

V. A. Yakubovich - mathematician, “father of the field”, and herald of intellectual democracy in science and society

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Abstract: The most important events of the remarkable life of V.A. Yakubovich the founder and chair (1970-2012) of the Department of Theoretical Cybernetics at the Faculty of Mathematics and Mechanics of Saint-Petersburg State University, the author/co-author of eight books and more than 300 journal articles and conference papers are considered through the lens of intellectual democracy movement in the modern Russia.

Vladimir Andreevich Yakubovich (referred to below as V. A.), one of the founders of the modern control theory, passed away at the age of 85 on August 17, 2012. He would have turned 90 in 2016. The authors of this paper are disciples of V. A. and do remember him as an outstanding scholar and humanist, a person of extraordinary sagacity and exceptional goodwill, a truly courageous human being. Confined to the sorrowful milieu and precarious lifestyle of the totalitarian state, V. A. had always been a stalwart champion of democratic principles, both in science to which he devoted his whole life and in the society to which he full-heartedly belonged. His journey to success was full of roadblocks, anxiety, and uncertainty. Nowadays, we enthusiastically call to mind his remarkable voyage and struggle, and eagerly admire his uncanny commitment to fairness and unparalleled loyalty to science.

V. A. was a corresponding member of the Russian Academy of Sciences and a member of the Academy of Natural Sciences of Russia. In 1998, V. A. has become a Honored Scientist of the Russian Federation and in 2005 Russian Government awarded him with the Order of Honor. He was a recipient of the 1986 Leningrad State University Prize for Pedagogical Excellence and the 1996 St. Petersburg State University Prize for the series of publications on optimal control. In 1995, Academic Publishing Company Nauka awarded him with a prize for the best journal publication. At the international level¹, in 1996, V. A. was presented with the main annual IEEE Control Systems Award and a Medal with the citation “For pioneering and fundamental contributions to stability analysis and optimal control”. One of his earliest papers titled “The solution of certain matrix inequalities in automatic control theory” was included in the monograph “Control Theory: Twenty-Five Seminal Papers (1932-1981)” prepared under the auspices of the IEEE Control Systems Society by a twelve-member Editorial Board and edited by Basar (2001). This monograph contains the most influential papers in the field as unanimously agreed “after several rounds of voting” (Basar, 2001, p. viii) by the Board. The inclusion of the paper by V. A. was, in the words of one of the Board members, Petar V. Kokotović, “because of its historical significance” (Basar, 2001, p. 233). Among

other accolades of V. A. is the following testimonial by the SIAM community regarding his relation to A. M. Lyapunov in the history of the development of linear matrix inequalities in control: “It is fair to say that Yakubovich is the father of the field, and Lyapunov the grandfather of the field” (Boyd et al., 1994, p.4).

At home, V. A. Yakubovich is considered as one of the leaders of the St. Petersburg mathematical community who, along with his numerous disciples and followers, has contributed a great deal to the mathematics of St. Petersburg. V. A. started his work at the university as head of one of the laboratories of the Research Institute of Mathematics and Mechanics. Among his first associates were V. I. Derguzov and V. N. Fomin who graduated the Faculty of Physics and were recommended to V. A. by academician V. I. Smirnov, a long-term supporter of V. A. Both Derguzov and Fomin became full professors of the Faculty of Mathematics and Mechanics with their own active research agendas and many students and followers. In 1970, V. A. founded the department of Theoretical Cybernetics at the Saint Petersburg (that time – Leningrad) State University Faculty of Mathematics and Mechanics and chaired it for more than forty years up to his final days. He paid a great deal of attention to pedagogical activities of the department that included the creation of three original cybernetics-oriented majors for the students and the development of the course sequence under the general title Theoretical Cybernetics. More than 40 of his post-graduate students had become candidates of science (PhD equivalent) out of which more than 10 became doctors of science (equivalent to Full Professor in the US or Habilitation in Europe). Among them are A. E. Barabanov, N. E. Barabanov, A. L. Fradkov, S. V. Gusev, G. A. Leonov, A. L. Lihtarnikov, A. S. Matveev, V. Reitmann and others who, in turn, supervise many new PhD dissertations. In all, there are more than a hundred PhD descendants of V. A. Yakubovich worldwide.

