Sergei Dmitrievich Kuznetsov
04/08/1949 – 07/28/2023

Fig. 1. S. D. Kuznetsov. Sophia Antipolis, France, February 2007.

Sergei D. Kuznetsov, a well-known Russian specialist in the field of database and information systems technologies, one of the founders of the Moscow ACM SIGMOD Chapter[1], passed away in July 2023. This short article is a tribute to the memory of a famous scientist and wonderful person, for whom the life of the Moscow ACM SIGMOD Chapter was an important part of his own life. Sergei Dmitrievich Kuznetsov (Sergei) was a major specialist in several areas for System Programming. The main ones are: operating systems, object-oriented approach in the design and development of programs, database management systems, and information systems.

In 1971, he graduated from the Faculty of Mechanics and Mathematics of Lomonosov Moscow State University with a degree in mathematics, then worked at the Institute of Precision Mechanics and Computer Science of the Academy of Sciences of the USSR

[1] https://synthesis.frccsc.ru/sigmod/eng/index_html.html.

(now the S. A. Lebedev Institute of Precision Mechanics and Computer Science of the Russian Academy of Sciences). He was one of the main developers of the operating system for the central processor of the AC-6 computer complex, which was actively used in real-time systems for controlling spacecraft flights. The first large-scale use of the AS-6 was the joint Soviet-American Soyuz-Apollo program (1975).

In 1979 Sergei defended a dissertation for the academic degree of Candidate of Physical and Mathematical Sciences on the topic "Organization of multiprogramming in the OS" (under supervision of V. P. Ivannikov), and in 1995 a dissertation for the scientific degree of Doctor of Technical Sciences on the topic "Research and development of a free SQL server"; in 2006 he received the academic title of professor.

In the 1980s Sergei worked at the Delta Research Institute of the USSR Ministry of Electronic Industry and at the Institute of Cybernetics of the Academy of Sciences of the USSR, where he was involved in the creation and implementation of supercomputer software "Electronics SS BIS-1", and the development of the CLOS cluster operating system and a relational database management system based on CLOS.

After the formation of the Institute for System Programming of the Russian Academy of Sciences in 1994, Sergei was the first Scientific Secretary of the Institute, and headed the Department of Data Management and Information Systems Development, whose tasks included the development of system software for data processing and analysis, database management systems, distributed big data processing technologies, and cloud computing technologies. Under the scientific guidance of Sergei development of algorithms for statistical data analysis and machine learning began, as well as software for solving applied problems, including text mining, social network analysis, bioinformatics problems, and multimedia data processing.

Sergei did a lot of public work and scientific and organizational work. In the 1990s, he was the chairman of the council of the Soviet (Russian) Association of Users of the UNIX operating system (SUUG), a member of the European Association EurOpen, Usenix and Uniforum associations, a member of the Association for Computing Machinery, a member of the IEEE Computer Society and its representative in Moscow, deputy chairman of the Moscow section of ACM SIGMOD, a member of program committees of international conferences, and co-chairman of the international conference of young scientists SYRCODIS. He was the editor-in-chief of the Open Systems Journal, the deputy editor-in-chief of the journal Proceedings of the Institute for System Programming of the Russian Academy of Sciences, etc.

Sergei conducted extensive teaching work at the Faculty of Computational Mathematics and Cybernetics of Lomonosov Moscow State University, at the Moscow Institute of Physics and Technology and the National Research University Higher School of Economics. A large team of highly qualified research programmers was trained under the leadership of Sergei.

Sparing words listing the deeds and the results obtained are not enough to tell about a person, especially about a person like Sergei, who had many talents, a gentle soul, and a sympathetic heart. Friends of Sergei know about his unique collection of jazz music, his graphic drawings, and the books he was fond of.

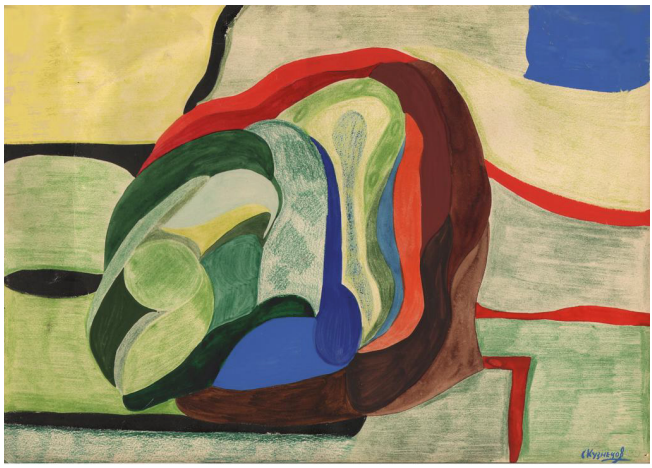

Fig. 2. Drawing by Sergei Kuznetsov. 1960s–1970s.

