

## CURRICULUM VITAE

DR. ALEXANDER ZHEGLOV, PH.D., DR. SCI. (HAB.)

### 1) **Personal**

Born August 23, 1974 in Ivanovo, Russia; nationality: russian; married, 3 children

### 2) **Education:**

a) graduated the Kolmogorov Physical-Mathematical School by Moscow State University in 1991;

b) graduated Moscow State University in 1996 (Department of Higher Algebra, Faculty of Mechanics and Mathematics of MSU), under the supervision of A.N.Parshin, diploma with distinction, 1996

c) postgraduate student of Higher Algebra Department of Mechanics and Mathematics Faculty of Moscow State University since 1996 till December 1999, under the supervision of A.N.Parshin.

d) postgraduate student of the Graduiertenkolleg "Geometry und Nichtlinear Analysis" of Humboldt University in Berlin since January 2000 till July 2002, under the supervision of A.N.Parshin and E.-W. Zink.

e) Ph.D. in mathematics, Moscow State University, Humboldt University in Berlin (July 2002); candidate dissertation (Ph.D. Thesis) "Multidimensional local skew-fields", electronic publication of Humboldt University in <http://edoc.hu-berlin.de/browsing/dissertationen/>

f) Dr. Sci. (habilitation) in mathematics, Steklov Mathematical Institute of Russian Academy of Science (Oktober 2016); habilitation Thesis "Torsion free sheaves on varieties and integrable systems" (in russian), <http://www.mi.ras.ru/dis/ref16/zheglov/dis.pdf>

### 3) **Appointments:**

August 2002 – April 2006: postdoctoral fellow of DFG (Deutsche Forschungsgemeinschaft)-Schwerpunkt "Globale Methoden in der komplexen Geometrie", project "Higher-dimensional Krichever correspondence" hosted by Prof. H. Kurke at the Department of pure and applied mathematics, Humboldt University of Berlin, Germany.

November 2002 – May 2006: Research fellow, Institute of Pure and Applied Mathematics, Far-eastern part of Russian Academy of Science; Chabarovsk, Russia.

May 2006 – August 2020: Associate Professor at the Chair of Differential Geometry and applications, Department of Mechanics and Mathematics, Moscow State University

Since September 2020 - Professor of the Department of Differential Geometry and Applications, Department of Mechanics and Mathematics, Moscow State University

Short-term research appointments (several weeks) at: University of Salamanca, Mat. Institute of Oberwolfach, Max Plank Inst. in Bonn, ICTP (Trieste), ESI (Wien), Cologne University

4) **Research interests:**

Algebraic geometry, algebraic number theory, integrable systems, higher local fields, valuation theory

My major research field at present time is the algebraic theory of integrable systems. Since 2002, together with colleagues from the Mathematical Institute of the Russian Academy of Sciences, as well as with colleagues from Germany (Humboldt University of Berlin, Cologne University), I developed the theory of higher-dimensional Krichever correspondence, which is a generalization of the well-known algebraic theory of the KP equation, and which connects many modern areas of mathematics. The results obtained on this topic from 2002 to 2016 formed the basis of my doctoral dissertation "Torsion free sheaves on varieties and integrable systems".

In particular, we developed an approach to a solution of the well-known classification problem of commuting rings of partial differential or differential-difference operators, as well as an approach to the study of their isospectral deformations, based on the study of spectral sheaves on projective algebraic varieties. In the framework of this approach, using fundamentally new algebraic-geometric and number-theoretic ideas and constructions developed by the school of A.N. Parshin, we investigated the geometric spectral data of a wide class of well-known examples of algebraically integrable systems; commutative subalgebras of operators in two variables were classified in terms of geometric spectral data; multidimensional analogues of the KP hierarchy were proposed, explicit isospectral deformations of well-known examples of algebraically integrable Calogero-Moser systems with rational potential were found.

A number of my early works was devoted to purely algebraic questions, namely the study of multidimensional local skew fields. In particular, I obtained a classification of splittable local skew fields with a commutative residue field up to continuous automorphisms in the case of skew fields of zero characteristic, and in the case of skew fields of positive characteristic. New results were obtained on the structure of the Brauer group over the fields of Laurent power series with an arbitrary residue field. In particular, I proved the conjecture of M. Artin that the exponent and index are equal for skew fields over  $C_2$ -fields, in the case of skew fields over fields of Laurent power series. Around the same time, it was proved by M. Artin and A. De Jong in another important case of skew fields over rational function fields of rationally connected algebraic surfaces over algebraically closed fields. In the general case the conjecture remains open.

