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# ON THE ISSUE OF COMPLETENESS OF THE MODERN CONCEPTION OF ATOMIC AND MOLECULAR STRUCTURE

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The modern picture of the world is based upon quantum mechanics and the theory of relativity which were developed about a century ago. During this period (when, taking into consideration exponential growth of information and development of technology, mankind has made such progress in human knowledge which can be equated to what it gained throughout all previous generations) there has been accumulated enormous experimental material. New sciences and conventional picture of the world, which dominates nowadays, ideal? Does it require more accurate definition? Are there any experimental data which it can't explain? These questions seem to be legitimate and the time is right for a detailed and profound examination. Meanwhile, methodologically the question whether the modern picture of the world is adequate should be divided into two parts:

1. a list of the problems of natural science which do not seem possible to be explained by the existing theory;

2. attempts to explain these experiments.

If after a detailed examination it turns out that all the experiments can be adequately explained within the frameworks of the existing theory and no reconsideration (or expansion) is needed - all this really would be great. It would mean that science can develop in the same direction as it has done before. However if there is at least one case contradicting the theory it would signify that the theory, even the most fundamental one, is bound to be extended and revised.

These quite evident considerations can be applied to specific problems and to the picture of the world as a whole, for example, to that theoretical and conceptual gap that exists between physics and chemistry.

Since the creation of quantum mechanics, physicists have been convinced that all processes in the world of atoms and molecules can be explained with Schrdinger equation (and where relativistic effects needs to be taken into account - with Dirac equation). From the point of view, which is considered self-evident by physicists, the fact, that many chemical and molecular-biological processes are based on the so-called semiempirical regularities, is the evidence of simple truth that they have not yet been deduced from Schrdinger equation

(either analytically or with the help of the modern computer): time will come when everything will be deduced and proved on the basis of existing conceptions.

However, the point of view of chemists (biochemists, molecular chemists and biologists) is absolutely different. "In the eyes of chemistry" physics is a science, which is not very applicable in life and cannot explain experiments in the world, the world that is made up of molecules (in simple terms, it is the whole world that surrounds a human). Once again, "in the eyes of the chemistry", the snobbery and self-confidence of physicists seem to be completely unjustified.

In three quarters of the century, since quantum mechanics was created (75 years is a very long period in the era of rapid science and technology development, which is comparable to centuries of the previous human development), organic chemistry and molecular biology emerged and made great advances. The number of experimental facts, which deduced from fundamental principles at present, is increasing "in the eyes of the chemistry and biochemistry". In given conditions, scientists, who work in the field of studying molecules' properties, have had a clear notion, that chemistry is based upon fundamental laws of physics only partially. "In the eyes of chemistry" in order to describe nature it is necessary to explore it from different angles. These different angles are thought to be a combination of fundamental laws of physics and the so-called semi-empirical rules, which are not deduced from fundamental laws of physics. In this respect, semi-empirical rules are not limited only to Hund rule of the order of filling up electron shells, but also fundamental conceptions which proved their efficacy, like periodic table and molecular orbits, on which the whole contemporary science of molecular texture and formation is based. It is exactly in the combination of laws of physics and (the so-called semi-empirical) laws of chemistry and biochemistry that scientists who work with molecules see one of the main manifestations of Bohr principle of complementarity.

The difference in the views of physicists, on the one hand, chemists-biochemists-molecular biologists, on the other, on nature arrangement seems to be of top priority not only from the practical point of view, but also from the conceptual one. It is true because the question, whether we live in the world which is determined by fundamental laws or whether it is based upon the combination of physical

laws and those, which appear only on the level of molecular formation and are not deduced from the atomic theory, seems uppermost.

If the point of view "in the eyes of chemistry" proved to be true it would mean the necessity to review the picture of the world significantly. On the other hand, the fact that the regularities which are the basis of chemistry failed to be deduced from fundamental laws, in spite of the numerous efforts, can't but alarm, as the possibility to deduce the regularities, if to speak objectively, makes fundamental and non-fundamental picture of the world not a question of knowledge but belief.

The fundamental picture of the world of the 20 century that remains mainly stable was created at Solvey Congress which only physicists attended. In the 21 century such formation of the question appears to be irrelevant to the problem. At the beginning of the 3d millennium natural sciences, such as molecular biology, biochemistry, genetics, biophysics, etc, don't seem less fundamental than physics and the advances in these spheres are fast and remarkable. It is neither right nor scientific to disregard the objectively existing views of scientists who study molecules. Physicists, chemists, biochemists, molecular biologists should collaborate with each other and equally participate in the discussions of fundamental questions in order to create the picture of the world. At the same time the look "upward" from the level of atoms (i.e. examination of the structure of substance starting from quarks) is as important as the look "downward" (the examination of chemical, biochemical and molecular-biological processes that exist and function, but can't be explained adequately in the framework of the traditional model). Taking into account the phenomenal development of not only chemistry but natural science itself, the snobbery of physicists who still (or forever?) are not able to deduce from quantum mechanics and the atomic theory basic structures and dynamic mechanisms that are studied in chemistry, biochemistry and molecular biology seems not only inappropriate but counterproductive and harmful. The structure, similar to the one of the Solvey Congress of the last century when solely physicists defined the picture of the world, seems wrong in the 21st century. From our point of view, the recent situation, when the borderline is drawn between physicists on the one hand and chemists, biochemists and molecular biologists on the other, must be changed. Congresses, symposiums and confer-

ences where physicists, chemists, mathematicians and biologists can gather to analyze and examine conjointly the fundamental questions seem absolutely indispensable. To our conviction, the following are the uppermost questions for the participants to deal with:

1. are there any experiments, in your viewpoint, in any area of knowledge that can't be adequately explained by the quantum theory?

2. have any data, demanding creation of a new theory which under certain conditions (e.g. in times when a picosecond is an enormous period) would pass into quantum mechanics as the latter passes into classical one, appeared in the 100 years since the beginning of the creation of the quantum theory?

3. is the world based upon fundamental laws on all levels of the structure of the matter (in particular, can the structures, originated in chemistry and biology be predicted from atomic theory - the question for which positive answer is evident for physicists) or we need for its description additional laws originating at the stage of molecules formation? (point of view widely distributed among chemists, biochemists, quantum chemists and molecular biologists which could not be contradicted only from conceptual basis - we need more specific and demonstrative scientific arguments).