We cover only three topics in the next sections:

- Scientific publisher and editor;
- Teacher;
- Scientist.

Scientific Publisher and Editor[2]

Sergei D. Kuznetsov apparently had always had a passion for working with texts. He loved to read and write, which, unfortunately, is rare among programmers. Probably, his first experience of professional immersion in working with the "scientific word" took place in the 1970s–80s, when he and Viktor Petrovich Ivannikov actively collaborated with the Abstract Journal of the Academy of Sciences of the USSR, which was published by VINITI. There was a huge flow of information that passed through Sergei and needed to be summarised and presented in a brief but meaningful form. In addition, at the same time, Sergei participated in scientific conferences, where one of his main roles was the drafting and editing of theses and reports. He worked extremely carefully with the authors. I remember one of the conversations with Sergei on the eve of a large conference on databases in Tver (then in Kalinin). I was excited to tell Sergei about the development of an integrated turbo environment that combined editing, compilation, and debugging tools and convince him that I was not involved in any databases, and therefore he should not expect any report from me for this conference. Sergei listened to me with interest and noted that, in a turbo environment, it is probably necessary to have an effective mechanism for working with internal representations of the program, that is, there was an intersection of my topic with the topic of the conference. The result was a good

[2] The section was prepared by Alexander K. Petrenko.

article, and the topic of DBMS for supporting integrated development environments is still relevant today.

An important stage in his editorial career was the creation of the Open Systems Journal[3], of which he was the first editor-in-chief. But the longest part of his life as an editor was associated with the Proceedings of the Institute for System Programming, 2000–2023. The editor-in-chief of the journal was Viktor P. Ivannikov, but for all editorial work and correspondence with the authors Sergei took over. In the first year, one issue was published, containing 8 articles. Then 2 issues were published per year, then a process was built: 6 issues per year, each with 10 to 20 articles, sometimes more.

It should be said that Sergei sometimes would formally pull rank if the work was not to his liking, and would immerse himself in it completely if he liked it. There was a happy accident with the Proceedings; he liked this work, and as a result he liked both the articles and the journal itself. He said more than once that the Proceedings had become the best programming journal in Russia in recent years, and he was proud of it. His contribution to the level of the journal primarily consisted in the fact that he not only read articles, but communicated with the authors if it was necessary to bring the article to the required quality. I have never heard of any of the authors being offended by such close attention. At the same time, Sergei always treated all authors very kindly, and the high praise from his lips always inspired and gave new strength.

Fig. 3. Drawing by Sergei Kuznetsov. Calendar. 1960s–1970s.

[3] https://www.osp.ru/os/about?lang=en.

Teacher

Academician Israel M. Gelfand, according to the recollections of his students, defined the concept of "good teacher" as follows: "To be a good teacher you need: first, *love your subject*, secondly, *love to teach*, and thirdly, *love those you teach*". Sergei Dmitrievich Kuznetsov fully met this high level.

Supervisor with a Remarkable Breadth of Knowledge[4]

"It has to be either databases or networks! Wouldn't need to study hard in either and there's a lot of potential!" said my best friend in the uni while we were discussing the area to study.

So he ended up doing networking and I went on an open day at the database seminar led by Sergei Dmitrievich. I was really unsure of what relational databases were at the time, but it all sounded very exciting. And it still is, 20 years later!

Sergei was an extraordinary teacher. He was across both hardware and software architectures and could describe a B-Tree index retrieval with a few waves of a cigarette, using its smoke to illustrate operational complexity. After one such impromptu explanation, something clicked, and I finally grasped the underlying connections between a whole lot of subjects I was studying at the time.

Sergei didn't force your hand in choosing the research topic. Instead, he supported and mentored you along the way. This wasn't the more strict study pattern many of us were used to, and it caused a few students to drop out. However, this freedom to choose quite offbeat and trendy topics was exactly what attracted like-minded students under Sergei's wing.

