Dedicatoria del VIII Taller de Geometría y Sistemas Dinámicos
23-26 de abril de 2019
Hotel Playa Cortés, Guaymas Sonora

Ante la sensible pérdida del Dr. Mikhail Karasev, quien fuera gran amigo y colaborador del Departamento de Matemáticas de la Universidad de Sonora, el comité organizador del VIII Taller de Geometría y Sistemas Dinámicos decidió dedicar la edición de este año en su memoria, a manera de homenaje póstumo y muestra de nuestra gratitud. A continuación presentemos una breve semblanza del Dr. M. Karasev y sus principales contribuciones.

Mikhail V. Karasev
(29/06/1949- 13/12/2018)

El profesor Karasev tuvo una destacada trayectoria académica y sus contribuciones científicas le merecieron amplio reconocimiento en el campo de la física-matemática. Sus numerosas publicaciones dan cuenta de importantes resultados en Cuantización, Mecánica Cuántica, Análisis Semiclásico, Geometría de Poisson, por mencionar algunas de las áreas de sus investigaciones. De una calidad humana excepcional, forjó fuertes lazos de amistad y de colaboración científica con investigadores de nuestro país. En varias ocasiones fué profesor visitante del Departamento de Matemáticas de la Universidad de Sonora, e impartió conferencias en el CINVESTAV y en el CIMAT. En particular, apreciamos su valiosa participación en el V Taller de Geometría y Sistemas Dinámicos, en su última visita a la Universidad de Sonora, en febrero-marzo de 2015.

Curricular abstract
Mikhail Vladimirovich Karasev

1. 1972 –M.Sc – Differential Equations
1974 – PhD, Noncommutative Analysis
1990 – D. Math.and Phys., Poisson geometry
and Semiclassical approximation (Doctor de EstadoCiencias Fisico-matematicas)

1995 – Soros Professor

1.Positions:
Since 1991 Professor, Head of Department of Applied Mathematics,
Moscow Institute of Electronics and Mathematics (MIEM),
since 2012 jointed with National Research University Higher School of Economics

Head of Council for defending Ph.D and Doctor dissertations
on ``Mathematical Physics, Probability Theory and Statistics'',

1.Premio Estatal Federación Rusa en el area de Ciencia, 2000

2.Visit: Centro de Investigación on Matemáticas (CIMAT), Guanajuato, Mexico, Prof. Xavier Gomez Mont, November–December 2000.
3.Visit: CINVESTAV del I.P.N., Mexico, Prof. E. Ramirez de Arellano, December 2000.
4.Actividades de estancia Académica del Prof. M.V. Karasev

Periodo: 10/03/2015-31/03/2015

Lugar: Departamento de Matemáticas, UNISON

Conferencista plenario del V Taller Internacional de Geometría y Sistemas Dinámicos, San Carlos, Guaymas Sonora del 17 al 21 de marzo de 2015. Título de la plática: "Inserting perturbation to create integrability".

Main Contribuations by M.V. Karasev

1.. The first topic of Karasev's research [1–7] is the noncommutative analysis or calculus of noncommuting operators. In these works it has been obtained many useful and previously unknown technical formulas; for example the simplest formula for the

sum of the Campbell–Hausdorff series [3], commutation formulas in the Weyl calculus [6], diagram method in commutation formulas [2], regular representations for algebras with non-Lie permutation relations [4, 5, 7]. A general construction of a convolution was discovered and proved analogs of classical Lie theorems for a wide class of algebras with quadratic permutation relations. The last results are closely connected with modern quantum group theory and noncommutative geometry.

1. **Semiclassical Asymptotics for Systems with Symmetry.** In the papers [8–10] and [14–16] some of these results were applied to the problems of semiclassical asymptotics for systems with symmetries (quantum analogue of the Lie–Cartan reduction procedure).The series of papers [11–16] is concerned with the quantization problem for general symplectic manifolds (in the semiclassical approximation). A complete theory of such asymptotic quantization was constructed. This theory is related with the well known Kirillov–Kostant–Souriau geometric quantization in special case of manifolds with polarization and for special symbols which are ``linear along polarization". The main result here is the quantization rule of two-dimensional nonclosed surfaces, and the definition of a new homological invariant: the integer index of such surfaces [14–16].

2.**Symplectic Groupoids**. In the works [17–20] the old geometric problem of constructing the analogues of Lie group objects for nonlinear Poisson brackets was solved. Karasev has developed the theory of symplectic groupoids and pseudogroups, proved the analogs of three classical Lie theorems and found the link between triple of objects: Poisson brackets, torsion of linear connection on Poisson manifold, structure functions of dual pseudogroup.