Besides, I participated in several research projects and grants at the Chair of Differential geometry and applications (RSF, RFBR, Scientific Schools), participated in the international laboratory named after D. Bernoulli under the guidance of Professor T.S. Ratiu (2011-13), and also was a member of organising and programme committees. The full list of these activities see on the webpage <https://istina.msu.ru/profile/azheglov/>

5) **Mailing address:**

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8) **Webpage**

<http://dfgm.math.msu.su/people/zheglov/English/AlexanderZheglov.html>

9) **Conference presentations:** the list of talks given since 2011 see on the webpage <https://istina.msu.ru/profile/azheglov/>

10) **Teaching experience:** 16 years.

Regular Courses: Differential Geometry, Computer geometry, Visual geometry and topology

Special courses: Algebraic Geometry; Lie groups and Lie algebras; Algebra, geometry and analysis of commuting ordinary differential operators

For more detailed information see the webpage

<https://istina.msu.ru/profile/azheglov/>

In different years I participated in organizing special seminars for underground students (together with G.I. Sharygin), scientific seminars at the Math. department of Moscow State University, gave popular science lectures for high school students (Russian Radio, Yandex School, Channel One, Odintsovo Center for Continuing Education), supervised or participated in work on master diploma thesis at MSU (I.N.Shnurnikov, 2006-2009, D. A. Pogorelov, 2012-2014), gave scientific advices to postgraduate students.

Besides, I gave several invited lecture courses at summer schools for graduate and undergraduate students in Russia (Koryazhma, 2015), China (Beijing, 2018), and semester lecture courses at the Peking University in China (2019), University of Dimitry Pozharsky in Moscow (2018).

11) **The international educational cooperation:**

Since 2006 I regularly give lectures on the compulsory courses for 2nd year students of the Kazakhstan branch of MSU in Astana (Nur-Sultan) and give lectures for foreign students at Moscow State University.

In 2018-2019 I participated in organizing a joint scientific-educational laboratory with the Peking University in China.

In 2018 I participated in writing joint graduate programs for students from Slovenia Universities.

12) **Grants and rewards:**

RFBR grants for research groups in 2006 – 2018,

RFBR grant for China-Russian cooperation 2016-2018 (one of investigators from russian side)

German research grants from DFG, DAAD for short term visits to MFO (Oberwolfach), MPI (Bonn), Humboldt Uni. zu Berlin in 2012 - 2016,

Russian Science Foundation grant for small research group in 2015 (up to 10 people, one of PI's)

Russian Science Foundation grant for small research group in 2016-2019 (up to 10 people, one of PI's)

Prize under the MSU Development Program – 2015,2016

"BASIS" Foundation's grant for Special Courses – 2019

13) **Research papers:**

1. A. B. Zhiglov, *On a structure of two-dimensional local skew fields*, Izv. Ross. Akad. Nauk, 1, 2001, pp. 25-61, in russian, English transl. in *Izvestiya: Mathematics* **65:1** (2001) 23-55
2. A. B. Zhiglov, *On a classification of two-dimensional local skew fields*, Usp. Matem. Nauk, v. 54, 4, 1999, pp. 169-170.
3. A. B. Zhiglov, *On a classification of two-dimensional local skew fields II*, Usp. Matem. Nauk, v. 55, 6, 2000, pp. 135-136.
4. A. B. Zhiglov, *Higher local skew-fields* in Proceedings of Muenster's conference "Invitation to higher local fields", Part II, section 8, Geometry and Topology Monographs, Warwick, Vol. 3, 2000, 281-292; math.NT/0012158
5. A. B. Zhiglov, *On wild division algebras over fields of power series*, Mat. Sb., **195:6** (2004), 21-56; English transl. in *Sb. Math.* **195:6** (2004), 783-817.
6. Zhiglov A. B., Osipov D. V., *On some questions related to the Krichever correspondence*, Matematicheskie Zametki, n. 4 (81), 2007, pp. 528-539 (in Russian); english

translation in *Mathematical Notes*, 2007, Vol. 81, No. 4, pp. 467-476; see also e-print arXiv:math/0610364 [math.AG].

