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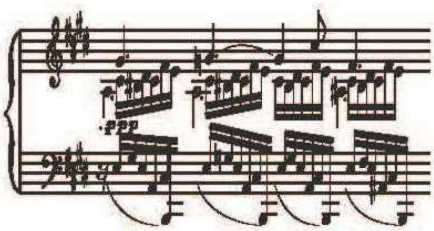

Special issue

dedicated

to Nikita Dmitrievna Vvedenskaya

A. Yu. Veretennikov
(editor)

Nikita Dmitrievna Vvedenskaya
(09.10.1930 – 06.05.2022)

This issue of the MPRF Journal is devoted to the memory of the remarkable person and outstanding mathematician Nikita Dmitrievna Vvedenskaya, Doctor of Sciences in Physics and Mathematics, who passed away in May 2022.

My first meeting with her occurred about forty years ago at a seminar at Steklov Institute. The talk was about ill-posed problems with the flavour of probability theory related to the mathematical interpretation of the Magnetic Resonance Imaging. Nikita Dmitrievna was already a senior staff member of the Institute for Information Transmission Problems (IITP). Later in the 90s we had a chance to meet regularly at the famous Pinsker and Dobrushin's seminar at IITP. She was very attentive to new researchers coming to the Institute. A few times I was honoured to be in a small company of younger mathematicians invited to be her guests. I was fully under the influence of her great personality. Beyond mathematics, Nikita Dmitrievna and I shared our love for cross-country skiing.

Later she approached me with small and not so small questions about her mathematical drafts and ideas, sometimes with co-authors, most often with Yuri Suhov. Of course, it was an honour for me if I could offer any tiny advice. I should have found time to discuss and to write a joint paper with her. It never happened, which I regret of. I have recently started looking at her published papers to offer them to my students for reading and for training at their first research steps.

This issue of the Journal contains three different types of papers. Firstly, there are two substantial reviews of Nikita Dmitrievna's scientific results and publications, one about her early works at the Keldysh Institute of Applied Mathematics, and the other one about her research works while she was at IITP. Both also contain some small but yet extraordinary paragraphs of memories. Secondly, there are several purely scientific papers mainly but not exclusively written by people who knew Nikita Dmitrievna well and some of them were her co-authors. Thirdly, there is one paper which combines memorial notes by several people. They all admired her personality.

Here are some more details about all the contributions of this issue of the Journal.

I.

The opening paper written by Nadezhda G. Afendikova is a substantial review of the first period of research activity of Nikita Dmitrievna at the Keldysh Institute of Applied Mathematics, straight after the defence of her Thesis, which was completed under the supervision of Olga Arsenyevna Oleinik at Moscow State University. The second paper by Yuri M. Suhov is a careful review on her research at the Institute for Information Transmission Problems from 1964 and until 2022. Also, the introduction of this paper contains several amazing episodes from the life of Nikita Dmitrievna.

II.

(1) The second part of the issue is a collection of research papers. The opening is by Andrey L. Piatnitski and Elena A. Zhizhina "Homogenization of non-autonomous operators of convolution type in periodic media". The paper tackles a periodic homogenization problem for a parabolic equation whose elliptic part is a convolution type operator with rapidly oscillating coefficients. The coefficients are rapidly oscillating periodic functions both in spatial and temporal variables, and the scaling is "diffusive" in the sense that the scaling factor of the time variable is equal to the square of the scaling factor of the spatial variable. Under certain natural assumptions it is shown that the equation under investigation admits homogenization and that the limit operator is a second order differential parabolic operator with constant coefficients.

(2) The next paper is written by Artem V. Logachev, Anatoli A. Mogulskii, Yuri M. Suhov, and Anatoli A. Yambartsev and is titled "Excursions of Markov processes: a large deviation approach". The paper considers a buyer-seller interaction model based on a two-dimensional process. The first coordinate is the number of buyers and the second one is the number of sellers. The rates of the incoming and outcoming flows of sellers and buyers, respectively, are assumed

to be polynomially dependent on their number at a given time. To make sure that the process is ergodic, it is assumed that the intensity of outcoming flow is greater in comparison to the incoming one. The problem associated with positive excursions of the trajectories of such processes is considered. The local principle of large deviations for these excursions is established.