3.**Poisson Cohomology and Deformation Theory**. The works [21–23] were concerned with the deformation of general nonlinear brackets. There we calculated the obstruction for deformations of brackets in terms of de Rahm cohomology of symplectic leaves. This topic started with the investigations in deformation quantization. Here a number of problems due to Lichnerowicz were solved.

4.**Semiclassical Quantization on Nontrivial Phase Spaces**. In [15, 18] Karasev has considered the quantization (in semiclassical approximation) of general Poisson brackets. There the analogs of the Lie theorem for convolution (or comultiplication) corresponding to general nonlinear commutation relations with small parameter was obtained. But it has become clear that to calculate the convolution modulo higher powers of the parameter one needs a more perfect scheme of quantization. In the works [24–29,39–41] Karasev has found the desirable generalization of the well known semiclassical schemes and have constructed a bridge to the geometric quantization, quantization by coherent states, and the theory of *-products on symplectic and Poisson manifolds. The results here are based on an integral expression for wave-functions by ``geometrical'' coherent states. Formulas for these states, for transition amplitudes, for inner products, etc., are absolutely simple and looks like something from the string theory. They involve the symplectic area, curvature and index of certain (complex) membranes in phase space (which is supposed to be Kaehlerian manifold). Very interesting geometrical objects appear in this construction; for instance, the Calabi's function and its analog generated by the Ricci curvature; the ``gauge form'' and modular function over lagrangian submanifolds, and others. This approach allowed to solve various problems in the theory of semiclassical approximation [30, 31, 35, 36], in symplectic geometry and the theory of dynamical systems [33, 34], in the theory of Lie algebras representations [32, 37, 38].

5.Among the other results one can also mention the following:

– global integral formulas for exact and semiclassical eigenfunctions for systems which are, in a sense, closed to integrable ones: perturbation of completely integrable, adiabatically integrable, having stable invariant submanifolds (closed trajectories, tori, Klein bottles, etc.);

– semiclassical ansatz for long-time evolution of wave packets, and for quantization of scars (unstable closed trajectories in chaotic systems);

– representations for wave-functions by means ``coherent states'' of algebras with non-Lie commutational relations (for instance, quadratic relations); as simplest example: perturbed oscillator and Zeeman effect;

– global geometrical expression for quantum multiplication (*-product) over Kahlerian manifolds by means certain three-point holonomy amplitudes and two-point probability amplitudes; construction of quantum-Kahlerian manifolds.

List of papers

1. Expansion of functions on noncommuting operators. – Sov. Math. Dokl, 1974, 15, N1,
346–350.
2. Certain formulas for functions on ordering operators. – Math. Notes, 1975, 18, N2, 267–277.
3. Infinite products and T-products of exponentials. – Theor. Math. Phys., 1976, 28, N2, 189–200 (with M.V.Mosolova).
4. Algebras with general permutation relations and their applications. – ``Modern problems in Mathematics", VINITI, Moscow, 1979, v.13, 145–267 (in Russian, with V.P. Maslov).
5. Operators of regular representation for one class of nonlinear permutation relations. –
Funct. Anal. and Appl., 1979, 13, N3, 91–92.
6. On the Weyl and ordered calculus of noncommuting operators. – Math. Notes,1979, 26, N6,
885–907.
7. Non-Lie permutation relations. -Russian Math. Surveys, 1990, 45, N5, 51–98
(with V.P. Maslov).
8. Path integrals and semiclassical asymptotics on the Lie group. – Theor. Math. Phys., 1977, 30, N1, 41-47.
9. On the quantization of rapidly oscillating symbols. – Math. USSR Sbornik, 1978, 34,
N6, 737–764 (with V.E. Nazaikinsky).
10. The asymptotic spectrum and oscillation front for operators with nonlinear commutation relations. – Soviet Math. Dokl., 1978, 19, N6, 1300–1304.
11. Global asymptotic operators of the regular representation. – Soviet Math. Dokl., 1981, 23,
N2, 228–232 (with V.P.Maslov).
12. Pseudodifferential operators and a canonical operator in general symplectic manifolds. – Math. USSR Izvestija, 1984, 23, N2, 277–305 (with V.P.Maslov).
13. Asymptotic and geometric quantization. – Russian Math. Surveys, 1984, 39, N6, 133–205 (with V.P.Maslov).
14. Spectrum asymptotics for mixed states of the equations of self-consistent field. – Theor. Math. Phys, 1984, 61, N1, 118–127.
15. Poisson algebras of symmetries and asymptotics of spectral series. – Funct. Anal. and
Appl., 1986, 20, N1, 21–32.
16. Quantum reduction to the orbits of symmetry algebras and Ehrenfest problem. – Inst. Theor. Phys., Kiev, 1987, ITP-87-157P, 36pp.
17. The Maslov Quantization Conditions in Higher Cohomology and Analogs of Notions
Developed in Lie Theory for Canonical Fibre Bundles of Symplectic Manifolds. – MIEM, 1981, Deposited in VINITI N1091, 1092–82 (in Russian). English transl. in Selecta Math. Sov., 1989, 8, N3, 213–258.