My PhD thesis was based on a niche mathematical concept of lattices and implemented using the MapReduce/Apache Hadoop stack, which was quite novel at the time (2005) [6]. Sergei's breadth of interests, all the reading, and his help with various topics meant that he was already familiar with both concepts and could guide me along the way. That was very impressive.

Sergei was also very interested in the real-life applications of database technologies. For many years, he hosted the "Corporate Databases" conference where his research students and technology professionals from large companies would spend hours in breakout sessions sketching on napkins and debating specific implementations of particular algorithms in different software products. Sergei's interest in both the theoretical and practical aspects of database systems was contagious; we were all buoyed by his enthusiasm.

I followed his advice to start translating some of the articles I found inspiring from English to Russian, as was his long-time habit. This served as both a great writing exercise and also helped me connect with a lot of interesting people once some of these translations were published (with Sergei's help, of course). Later on, I stumbled upon the idea to try out a thesis based on one of the articles.

[4] The subsection was prepared by Yuri Kudryavcev.

That writing itch also made me start blogging, connect with more people through the blog, and eventually move to Australia to work with some of them on implementing database technologies. Meeting Sergei definitely defined my life!

Excellent Lecturer and Mentor[5]

I was lucky to be not only a student who attended Sergei D. Kuznetsov's lectures, but also his supervisee.

As a listener to Sergei's lectures, I can say that he was an unsurpassed lecturer who brought to each lecture not just knowledge, but the spirit of researchers and, DBMS developers, and the history of the development of science and the database industry. With full notes available, students actively attended the lectures because they were informative and interesting.

Sergei treated people very warmly, with sincere participation and empathy. He tried to find interesting activities for each of his students, of whom he actually had many. By the way, Sergei had always an "overkill" of scientific students; many wanted to get him as a research advisor. But Sergei was an inexhaustible source of ideas for scientific activity; both Viktor Petrovich Ivannikov and Lyudmila Sergeevna Korukhova, the Scientific Secretary of the System Programming Department, knew this, so they often turned a blind eye to the "overkill". Sergei had a wide circle of acquaintances in the IT industry, thanks to which many of his students, including me, found their first job in IT companies, or on IP projects. Recommendations and requests from Sergei meant a lot. They trusted him and respected his opinion.

I remember how Sergei recommended me to one company to gain my first practical experience. I had interviews and went to communicate in person, but they didn't hire me. Sergei was very worried that it didn't work out. I remember his face, how he silently smoked, sighed, and thought. In the end, he promised to find me an equally good place and, of course, he kept his promise. Sergei was not a demanding leader. He was kind, understanding, and even treated the students like a father. When setting exams, he could challenge a student mercilessly on all topics, fail the student, and in the end give him a good grade. I can't speak for everyone, but Sergei's kind attitude forced me not to let my supervisor down and to respond to condescension with diligence.

As a leader, Sergei was attractive for his aura of openness, on the one hand, and the incredible "coolness" of his personal and joint works with Russian and foreign partners. This was the magic of his figure, sitting in cloudy smoke on the balcony of the hall of the Faculty of Computational Mathematics and Cybernetics of the Moscow State University.

I can't imagine how my supervisor managed to do so much and at the same time communicate with people without rushing. By the way, he always had many pages open at the same time in his browser. But when I came to him, he almost never kept me waiting and said: "Let's go have a smoke."

Subsequently, already during my work at the Faculty of Computational Mathematics and Cybernetics, I gave a lecture course on the theory of databases based on the notes of

[5] The subsection was prepared by Andrey Suslov.

Sergei during my business trip to Kazakhstan, at the Moscow State University branch. It was already clear to me then that students' interest was determined not so much by the content of the course as by the presentation of the material and its connection to the life stories of interesting people. I didn't have my own baggage of stories, of course, but I gladly (and probably with a smart look) retold stories from Sergei

We continued to have very warm relations even after the University. We once met in the mid-2000s on a winter evening at a hotel in Kazakhstan, where Sergei came to give lectures, and I was already working in another company, by the way, related to the research work of Pavel Velikhov. Sergei Dmitrievich was with his wife Lena. It was cold in the room, but we drank hot tea all evening, discussed world trends, and just warmly talked about life. Sergei was always sincerely happy about my successes, as if I was his own son.

