The general laws of the breakdown and formation of molecules are described in Chapter II. Much of the material in this chapter is not strictly kinetics but knowledge of it is absolutely essential for understanding calculations based on spectroscopic data. Section 33, which deals with the general mechanism of the formation of molecules from atoms and radicals, is a useful introduction to the problems of the theory of the transition state.

In Chapter III the authors consider calculations of the velocity constant from the number of collisions and activation energy. Twenty-two pages of this chapter are devoted to radical reactions, with emphasis on reactions in the vapour phase. It would have been helpful to consider various applications of the radical-chain theory to reactions in solutions.

Chapter IV presents rather laconically the theory of the transition state; the authors evaluate critically the possibilities of its application and stress particularly the incorrectness of the assumption of equilibrium between the initial substances and the active complex.

It is hardly desirable to relegate a number of important conclusions and mathematical calculations to appendices since it tends to impair continuity. It might have been better to have included information which the authors supposed to be unfamiliar to the reader in an introductory chapter. Such a chapter could have dealt, *inter alia*, with the theory of probability, the laws of distribution, and the methods of approximation.

Problems of unimolecular and termolecular reactions are considered in detail in Chapter V; Slater's theory could probably have been considered in greater detail.

Chapter VI deals with reactions in solutions. It presents, essentially, the results of "testing" various theories of kinetics on processes in solution. The last two paragraphs are devoted to coupled conjugated reactions.

Chain reactions are described in Chapter VII which will probably be the subject of vigorous discussion by specialists because of the interpretation of individual problems.

Chapters VIII and IX contain material on photochemical and radiation-chemical reactions. The introduction of this subject into a general kinetics course is only to be welcomed. Radiation chemistry is a rapidly growing and extremely important branch of which there is, nevertheless, virtually no concise and satisfactory account in textbooks.

The remainder of the book – from p.307 to 480 (Chapters X, XI, and XII) is devoted to catalysis. The individual preferences of the authors are particularly evident here. Homogeneous catalysis occupies a relatively secondary place and is dealt with in 30 pages with complete omission of a number of questions (for example, ion catalysis of ortho-para hydrogen transformations, oxidative catalysis by transition metals, hydrolysis of organic compounds, alkylation, etc.). Heterogeneous catalysis is treated better and more fully.

After considering general laws the authors analyse the facts which led to the concept of active centres. Adsorption on heterogeneous surfaces, the work of S.Z.Roginskii, A.N.Frumkin, M.I.Temkin, and others, and the methods used for finding the type of distribution function from the isotherm are described. A.A.Balandin's multiplet theory and his principle of energy correspondence are then briefly described.

N. I. Kobozev's *"ensemble"* theory is described in 30 pages with splendid knowledge of the subject and numerous illustrative examples. Unfortunately no information is given on topochemical processes.

The chapter dealing with electronic concepts in catalysis is interesting and useful but the reviewer feels that the authors were unduly restrained here and the subject could have been considered in greater detail. The introduction of a chapter on isotope methods is entirely justified; it is short but contains much important and useful information.

It must be mentioned that the book contains quite a number of misprints and small oversights which at times obscure the meaning. Thus, on p.153 there is a reference to Eqn.(49) whereas in fact it should be Eqn.(47) which is in another chapter on p.159. In Eqn.(3) a plus sign and not a minus sign should precede the square bracket. On pp.167 and 168 the exponent of RT in Eqn.(37) should have been $1-x$ and not $x-1$. The first sentence of the second paragraph in section 53 again on p.168 may suggest that the progression along the reaction coordinate corresponds to translational movement in space of the whole complex which is, of course, not true. All these small errors can be easily eradicated by careful editing of the next edition.

The book reflects the authors' great teaching experience and is the result of many scientific and methodological investigations and discussions. The problem of writing an original textbook on such extremely important branches of physical chemistry as kinetics and catalysis has, on the whole, been successfully resolved by the authors.

This textbook of kinetics and catalysis is comprehensive and will doubtless be read with interest by chemists and physical chemists.

L.A. Nikolaev



KONSTANTIN VASIL'EVICH CHMUTOV
(60th Birthday)

March 21st, 1962 was the sixtieth birthday of Konstantin Vasil'evich Chmutov. He was born in Moscow and started his working life at Bezhits at the Krasnyi Profintern factory,

and his early experience on the shop floor, as a tempering furnace operative, and as a factory laboratory assistant, has been reflected in his whole approach to scientific work.

