Victoria Kreps

3 September 1945 – 3 March 2021

Victoria in the lecture hall at Mathematical-Mechanical faculty, 1967

Victoria Kreps was assigned to the laboratory of game theory and operations research of the Leningrad Division of the Central Institute for Economics and Mathematics in 1968, after finishing the Mathematical-Mechanical faculty of Leningrad State University. Even though the field was new to her, in two months she obtained her first result in game theory, proving that stochastic independence is the only form of dependence of the players' mixed strategies such that every finite strategic game admits a Nash equilibrium [1], [5].

In the 70s and 80s Victoria did a lot of applied research. It was not a good time for game theory in the Soviet Union since the field dealt with conflict and competition, which was problematic under Soviet ideology. Despite this she published two papers [2,3] in the International Journal of Game Theory, then the top international journal in game theory; an achievement that is certainly unique, and almost impossible at that time. The paper [2] was devoted to the uniqueness of equilibrium in bimatrix games, and [3] extended the analysis to games of more than two players. In 1980 Victoria defended her Ph.D. thesis "Vector spaces of games admitting an equilibrium", which was greatly delayed due to the anti-semitic climate of the time.

In the 90s, Victoria started to work in a new direction emerging from the works of R. Aumann (Nobel prize 2005) — repeated games with incomplete information, perhaps the class of games most difficult to analyze. These were the most fruitful years of her academic work. In this type of game, the less informed player infers information about the state of the game by watching the actions of the more informed player. No explicit solutions for these games were then known. In a series of over 10 papers published in leading international journals, Victoria and Victor Domansky identified and studied in detail several classes of repeated games having explicit solutions (for example, [6–7], [9], [10–12], [15–16], [18], [22]). [9] was the first paper to establish the connection between repeated games and transport problems, which 20 years later become an important tool in the study of these games. Starting with [11], a number of papers were devoted to models of financial markets giving an endogenous explanation of random walk behavior occurring in price dynamics through the "masking" actions of the insider. These results are well known internationally and became the foundation of the long-term friendship with the French and Israeli schools of game theory, many research visits and connections. Victoria also continued to study questions

about the structure and uniqueness of equilibrium in coalition-free games ([5], [8], [13], [19], [26]).

In 2010 Victoria defended her Habilitation thesis "Strategic randomization in making competitive economic decisions: a game theory approach" [14]. The Habilitation thesis was devoted to the game theoretic consequences of asymmetry of information in financial markets, as well as the problem of ranking on the basis of multi-dimensional data.

Victoria was open to new problems and in the last ten years collaborated extensively with younger colleagues, e.g. [17], [20], [21], [23], [26]. Two students, M. Sandomirskaya and F. Sandomirskiy defended their Ph.Ds under her supervision.

Victoria was a talented organizer, able to find unexpected solutions to seemingly hopeless situations. She played a key role in organizing the first international game theory conferences in St. Petersburg in 1996 and 2001. In 2015, largely due to her energy and resourcefulness, the International Game Theory Laboratory was founded at the Higher School of Economics at St. Petersburg, led by Herve Moulin, a world-renowned scientist in game theory and microeconomics. She was active in the research life of the laboratory and spared no effort in its development, helping to solve complicated organizational matters. In the last few years all the scientific and organizational activity of the laboratory of Theoretical Economics at Institute of Regional Economic Studies also came under her care, which she headed and to which she attracted a number of young talented researchers.

Victoria, or, to everyone, simply Vita, had many friends. She was always interested in people with all their successes and failures, and was genuinely interested in everything that happened in their lives. The problems of others were her own. If someone needed help, she spared no effort to assist. Due to Victoria

many scientists started on the path to success, now working all over the world. She possessed an unfaltering sense of dignity, and even those who were used to talking to others from on high, would never permit themselves to do so in her presence. She was a very strong, determined person, never despaired and never gave up. Already seriously ill, she wrote three papers [24-26] and continued her work until her last day.

Victoria in the same lecture hall at the alumni meeting, 2018

Her colleagues in the Laboratory of Game Theory at HSE and the Laboratory of Theoretical Economics at IRES, as well as everyone who knew her across the world, grieve for her passing.

The main works of Victoria Kreps:

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[13] Kreps, V. L. (2010). On game-theoretic characterisation of stochastic independence. *Discrete Mathematics & Applications*, *20*(3), 277-289.

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