As an indicator of the demand for textbooks by Sergei, statistics on the number of downloads can serve as a guide. Over the past three months it has been like this:

– Databases. Introductory course

  - November 2023–1615 downloads
  - December 2023–1922 downloads
  - January 2024–1938 downloads

– Fundamentals of Modern Databases

  - November 2023–1851 downloads
  - December 2023–2044 downloads
  - January 2024–2239 downloads

– Summary statistics by article

  - 600–700 downloads per month.

Further unique evidence of the students' gratitude is the course of lectures "Databases" [6].

In the header of each page there is the following inscription: "These lecture notes were prepared by students, have not been professionally edited and may contain errors. Please follow https://vk.com/teachinmsu for updates."

Not everyone gets such recognition and respect from students.

We didn't have time to meet before the pandemic, but we regularly called each other. I was looking forward to our meeting, but Sergei, as it turned out later, was already ill and did not want to be seen like that.

I think the most important thing that has always been in my supervisor is love. For people, for business, for the world in general. To love your subject, to love to teach and to love those you teach – this is 100% about our dear Sergei Dmitrievich.

[6] https://teach-in.ru/file/synopsis/pdf/database-M.pdf.

Fig. 4. The course of lectures on Databases

Fig. 5. Drawing by Sergei Kuznetsov. 1997

Scientist[7]

Sergei D. Kuznetsov was a leading Russian scientist in the field of Database Management Systems. His activities in this area included not only academic and educational activities, but also deep practical activities: Sergei was the scientific director of the development of the GNU SQL Server DBMS and Sedna XML Database. Sergei delved into completely different aspects of creating a DBMS, from complex scientific issues to purely technical ones. And besides these two systems in which Sergei was directly involved, he also maintained connections with the entire Russian DBMS development community and helped with advice and his expertise on other DBMS projects.

I was lucky enough to work with Sergei on the Sedna project, and subsequently Sergei and I worked together at Huawei, where Sergei advised the company's management on the development of its product line. Sergei quickly immersed himself in the topic of massively parallel analytical DBMSs and wrote fundamental articles about the prospects and limitations of real-time analytics systems.

Also Sergei asked me to review his latest work in the field of DBMS. This fundamental work by Sergei proposed an elegant solution to a very old problem of relational DBMSs and the SQL standard – working with unknown values. And although some solutions to the problem have already been proposed in the industry, Sergei described many years of development of thoughts and initiatives in this direction and justified his solution to this problem in very clear terms. At the same time, Sergei worked hard on the article in the last months of his life, despite already serious health problems. The work turned out to be of very high quality and is one of the most valuable scientific contributions of Sergei

I would especially like to note the deep human interest of Sergei in researchers in the field of DBMS. Sergei was always interested not only in the scientific results of his colleagues, but also always showed deep human interest in their activities and destinies.

Acknowledgements. We would like to thank Nadezda Zotova from HSE University for her help with typing this text.

Selected works. In the References section below a list of selected papers by Sergei Dmitrievich is provided. The list of papers that he himself compiled consists of 219 items. Here we have selected the very first and most recent papers. For the most part, these are brilliant analytical reviews, as well as landmark works that determined entire areas of research and development of the teams in which he worked. A more complete list of works, including textbooks and monographs written by Sergei Kuznetsov can be found on his website https://kuz.me/.

[7] The section was prepared by Pavel Velikhov.

Fig. 6. 9 myself. 1960s–1970s.

References

1. Kuznecov, S., Kudryavcev, Y.: Applying map-reduce paradigm for parallel closed cube computation. In: Chen, Q., Cuzzocrea, A., Hara, T., Hunt, E., Popescu, M. (eds.): The First International Conference on Advances in Databases, Knowledge, and Data Applications, DBKDS 2009, Gosier, Guadeloupe, France, 1–6 March 2009, pp. 62–67. IEEE Computer Society (2009)
2. Kuznetsov, S.D., Velikhov, P.E., Fu, Q.: Real-time analytics: benefits, limitations, and tradeoffs. Prog. Comput. Softw. **49**(1), 1–25 (2023)
3. Kuznetsov, S.D.: Typed unknown values: a step towards solving the problem of representing missing information in relational databases. Trudy ISP RAN/Proc. ISP RAS 35 (2) (2023) 73–100
4. Chistyakova, A., Cherepnina, M., Arkhipenko, K., Kuznetsov, S.D., Oh, C.S., Park, S.: Evaluation of interpretability methods for adversarial robustness on real-world datasets. In: 2021 Ivannikov Memorial Workshop (IVMEM), pp. 6–10. IEEE (2021)