In 1926, when Chmutov was a student at the Moscow Higher Technical College, he showed an interest in surface phenomena and published two papers on his research undertaken at the physicochemical laboratory. Not surprisingly, the eminent Russian chemist Professor N. A. Shilov of the Moscow Higher Technical College soon noticed Chmutov and enlisted his collaboration. The scientific team gathered around Shilov proved a splendid medium for the development of the gifted young scientist.

In the very first years of this collaboration, which unfortunately were the last years of Shilov's life, Chmutov, first as a graduate student and then as a teacher, carried out his classical work on surface oxides of carbon. He showed that, as a result of chemical adsorption or chemisorption of oxygen by active carbons, the surface oxygen complexes or surface carbon oxides acquired, after hydration, ion-exchange properties. This research opened up a new chapter on chemical surface compounds in the physical chemistry of surface phenomena. His concepts are still topical since there is great scientific and technological interest in the questions of ion-exchange adsorption and chromatography.

Chmutov spent 25 years at the Moscow Higher Technical College. His lectures were always absorbing and accompanied by interesting and splendidly devised demonstrations. His research programmes have always been conceived with originality and the experiments carried out imaginatively and elegantly. Chmutov is a veritable virtuoso of physicochemical experimentation, being an inventor, a constructor, a mechanic, an optical specialist, and a glass-blower, able to make whatever might be necessary for the experiments, with care and extraordinary knowledge.

In 1940 Chmutov obtained his doctorate, his thesis being "Sorbtsionnye Yavleniya v Kapillyarnykh Sistemakh" (Sorption Phenomena in Capillary Systems), and was soon made Professor. The results of ten years' research and teaching served as the basis of the book "The Physicochemical Foundations of Anti-Gas Measures" written by Chmutov with M. M. Dubinin. During this period and in subsequent years Chmutov devised various kinds of apparatus which found extensive application.

From 1943 until 1950 Chmutov was head of the Department of Colloid Chemistry. He carried out with his students and colleagues a programme of research dealing with diffusion kinetics which was of great scientific interest and found technological application in the diffusion of dyestuffs in gelatine layers in the manufacture of colour cine-films. This series of investigations included the temperature dependence of the diffusion coefficient in the polymer–monomer system. Chmutov took part in the development of the multiple investigation of particle growth in a vanadium pentoxide sol, which was unusual in concept and method of investigation, and which led to the method of "palpation" of the active centres of colloidal particles.

Towards the end of the 1940's Chmutov became the director of the newly created Chromatography Department of the Institute of Physical Chemistry of the Academy of Sciences of the USSR. Shortly afterwards he headed the Chromatography Commission of the Chemical Sciences Division of the Academy of Sciences, and since then his scientific activities have been connected mainly with the Academy, and range over problems of the physicochemical properties of ion-exchange sorbents, simulation of chromatographic processes, obtaining chromatograms with non-equilibrium operating conditions of the ion-exchange column. A new adsorption–complex-formation method of metal separation for the production of phosphors was made possible by work on the preparation of spectrally pure salts. An original variant of systematic qualitative analysis using chromatography was developed. New data have been obtained on the sorption of certain elements by soils. Separation of radioactive rare-earth elements has led to elaboration of the theory of ion-exchange chromatography based on complex formation. Recent years have seen a systematic investigation of the effect of ionising radiation on ion-exchange materials.

Chmutov continues to devise new apparatus and installations for the mechanisation and automation of the laborious techniques of chromatography, using refractometric, colorimetric, conductometric, and radiometric devices for measuring the concentration of solutions.

In recent years Chmutov has published several monographs: "Tekhnika Fiziko-Khimicheskogo Eksperimenta" (Physicochemical Experimental Techniques) (3rd Edition, 1954), "Primenenie Elektronnykh Priborov i Skhem v Fiziko-Khimicheskom Issledovanii" (The Use of Electronic Apparatus and Circuits for Physicochemical Investigations) (1961), and "Avtomaticheskie Pribory v Kolonochnom Khromatograficheskom Analize" (Automatic Instruments in Column Chromatographic Analysis) (1961).

Chmutov considers popularisation of science very important and contributes to it by writing, radio talks, and lectures. He is a member of the editorial board and Deputy Editor-in-Chief of "Zhurnal Fizicheskoi Khimii" (Russian Journal of Physical Chemistry), editing papers with the energy and profound knowledge typical of him. He is also a member of the editorial board of the journal "Znanie–Sila" (Knowledge–Strength), and editor of many books and popular publications.

In 1953 Chmutov was elected a Corresponding Member of the Academy of Sciences of the USSR.

Chmutov's many friends, students, and colleagues wish him good health and many years of fruitful work, on the occasion of his sixtieth birthday.

M.M. Dubinin and E.C. Zhukovskaya