Despite all the success that V. A. seemingly enjoyed throughout his remarkable career, his life, just as the life of way too many leading mathematicians of his generation, was, unfortunately, not an easy one and with all his mathematical and pedagogical talents, little would he had been able to achieve without strong backing of many renowned mathematicians who, by offering

¹ See also obituaries published by IFAC (Leonov and Kurzanski, 2012) and IEEE (Fradkov et al., 2013)

their confident support to V. A., often acted boldly against non-democratic and discriminatory forces typical for the Soviet era academic milieu. V. A. was born on October 21, 1926 in Novosibirsk (the third largest city in Russia, about 2000 miles from Moscow). His childhood years have been full of hardship and insecurity, as his father did not escape the flywheel of Stalin's purges. Despite all misfortunes (though typical for many families lived through that period of Soviet history), V. A. managed to enroll in Moscow State University (MSU) where his teachers were famous mathematicians I. M. Gelfand, A. N. Kolmogorov, and V. V. Nemytsky. In 1949 they recommended V. A. for post-graduate studies (aspirantura). However, the MSU Faculty of Mechanics and Mathematics Communist Party Committee didn't approve his candidacy. The reason for this unjust decision was V. A.'s criticism and repudiation of the cases of anti-Semitism made public at a student meeting after which he was reprimanded for the "distortion" of the Soviet reality. (Much later, being himself a department chair, V. A., on many occasions, fearlessly confronted official anti-Semitic praxis at Leningrad State University (LSU) by trying, though unsuccessfully (see Vershik (1994)), to recruit either as a faculty member or a doctoral student mathematically talented individuals of Jewish ethnicity. It was not until 1988 when, following the election of a new dean, G. A. Leonov, under the umbrella of perestroika and on the wave of democracy, this shameful policy of ethnic discrimination was entirely eradicated at the LSU (now SPbSU) Faculty of Mathematics and Mechanics).

The efforts of I. G. Petrovsky and others to recommend V. A. to join Steklov Mathematics Institute in Moscow or, likewise, Ioffe Physical-Technical Institute in Leningrad were fruitless. Notwithstanding, at the initiative of the dean of the Faculty V. V. Golubev, V. A. quite unexpectedly was offered a decent job as an engineer at the Leningrad Shipbuilding Research Institute along with a room in the dormitory. While working at the institute, V. A. was also an active contributor to a seminar led by academician V. I. Smirnov and frequented by such notable mathematicians as O. A. Ladyzhenskaja and S. G. Mikhlin. As a result, without formal post-graduate studies, V. A. completed dissertation (1953) in which he upgraded well-known results of A. M. Lyapunov and N. E. Zhukovsky regarding stability criteria of solutions of the Hill equation describing the motion of the moon. With a terminal degree, V. A. first secured a teaching position at the Leningrad Mining Institute and soon (1956), enjoying strong support of V. I. Smirnov, he moved to the Leningrad State University Faculty of Mathematics and Mechanics. In 1959, V. A. defended his doctor of science dissertation with opponents being such stars of Soviet science as V. I. Smirnov, M. G. Krein, G. Yu. Dzhanelidze, and M. A. Krasnosel'skiy. During the defense, V. A. had to defend his work from bizarre accusations in "plagiarism" from N. P. Erugin (see a footnote in Yakubovich (1994)). Such accusations were to a large extent an embodiment of self-serving attempts to put a roadblock in the way of the emerging appeal of groundbreaking mathematical developments made possible by V. A.'s work for the immediate and future generations of mathematics students.