(3) The third paper by Evgueny A. Pechersky, Ernest L. Presman, and Anatoli A. Yambartsev "Sojourn times of Markov symmetric processes in continuous time" is summarized below. The symmetric birth and death process on a finite set of integers $(1, \ldots, N)$ with linear transition rates is studied; naturally, transitions from 1 may be to state 2, and from N to state $N-1$ only. It is shown that as N goes to infinity and after the appropriate scaling the process spends most of its time in some neighbourhood of state 1, which is a sort of a Law of Large Numbers result. Further, the authors show the asymptotics of the local large deviation type. The ultimate authors' idea behind the theorems is to link their results with the problem of the matter and anti-matter in the Universe.

(4) The fourth paper "On exponential recurrence of 'Markov-up' processes" is by Diana O. Kalikaeva, the student at mech.-math. faculty of Moscow State University. This is a recently introduced class of semi-Markov processes on the half line with the property of moving upwards according to some Markovian rule, while its downward itinerary has a more complicated nature depending on the past of the trajectory from the last turning point to current time. Under certain natural assumptions, exponential recurrence is proved for such a model.

(5) The fifth paper is written by the postgraduate student at Moscow State University Roman Yu. Sineokiy with the guest editor of this volume. It has a title "On recurrence, convergence and mixing rate of generalised Wright – Fisher diffusion with mutation". The continuous time version of such a diffusion is considered in the situation where the process never hits the endpoints of the interval [0,1]. The model itself came from the population genetics and relates to a genes' diffusive behaviour. For the model under consideration, an exponential recurrence is proved with the bounds which are not uniform in the initial data. As a corollary, exponential convergence in total variation is shown for the marginal distribution towards the invariant measure. A similar result is proved for Kolmogorov's beta-mixing coefficient. The paper strengthens earlier results by several authors by considerably relaxing the regularity conditions on the coefficients of the model.

(6) The sixth paper, which relates to ergodic control is written by the guest editor of the issue. The paper tackles Bellman's equation (BE) and Howard's algorithm of a successive strategy improvement for the average ergodic control of the solution of a one-dimensional stochastic differential equation with switching, in the case where the diffusion coefficient depends on control. Existence and uniqueness of solution of the ergodic BE is established and convergence of Howard's algorithm is proved.

III.

The memories belong to Vladimir M. Tikhomirov who offers many details about Nikita Dmitrievna Vvedenskaya, to Anatoli M. Vershik who highlights the bridging role of Nikita Dmitrievna among various mathematical and non-mathematical society groups, to Simon G. Gindikin, one of the old co-authors and close friends of Nikita Dmitrievna, to Andrei L. Piatnitski and Elena A. Zhizhina who report of some Armenian conferences where Nikita Dmitrievna participated, and to Olga G. Egudina who knew her from her childhood in Tashkent. They were all friends of Nikita Dmitrievna.

Finally, here is a link to the video-interview, which Nikita Dmitrievna Vvedenskaya gave in the end of 2021 during the celebration of the jubilee year of the Institute for Information Transmission Problems,
`https://www.youtube.com/watch?v=Q0jjItNzAqY`,
and one earlier interview published at
`http://www.kommersant.ru/doc/3106109`
given by Nikita Dmitrievna to Elena Kudriavtseva (the Ogoniok magazine from 10.10.2016), in Russian.

I do not see a better way to complete this short editorial note than by a citation from Professor Tikhomirov's memories (see in what follows): "The bright memory of Nikita Dmitrievna Vvedenskaya will forever remain in the hearts of those people who have been connected to her."

Acknowledgment. The Journal thanks Dr Maria Veretennikova for translating and editing several papers for this issue.

For the Editorial Board,
Alexander Veretennikov, the guest Editor