IGOR ZASLAVSKY
1932 – 2019

Igor Zaslavsky was a brilliant model of a great Scientist and wonderful Man. The first scientist I met *in vivo* was Igor Dmitrievich Zaslavsky. By that time, in the late sixties, Igor Dmitrievich was already a well-known scientist, Head of Department of the Institute for Informatics and Automation Problems of NAS RA (since 1961). Furthermore, though I was only 5 years younger, I listened to his advice and remarks full of respect and attention. By the above-said meeting, we discussed the formal part of my first paper on the theory of Aristotelian syllogistics. He was so delicate while explaining an essential fault in my formal presentation of categorical judgments in my variation of William Stanley Jevons's system of the logic of substitution. Soon I improved my system, got my PhD (candidate of science in logic) and then published a monograph "Extended syllogistics" (Yerevan, 1977) in which I presented my solution of the problem of polysillogism. I. D. Zaslavsky appreciated my solution and advised to find out quantitative evaluations of the simplification achieved by my method. I remember well he asked me how I came to my simple scheme of deducing conclusions from the set of any number of given premises. The question surprised me, and I couldn't give a plausible answer by that moment. Now, when more than forty years have passed, I am almost sure of correct answer to I. D. Zaslavsky's question since I remember, or it seems to me that I remember that I occasionally have noted how easily one could deduce the conclusion from three premises and then tried to demonstrate that the same simple scheme works also in the case of any given number of premises.

Igor Zaslavsky was a prominent representative of the school of Constructive logic lead by the famous mathematician, correspondent member of Russian National Academy of Sciences Andrey Markov and Professor Nikolay Shanin. His scientific papers were conceptual and elaborated some essential new approach to problems of constructive logic and mathematics. The traditional subject of constructive analysis is numbers, functions, and algorithms. In his early works, I. D. Zaslavsky introduced to this traditional field of concepts principally new ideas like that of the idea of *memory* in the systems of graf-schemes (I. D. Zaslavsky, "Graf-Schemes with Memory", Works of Mathematical Institute of Academy of Sciences of USSR, 72 (1964), 99-192). This same year he published a principle study of differentiation and integration in the field of constructive functions (I. D. Zaslavsky, "On the Differentiation and Integration of Constructive Functions", Dokl. USSR Academy of Sciences, 156: 1 (1964), 25-27). A 1969 paper by Zaslavsky had its subject of study the idea of Claude **Shannon** – the founder of the cybernetic science (I. D. Zaslavsky, "On Shannon's Pseudo-Functions", Zap. scientific sem. LOMI, 16 (1969), 65-76). Another truly brilliant paper presented the conception of symmetric constructive

logic (I. D. Zaslavsky, "On Predicate and Arithmetic Calculi of Symmetric Constructive Logic", Dokl. USSR Academy of Sciences, 210: 3 (1973), 517-520).

All these significant results on fundamental problems of constructive logic got their generalised and systematic presentation in Igor Zaslavsky's fundamental monograph "Symmetric constructive logic" (Yerevan, RA Academy of Sciences publ., 1978). This monograph served a basis for the development of investigations in the field of mathematical logic in Armenia. It was also supported by Igor Zaslavsky's personal activities in teaching mathematical logic to students of the Yerevan state university where he got Professorship in 1961. Starting from these days, Igor Zaslavsky formed competence in mathematical logic among hundreds of his students. These two fundamental factors were decisive in building the Armenian school of constructive logic.

Due to these significant results, Igor Zaslavsky was invited to participate in many international conferences dedicated to problems of mathematical logic, classical constructive logic and its modern schools. He became a member of editorial boards of many scientific journals. His prominence was also acknowledged by his participation in scientific Councils of candidate and doctor of science degrees in his branch of mathematical science. Igor Zaslavsky was chosen to the National Academy of Sciences of Republic of Armenia in the year 2000 in recognition by the scientific community of Armenia of his merits in the field of mathematical logic and the creation of the Armenian school of mathematical logic

His habits can characterise a grown-up man. In this regard, Fyodor Dostoyevsky mentioned, "It seems, in fact, as though the second half of a man`s life is made up of nothing, but the habits

he has accumulated during the first half". Apparently, these words do not hold regarding Igor Zaslavsky as a scientist. Zaslavsky, the scientist, was in constant search, in perpetual research of problems of mathematical logic. In 2003 Igor Zaslavsky published a fundamental study of formal axiomatic theories of three-valued logic (I. D. Zaslavsky, *Formal'nye aksiomaticheskie teorii na osnove trekhznachnoi logiki* (Formal Axiomatic Theories on the Base of Three-Digit Logic, in Russian). *Zapisi nauchnikh seminarov POMI*, *304*(2003), 19-74) and in 2005 was published the English version (I. D. Zaslavsky, "Formal Axiomatic Theories on the Base of Three-Valued Logic", *J. Math. Sci. (N. Y.)*, *130:*2 (2005), 4578-4597).

