MISCELLANY



## VENIAMIN GRIGOR'EVICH LEVICH (FIFTIETH BIRTHDAY)

On March 30th Veniamin Grigor'evich Levich, Corresponding Member of the Academy of Sciences of the USSR, celebrated his fiftieth birthday.

V. G. Levich is one of the group of Soviet theoretical physicists who pioneered the application of the methods of theoretical physics to the solution of urgent problems of modern chemistry. His research and the work of the flourishing school he created have developed a number of new aspects of physical chemistry and electrochemistry, which have affected the development of these scientific fields and their practical application and contributed to the leading position of Soviet science in a number of fields.

Levich was born in Kharkov, where he spent his youth. After graduating from University in 1937, he moved to Moscow and engaged in postgraduate work at the Lenin Moscow State Pedagogic Institute under the supervision of L. D. Landau.

Levich's early studies were concerned with the theory of surface phenomena, especially the properties of monolayers at the interface between phases, the thermal movement within them, and the effect of such layers on the extinction of capillary waves on the surface of water. These studies were the first in an extensive cycle of investigations in which Levich laid down the foundations of a new discipline: physicochemical hydrodynamics. This is concerned both with the effect of liquids and gases on the chemical reactions occurring in them and the effect of physicochemical factors on the movement of liquids.

After Levich presented his Candidate's thesis, he met Academician Frumkin; this meeting greatly influenced the further development of the young scientist.

In 1940 Levich began working at the Colloid-Electrochemical Institute, which was later reorganised as the Institute of Physical Chemistry. Subsequently Levich became head of the theoretical department of the Institute of Electrochemistry which split off from the Institute of Physical Chemistry.

During the war his studies on physicochemical hydrodynamics were to a considerable extent of an applied and specialised character. Nevertheless, by 1943 he had already formulated the main hypotheses of the theory of concentration polarisation in moving solutions which formed the basis of his doctoral thesis (1943).

Taking the general theory of concentration polarisation as a basis, Levich put forward the concept and elaborated the theory of the rotating disc electrode. The use of the disc electrode became one of the widely employed methods of investigating electrode processes. Further development of the theory of various modifications of the disc electrode (1958–1961) led to its use both in various electrochemical investigations and in the study of mass exchange, thermal diffusion, the rate of flame propagation, catalytic reactions, dissolution of metals and alloys, growth of large single crystals, for analytical purposes, etc.

During the following years Levich developed intensively both the principles of physicochemical hydrodynamics and a number of its concrete applications. Among these one must mention the theory of mass transfer in turbulent flow, heat transfer in liquid metals, the theory of the movement of droplets and bubbles in a liquid medium, the theory of electrophoresis and the theory of electrocapillary motion, numerous problems of capillary hydrodynamics—jet disruption, thermocapillary motion, diffusion in thin films of liquid, and others.

This cycle of studies was published in the monograph "Fiziko-Khimicheskaya Gidrodinamika" (Physicochemical Hydrodynamics) which was awarded the Mendeleev Prize, and was translated in the USA and other countries, bringing the author recognition and renown both in the Soviet Union and abroad.

The importance of physicochemical hydrodynamics became particularly clear in the last few years when this aspect of physical chemistry began to develop extremely rapidly. This was associated with the development of the study and application of high-intensity processes taking place under extreme conditions in industry.

Physicochemical hydrodynamics has been responsible for the successful progress in the field of electrochemical transducers.

Most recently Veniamin Grigor'evich, now with numerous students, has again turned to problems of physicochemical hydrodynamics, concentrating his attention on the study of complex processes taking place in chemical apparatus.

A novel theory of mass and heat transfer in statistical systems was developed by combining the methods of hydrodynamics, statistical physics, and the theory of probability. This theory made it possible to evolve a theoretical basis for catalytic reactions with a static catalyst bed. It also formed a successful basis for the development of the theory of the pseudoliquefied state. Finally, it provided the basis for calculations on mass-exchange processes in systems of moving bubbles and droplets.

Thus in their later studies Levich and his colleagues were able to pass from a description of the elementary steps in mass and heat transfer to the creation of a sound theory of mass and heat exchange occurring in actual, complex apparatus.

In recent years Levich and his colleagues undertook a series of investigations of the physicochemical hydrodynamics of porous media in connection with the problem of creating electrochemical generators. These investigations,

closely associated with experimental studies, advanced the theory of porous gas electrodes and furnished a deeper insight into the mechanism of their action.

Since 1958 Levich and his students have turned their attention to the development of the theory of chemical and electrochemical reactions in the liquid phase. They formulated a sound quantum-mechanical theory of reactions with charge transfer in the medium. The development of the theory began with consideration of oxidation–reduction reactions in solutions. The general theory for polar media was applied to the investigation of electrode reactions. Latterly a quantum theory of electrode reactions with proton transfer (the theory of the discharge of hydrogen ions) has been postulated.

Levich undertakes a great deal of teaching. Over a period of years he has been the head of the Department of Theoretical Physics at the Moscow Institute of Engineering and Physics. He is now Director of the Department of Chemical Mechanics at Moscow State University. His teaching activities helped to create a large school of theoretical physicists working in the field of physical chemistry.

Levich possesses all the qualities of a great scientist and we are confident that he will continue to show boundless energy and creative activity in the future.

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