenblit, B. Ya. Moizhes, V. M. Muzhdaba, Yu. I. Ravich, I. A. Smirnov and V. I. Tamarchenko).
- ¹⁵Thermoelectric Power and Thermomagnetic Properties of Bismuth at Low Temperatures, Zh. Eksp. Teor. Fiz. **56**, 8 (1969) [Sov. Phys. JETP **29**, 4 (1969)] (jointly with I. Ya. Korenblit and M. E. Kuznetsov).
- ¹⁶Magnetoresonance in Tellurium, in: Physics of Selenium and Tellurium, Oxford, Pergamon Press, 1969, p. 371 (jointly with D. V. Mashovets).
- ¹⁷Some Kinetic Phenomena in Neodymium Monochalcogenides in the Domain of Magnetic Ordering, Fiz. Tverd. Tela (Leningrad) **11**, 2192 (1969) [Sov. Phys. Solid State **11**, 1770 (1970)] (jointly with V. P. Zhuzé, V. I. Novikov and V. M. Sergeeva).
- ¹⁸The Structure of the Energy Spectrum of the Valence Band of Tellurium, Zh. Eksp. Teor. Fiz. **57**, 1479 (1969) [Sov. Phys. JETP **30**, 799 (1970)] (jointly with M. S. Bresler, V. G. Veselago, Yu. V. Kosichkin, G. E. Pikus and I. I. Farbshtein).
- ¹⁹Electron Thermal Conductivity and the Wiedemann-Franz Relation for Bi, Zh. Eksp. Teor. Fiz. **57**, 1867 (1969) [Sov. Phys. JETP **30**, 1009 (1970)] (jointly with I. Ya. Korenblit, M. E. Kuznetsov and V. M. Muzhdaba).
- ²⁰Energy Spectrum of Holes in Tellurium and Landau Level Splitting in a Magnetic Field, in: Proc. Tenth Intern. Conf. on Physics of Semiconductors, Cambridge, Mass., 1970, publ. by US Atomic Energy Commission, Washington, D. C. (1970), p. 357 (jointly with V. B. Anzin, M. S. Bresler, I. I. Farbshtein, Yu. V. Kosichkin, D. V. Mashovets, G. E. Pikus and V. G. Veselago).
- ²¹Thermal Conductivity of Indium Antimonide at Low Temperatures, Phys. Status Solidi **B44**, 525 (1971) (jointly with V. V. Kosarev and P. V. Tamarin).
- ²²Magnetophonon Resonance in Semiconductors, Usp. Fiz. Nauk, **112**, 3 (1974) [Sov. Phys. Usp. **17**, 1 (1974)] (jointly with R. V. Parfen'ev, G. I. Kharus and I. M. Tsidil'kovskii).
- ²³Manifestation of a Hydrodynamic Effect in the Thermal Conductivity of Tungsten, Pis'ma Zh. Eksp. Teor. Fiz. **20**, 382 (1974) [JETP Lett. **20**, 171 (1974)] (jointly with A. B. Batdalov and V. I. Tamarchenko).
- ²⁴The Effect on Antiferromagnetic Ordering on the Electron Kinetic Phenomena in Dysprosium Monosulfide, Zh. Eksp. Teor. Fiz. **68**, 2159 (1975) [Sov. Phys. JETP **41**, 1081 (1975)] (jointly with V. I. Novikov, V. P. Zhuzé and V. M. Sergeeva).
- ²⁵Thermal Conductivity of Vanadium at Low Temperatures, Pis'ma Zh. Eksp. Teor. Fiz. **23**, 513 (1976) [JETP Lett. **23**, 469 (1976)] (jointly with B. K. Chakal'skii, V. M. Azhava and N. A. Red'ko).

Translated by G. Volkoff