7. H.Kurke, A.Martin-Pizarro, A.Zheglov, I.Zhukov, *Motivic integration: seminar talks*, preprint of Humboldt University, 2005, 34p.
8. A. B. Zheglov, *Two dimensional KP systems and their solvability*, preprint of Humboldt University, 4, 2005, 42p.,  
<http://www.mathematik.hu-berlin.de/publ/pre/2005/M-05-04.html>
9. A.B. Zheglov, D.V. Osipov, *Higher KP-hierarchies and punctured ribbons*, in "Modern problems of mathematics and mechanics. Volume III "Mathematics". Issue 2 "Geometry and topology". Edited by A.T. Fomenko, Moscow State University, 2009, pp. 15-35 (in Russian).
10. Herbert Kurke, Denis Osipov, Alexander Zheglov, *Formal punctured ribbons and two-dimensional local fields*, *Journal für die reine und angewandte Mathematik (Crelles Journal)*. Volume 2009, Issue 629, Pages 133 - 170, see also e-print arXiv:0708.0985 [math.AG].
11. Herbert Kurke, Denis Osipov, Alexander Zheglov, *Formal groups arising from formal punctured ribbons*, *International Journal of Mathematics*, Volume: 21, Issue: 6 (2010) pp. 755-797, see also e-print arXiv:0901.1607 [math.AG].
12. Zheglov A.B., *On rings of commuting partial differential operators*, *St.-Petersburg Math. J.*, no. 5, 2013, 86-145; e-print arXiv:1106.0765v4
13. Zheglov A.B., Mironov A.E., *Baker-Akhieser modules, Krichever sheaves and commutative rings of partial differential operators*, *Fareast Math. J.*, Vol. 12 (1), 2012 (in Russian)
14. Kurke H., Osipov D., Zheglov A., *Commuting differential operators and higher-dimensional algebraic varieties*, *Selecta Math. New series*, 20:4 (2014), 1159-1195;
15. Vostokov S.V., Gorchinskiy S.O., Zheglov A.B., Zarkhin Yu G., Nesterenko Yu, Orlov, Osipov, Popov, Shafarevich I.R., *Aleksei Nikolaevich Parshin (on his 70th birthday)*, *Russian Mathematical Surveys*, v.68, no.1, 189-197;
16. A. B. Zheglov and H. Kurke. *Geometric properties of commutative subalgebras of partial differential operators*. *Sbornik Mathematics*, 206(5):676-717, 2015.
17. Mironov A.E., Zheglov A.B., *On commuting differential operators with polynomial coefficients corresponding to spectral curves of genus one*, *Doklady Math.*, 2015, vol. 462, 2, p. 12;

18. A. B. Zheglov, A. E. Mironov, B. T. Saparbayeva, *Commuting Krichever-Novikov differential operators with polynomial coefficients*, Siberian Math. J., 57:5 (2016), 819823
19. Zheglov A., Mironov A. *Commuting ordinary differential operators with polynomial coefficients and automorphisms of the first weyl algebra*, International Mathematics Research Notices. 2016. no. 10. P. 29742993.
20. Pogorelov D. A., Zheglov A. B. *An algorithm for construction of commuting ordinary differential operators by geometric data*, Lobachevskii Journal of Mathematics. 2017. Vol. 38, no. 6. P. 10751092.
21. Zheglov A. B. *Surprising examples of nonrational smooth spectral surfaces*, Sbornik Mathematics. 2018. Vol. 209, no. 8. P. 2955.
22. Zheglov A. B., Osipov D. V. *On first integrals of linear hamiltonian systems*, Doklady Mathematics. 2018. Vol. 98, no. 3. P. 616618.
23. Burban I., Zheglov A. *Fourier-Mukai transform on Weierstrass cubics and commuting differential operators*, International Journal of Mathematics, 2018, P. 1850064.
24. Zheglov A. B., Osipov D. V. *Lax pairs for linear hamiltonian systems*, Siberian Mathematical Journal. 2019. Vol. 60, no. 4., P. 592?604.
25. Zheglov A. B., *Algebraic geometric properties of spectral surfaces of quantum integrable systems and their isospectral deformations*, Proc. of the XXXVIII Workshop in Bialowiezha, 2020
26. Burban I., Zheglov A. *Cohen-macaulay modules over the algebra of planar quasi-invariants and calogero-moser systems*, Proceedings of LMS, 2020. -Vol. 121, no. 4.-P. 1033-1082; ArXiv Mathematics no. 1703.01762., P. 1-50.

14) **Other publications:**

1. Ph.D. Thesis "Multidimensional local skew-fields", electronic publication of Humboldt University in <http://edoc.hu-berlin.de/browsing/dissertationen/>
2. Habilitation Thesis "Torsion free sheaves on varieties and integrable systems" (in russian), <http://www.mi.ras.ru/dis/ref16/zheglov/dis.pdf>
3. Zheglov A. B., *Algebra, geometry and analysis of commuting ordinary differential operators*, short lecture notes given at the 1st International summer school for undergraduate students, Peking University <https://istina.msu.ru/courses/128271056/>

4. Zheglov A. B., *Algebra, geometry and analysis of commuting ordinary differential operators*, textbook based on two semester lecture courses given at MSU and at the Peking University, ISBN 978-5-9500628-4-1, MSU  
<http://dfgm.math.msu.su/people/zheglov/English/AlexanderZheglov.html>