Mathematics and logic, as well as mathematical logic, are samples of precision and rigorousness. This is achieved through strict definitions of all concepts and terms used in mathematics and logic. In other sciences there are quite many concepts and terms used contextually (so to say, "intuitively"), not using explicit definitions. One can even suspect if the science of logic could be applied to these imprecise and indefinite concepts usually called *fuzzy sets*. Nevertheless, logicians succeeded in managing fizzy sets in the frame of *fuzzy logic*. I. D. Zaslavsky developed in 2008 a system of Fuzzy constructive logic (I. D. Zaslavsky, *Nechetnaq konstruktivnaya logika* (Fuzzy Constructive Logic, in Russian). *Zapisi nauchnikh seminarov POMI*, *358* (2008), 130-152 and its English version - I. D. Zaslavsky, "Fuzzy constructive logic", *J. Math. Sci. (N. Y.)*, *158*:5 (2009), 677-688). In 2012 I. D. Zaslavsky presented a significant extension of his system of constructive fuzzy logic (I. D. Zaslavsky, *Rasshirennaq nechetnaq konstruktivnaya logika* (Extended Fuzzy Constructive Logic, in Russian). *Zapisi nauchnikh seminarov*

POMI, *407* (2012), 35-76). The English version of I. D. Zaslavsky's extended system of constructive logic was published in 2014 (I. D. Zaslavsky, "Extended fuzzy constructive logic", *J. Math. Sci. (N. Y.)*, *199*:1 (2014), 16-35).

Life proves that talent is always multifaceted. I. D. Zaslavsky fascinated his students and colleagues by thorough knowledge of an unlimited field of science and culture. Of course, the main factor was his unordinary interest in all branches of human knowledge. Nevertheless, there was another significant factor too. Once Igor Dmitrievich told me that he remembered not only each one lecture he attended in years of his study at Leningrad (nowadays St-Petersburg) State University. Moreover, he said he remembered the professor who presented this lecture and even remembered the auditorium where the lecture took place. He spoke of his memory as of something ordinary but I never heard of human memory so much extraordinary.

Different aspects of life in the Soviet years in different people cause different assessments. But very rarely did I hear complaints about the setting of teaching lessons in the Soviet school, especially in those distant years. Therefore, I was quite surprised when, in a conversation with me, Igor Dmitrievich noticed that he was additionally engaged in history with his children. He believed that in history textbooks specific material is not provided in sufficient volume. Of course, I could not judge the volume of Igor Dmitrievich's knowledge of the detailed circumstances of historical events of the past.

Nevertheless, one of his remarks left a lasting impression on me. Igor Dmitrievich was a member of the Armenian Philosophical Academy. He often spoke at the annual meetings of the Armenian Philosophical Academy and philosophers always listened to him with great attention.

When, after his next speech, I noticed how successful his report was with philosophers, he laughed off, telling me the case of Cromwell. In connection with the decisive victory of Cromwell, the townspeople greeted him with loud cries of delight. When someone from Cromwell's entourage noticed how many people took to the streets in honour of his victory, he replied with sarcasm that there would be much more people on the streets if they led him to the scaffold.

The subject of my discussions with Igor Dmitrievich often was Gödel's famous theorem on the incompleteness of formalised arithmetic. In the second half of the past century, Gödel's theorem was one of the most cited results in the field of foundations of mathematics. Since I was not a mathematician I could judge Gödel's theorem completely independently, free of any mathematical pre-assumptions. Gödel proved his theorem by building a special formula *G* which appeared "undecidable" in the sense that neither this formula *G,* nor its negation could be proved. Though Gödel built this formula with very strict mathematical means its content was so to say "strange": Gödel's formula said that it was not provable. Since this formula did not contain any mathematical content, I insisted that Gödel's formula could not have any bearing to formalised mathematics. But Zaslavsky could not agree with me since building his formula Gödel actively used special type numbers later on called Gödel's numbering.

Then I used another argument. I pointed out that in actuality ***Gödel's undecidable formula G does not belong to the system of formalised arithmetic*** presented in Rusell's and Whitehead's *Principia Mathematica* because to construct Gödel's formula *G* one needs *Gödel's numbering* which is absent in *Principia Mathe-*

matica (see in detail Wisdom 2(9), 2017, 18-28). I did not bother Igor Dmitrievich with my new arguments because of his poor health. I hope will discuss the "eternal problems" of Godel's proof in the better world and I'll enjoy the wise commentaries of Igor Dmitrievich – the true sage of modern mathematical logic.

Thackeray wrote that life is a mirror: if you frown at it, it frowns back; if you smile, it returns the greeting. Igor Dmitrievich always smiled to his colleagues. I never saw him frowning at anyone. Meeting Igor Zaslavsky, everyone smiled back and enjoyed meeting him. This was his nature, and it provided him with true joy while meeting people.

Life is given once, and everyone manages to live it up to his last day. But the meaning of a scientist's life lies in contributing to the treasury of human knowledge. The scientific heritage of Igor Zaslavsky and the school of constructive logic he created brought honour both to Igor Zaslavsky and the science of Armenia. I am sure that the constructivist system of fuzzy logic developed by Igor Zaslavsky, in view of the enormous prospects of its applications in the field of artificial intelligence, will be a new brilliant page in the history of science.

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