5. Ryndin, M.A., Turdakov, D.Y., Kuznetsov, S.D.: Catalyst: Combining co-training and active learning for lifelong classification. In: 2020 Ivannikov Ispras Open Conference (ISPRAS), pp. 96–101. IEEE (2020)
6. Kuznetsov, S.D.: In anticipation of native DBMS architectures based on non-volatile main memory. Proc. Inst. Syst. Prog. RAS **32**(1), 153–180 (2020)
7. Nguyen, V.A., Duong, N.S., Nguyen, T.T.H., Kuznetsov, S., Nguyen, T.Q.V.: A method for determining information diffusion cascades on social networks. **6**(2), 61–69 (2018)
8. Kuznetsov, S.D.: New storage devices and the future of database management. Baltic J. Modern Comput. **6**(1), 1–12 (2018)
9. Drobyshevskiy, M., Turdakov, D., Kuznetsov, S.: Reproducing network structure: a comparative study of random graph generators. In: 2017 Ivannikov ISPRAS Open Conference (ISPRAS), pp. 83–89. IEEE (2017)
10. Kuznetsov, S.D.: Perspectives and problems of nonvolatile memory usage. In: Proceedings of the 5th International Conference on Actual Problems of System and Software Engineering, pp. 7–21 (1989)
11. Kuznetsov, S.D.: Data management: 25 years of forecasts. Proc. Inst. Syst. Prog. RAS **29**(2), 117–160 (2017)
12. Kuznetsov, S.D.: ODMG and SQL object models ten years later: no inconsistencies. Proc. Inst. Syst. Prog. RAS **27**(1), 173–192 (2015)
13. Kuznetsov, S.D., Poskonin, A.V.: NoSQL data management systems. Prog. Comput. Softw. **40**, 323–332 (2014)
14. Turdakov, D.Y., et al.: Texterra: A framework for text analysis. Prog. Comput. Softw. **40**, 288–295 (2014)
15. Bourdonov, I.B., Ivannikov, V., Kossatchev, A.S., Kuznetsov, S.D., Tomilin, A.: Operating system of the multi-machine computer AS-6. In: Impagliazzo, J., Proydakov, E. (eds.) Perspectives on Soviet and Russian Computing. SoRuCom 2006. IFIP Advances in Information and Communication Technology, vol. 357, pp. 31–35. Springer, Heidelberg (2011). https://doi.org/10.1007/978-3-642-22816-2_5
16. Kuznetsov, S.D.: Transactional parallel DBMSs: a new wave. Proc. Inst. Syst. Prog. RAS **20**, 189–251 (2011)
17. Taranov, I., et al.: Sedna: native XML database management system (internals overview). In: Proceedings of the 2010 ACM SIGMOD International Conference on Management of Data, pp. 1037–1046 (2010)
18. Kuznetsov, S.D.: Object-relational databases: former stage or depreciated capabilities? Proc. Inst. Syst. Prog. RAS **13**(2), 115–140 (2007)
19. Kostenko, B., Kuznetsov, S.D.: History and urgent problems of temporal databases. Proc. Inst. Syst. Prog. RAS **13**(2), 77–114 (2007)
20. Novak, L., Kuznetsov, S.D.: Canonical forms of XML schemas. Prog. Comput. Softw. **29**, 283–293 (2003)
21. Grinev, M., Kuznetsov, S.D.: UQL: A UML-based query language for integrated data. Prog. Comput. Softw. **28**, 189–196 (2002)

22. Kuznetsov, S.D., Ivannikov, V., Burdonov, I., Kosachev, A., Kopytov, G.: The CLOS project: Towards an object-oriented environment for the development of applied systems. Control Syst. Comput. 61–65 (1992)
23. Kuznetsov, S.D.: State-of-the-art and perspectives of database theory and practice: An analytical survey. Appl. Inf. **4**, 153–172 (1989)
24. Kuznetsov, S.D., Byakov, A.Y., Ivannikov, V.: Standard operational system for the central processor of a computational system. Preprint (1974)
25. Kuznetsov, S.D., Byakov, A.Y.: Standard operational system for the central processor of a computational system. Proc. Young Spec. **1,** 79–93 (1973)

Alexander K. Petrenko
Yuri Kudryavcev
Andrey Suslov
Pavel Velikhov