Fortunately, V. A. succeeded in overcoming the hurdles of unprofessional behaviour of some of his colleagues and managed to attract quite a few talented students to his orbit. One of them, A. L. Fradkov, is a current member of the Russian Government Council on Grants for state support of research conducted under the supervision of leading scientists. Most recently, he

has been very active in the formation of the grassroots Society of Researchers — an informal egalitarian body that defends the freedom of thought in the Russian scientific community, promotes the ideas of intellectual democracy within the Russian Academy of Sciences, champions transparent and open elections of academic administrators and university rectors. Likewise, the orbit of V. A. included G. A. Leonov — the first (and current) dean of the SPbSU Faculty of Mathematics and Mechanics to be elected (1988) through an open search process. Ever since, all decisions within the Faculty have been developed and (now traditionally) come out as a result of crystal clear administrative policies, open and all-embracing discussions at the meetings of the Faculty Senate. And not a small measure of the healthy morale that students and faculty have been enjoying for the last quarter of a century is the fact that any kind of discrimination, ethnic or otherwise, belongs to the regrettable past of the university mathematical community.

All things considered, the authors have been striving not only to continue research in the domains defined by V. A., but, following his footsteps, to promote democratization of Russian science and education. The notion of academic freedom is at the cornerstone of the very definition of a university and is successful mission. Already in the 11th-12th centuries, with the formation of the first universities in Europe, the ideas of academic autonomy, freedom, and democracy had come to be recognized as critical elements of university culture. By demonstrating their effectiveness and viability over the past millennium, these ideas have been embraced by society. Gradually, universities have developed the concept of granting academic degrees as a way of confirming the completion and successful defense of a dissertation. In the spirit of ideas of democratic reforms and the development of informed citizenry in Russia, ideas that were dear to V. A., the authors consider the reinstatement of the principles of academic autonomy and the growth of intellectual democracy in Russian universities to be of critical importance for the success of these societal transformations.

Unfortunately, in the modern Russia, two conflicting trends in the development of the society can be recognized: a trend toward democratization (e.g., a move towards academic autonomy of major universities) and a trend toward the establishment of local totalitarian academic structures. In particular, the latter trend can be observed at some Russian universities in the form of abuse of democratic principles of open discussion and external control of decision-making. This leads to such paradoxical situations as the creation of post-doctoral positions the remuneration of which is higher than that of a full professor. Worse still, the very professors have to compete to obtain those positions as means of support of their research. Likewise, unacceptable is the practice of keeping full professors on contracts that have to be renewed every two years or even every year. It thereby seems unlikely that any high profile foreign scholar would be willing to trade a tenured university position in Europe or North America for a two-year renewable contract in Russia.

At the same time, one of the manifestations of intellectual democracy that St. Petersburg State University, V. A.'s academic home for almost 60 years, can be proud of is its elevation to the level at which the university not only provides an organizational structure for defense of doctor of philosophy (PhD) dissertations, but also has the final say in awarding PhD degrees. Recently, an honor to inaugurate this new

scientific format in Russia fell to an academic group led by G.A. Leonov who, drawing on European tradition of the exchange of ideas among scholars without borders and experience in utilizing academic autonomy of a university, has been a long-term proponent of international academic cooperation. So, in June 2013, the first three PhD degrees completed through the joint supervision by the members of the departments of Applied Cybernetics (St. Petersburg State University) and Mathematical Information Technology (University of Jyväskylä, Finland) were awarded by the university (Kuznetsov et al., 2013). In these inaugurate events, the University of Jyväskylä Professors Pekka Neittaanmäki and Timo Tiihonen along with the University of Craiova (Romania) Professor Vladimir Rasvan have participated.

To conclude, the authors want to express their utmost confidence that life and struggle of V. A. Yakubovich – the mathematician, the "father of the field", and the herald of intellectual democracy in science and society – do serve as a guiding star for anyone with true aspirations of the democratically robust milieu of the modern Russia.

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