VENIAMIN GRIGOR'EVICH LEVICH
– ON THE OCCASION OF HIS FIFTIETH BIRTHDAY

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Corresponding Member of the Academy of Sciences of the USSR Veniamin Grigor'evich Levich celebrated his fiftieth birthday on March 30. Trained as a theoretical physicist, V. G. Levich has devoted his thirty years of scientific activity to the development of urgent theoretical problems of physical chemistry and electrochemistry.

Veniamin Grigor'evich Levich was born in Khar'kov, where he received his higher education. At Khar'kov University, V. G. Levich had the good fortune to study under L. D. Landau. V. G. Levich subsequently became one of his closest associates. After graduating from the University, he entered the graduate program at V. I. Lenin Moscow State Pedagogical Institute, where, under the supervision of L. D. Landau, he was occupied with the investigation of surface phenomena at interfaces.

During the years of the Second World War, V. G. Levich was occupied with research of great practical importance. At the same time, he did not cease to work on the development of theoretical problems of physical chemistry. It was precisely during this period, at the beginning of the forties, that the first articles of V. G. Levich giving a theoretical consideration of processes of passage of current through solutions of electrolytes appeared. These works formed the basis of the doctoral dissertation of the twenty-six year old scientist.

The works of V. G. Levich on the theory of convective diffusion in liquids represent an important contribution to electrochemical kinetics. A characteristic of Levich's scientific style is the fact that studies conducted originally within the framework of electrochemical theory were subsequently generalized to the case of phenomena of great importance in other divisions of physical chemistry and chemical technology.

We should make special mention of the results obtained by V. G. Levich in a study of complex processes that occur in chemical apparatus. He developed the theory of mass and heat exchange in static systems, permitting a development of the theoretical basis of reactors with a fixed layer of catalyst. On the basis of this theory, he successfully developed the theory of pseudo-liquefied state. Finally, on this basis, he succeeded in calculating the process of mass exchange in systems of moving bubbles and drops.

The first edition of V. G. Levich's monograph Physicochemical Hydrodynamics was published in 1952. The second substantially expanded edition came out in 1959. This book has been translated in many countries and is now an indispensable reference for students, graduate students, and scientific workers not only in the Soviet Union, but also abroad (Hungary, Czechoslovakia, the United States, England, etc.). The new division of physical chemistry – physicochemical hydrodynamics – is correctly linked with the name of V. G. Levich, who not only laid the foundation for this line but also, with his numerous students, created the quantitative theory for a number of processes of great applied significance. Here we might indicate, for example, the theory of the polarographic method as applied to irreversible processes, investigation of waves on the surface of a liquid, and the investigation of motion and diffusion in thin films.

In recent years the assortment of problems to which it has proved possible to apply the general physical ideas

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and calculation apparatus developed in physicochemical hydrodynamics has expanded substantially. Physicochemical hydrodynamics has promoted the successful development of studies of electrochemical transformers. In the development of new instruments, the theory of noise in electrochemical systems, developed by V. G. Levich and associates on the basis of quantum kinetics, is acquiring special importance. In connection with the problem of designing electrochemical generators, V. G. Levich and his associates have conducted a number of investigations in the field of the physicochemical hydrodynamics of porous media. These studies, closely linked with experimental investigations, have advanced the theory of gas electrodes and promoted a more profound understanding of their mechanism of action.

In addition to the rotating disc electrode, V. G. Levich and associates have proposed a number of new methods of investigating the kinetics of rapid electrode reactions, for example, Faraday heterodyning. The theory of Faraday impedance electrochemical transformations, complicated by chemical homogeneous and heterogeneous reactions and the adsorption of the reagents on the electrode, have been developed. The investigation of the metal–solution interface on the basis of a study of the photoeffect, the theory of which was recently developed by V. G. Levich and his associates, is extremely promising.

As is well known, a substantial influence upon the kinetics of electrochemical reactions is exerted by the structure of the electrical double layer. In view of this, V. G. Levich and associates have developed a coherent statistical theory of solutions of electrolytes, considering the external field, which makes it possible to find micropotentials, the adsorption isotherm, capacitance, and other characteristics of a double layer.

In the last eight years, an important place in the scientific creativity of V. G. Levich has been occupied by the construction of a quantum mechanical theory of charge transfer in homogeneous and heterogeneous chemical reactions. The first studies of this great cycle of investigations was devoted to a consideration of oxidation–reduction reactions in the volume of solutions. The quantum mechanical approach to this problem has proved extremely fruitful and has led to the creation of a theory of electron exchange reactions. The solution of problems concerning volume reactions has made it possible to turn to a consideration of electrode reactions. The kinetics of reactions on metallic electrodes were investigated first, and the concrete quantum mechanical derivation of one of the basic equations of electrochemical kinetics – the Tafel' formula – was given. In a whole series of studies, various questions associated with the kinetics of oxidation–reduction reactions on semi-immersed electrodes were investigated.

The successful consideration of reactions of electron exchange has made it possible to embark upon the development of the theory of one of the most important reactions of electrochemistry – the decelerated discharging of hydrogen ions. Quite recently, V. G. Levich and his associates have obtained new results along this line.

V. G. Levich considers the training of scientific staff, the education of youth, to be extremely important. He began his pedagogical activity, which he has already been conducting successfully for about thirty years, while still a graduate student at the V. I. Lenin Moscow State Pedagogical Institute. Subsequently, for a number of years, V.G. Levich was head of the Chair of Theoretical Physics at Moscow Physical Engineering Institute. Recently, he has headed the Chair at Moscow State University. V. G. Levich is not simply a good lecturer; he is a teacher of youth. This is evidenced, in particular, by the fact that almost all his associates and co-workers, including doctors of science, are former students of his. In contact with young scientists, V. G. Levich knows how to combine sincere respect with complete ease in the expression of his own ideas and opinions.

Anyone who would like to know more about Veniamin Grigor'evich Levich as a man and a scientist should drop in on one of his scientific seminars: noisy and gay, truly democratic, and mercilessly exhausting of the speaker.

All these features of the scientist and man inspire confidence that V. G. Levich will always be at the forefront of Soviet science.