18. Quantization of nonlinear Lie-Poisson brackets in semiclassical approximation. Inst. Theor. Phys., Kiev, 1985, ITP-85-72P, 36pp. (in Russian).
19. Analogues of the objects of the Lie group theory for nonlinear Poisson brackets. – Math. USSR Izvestiya, 1987, N3, 4970–527.
20. Flat Poisson manifolds and finite-dimensional pseudogroups. – Math. Notes, 1989, 45, N3, 53–65.
21. Corrections to the classical dynamics and to the quantization conditions, arising under deformations of Poisson brackets. – Dokl. AN USSR, 1987, 297, N6, 1294–1298 (with Yu.M.Vorobjev).
22. On the Poisson manifolds and Schouten brackets. – Funct. Anal. and Appl., 1988, 22, N1, 1–11 (with Yu.M.Vorobjev).
23. Deformations and cohomologies of Poisson brackets. – ``Topol. and Geom. Methods in Analysis", Voronezh Univ.Press, 1989, 75–89 (in Russian, with Yu.M.Vorobjev). English transl. in Lect. Notes Math., 1990, v.1453, 271–290.
24. Connections on the Lagrangian submanifolds and certain problems in semiclassical approximation. – Zapiski Nauch. Semin. LOMI, Leningrad, 1989, v.172, 41–54 (in Russian). English transl. in J. Sov. Math., 1982, v.10, N5, 1053–1062.
25. To the Maslov theory of semiclassical asymptotics. Examples of a new global quantization Formula applications. – Inst. Theor. Phys., Kiev, ITP-89-78 E, 32pp.
26. New global asymptotics and anomalies in the problem of quantization of adiabatic invariant. – Funct. Anal. and Appl., 1990, 24, N2, 104–114.
27. Hermitian bundles over isotropic submanifolds and correction to Kostant–Souriau quantization rule. – Inst. Theor. Phys., Kiev, ITP-90-85E, 28pp. (with Yu.M.Vorobjev).
28. Simple quantization formula. – Proc. Inter. Coll. ``Symplectic Geometry and Mathematical Physics. Aix-en-Provence: 1990", Birkhauser, Boston, 1991, pp.234–243.

29. Quantization by parallel transport. Global formula for semiclassical wave-functions. In book: Quantum Field Theory, Quantum Mechanics and Quantum Optics, Proc. XVIII Intern. Coll. Group Theor. Meth. in Phys., Moscow, 1990. Part I, Nova Sci. Publ., N.Y., 1991, p.189–192.
30. Integral representation of wave-functions generated by connection in the germ of Poisson structure. -- In book: Quantum field theory, quantum mechanics and quantum optics, Proc. XVIII Intern. Coll. Group Theor. Meth. in Phys., Moscow, 1990. Part I, Nova Sci. Publ., N.Y., 1991, p. 193-194, (with Yu.M.Vorobjev).

31. Quasimodes generated by characters of dynamical group, and deformation of Kirillov form. – Funct. Anal. and Appl., 1992, 26, N1, p. 71–79, (with Yu.M.Vorobjev).

32. Exact and semiclassical representation over Lagrangian submanifolds in su(2)*, so(4)*, su(1,1)*. – J. Math. Phys., 1993, 34, N11, 4986–5006 (with M.B.Kozlov).

33. Linear connections for Hamilton dynamics over isotropic submanifold, in ``Seminar on Dynamical Systems (Proc. of Euler Intern. Math. Inst.)", S.Kuksin, et al. (ed.), Birkhauser, Boston 1994, p. 235–252 (with Yu.M.Vorobjev).

34. On analog of Maslov class in non-Lagrangian case. – New in global analysis. Problems in Geom., Topol. and Math. Phys., Voronez Univ., 1992, p.37–48 (with Yu.M.Vorobjev).

35. Integral representations over isotropic submanifols and equations of zero curvature. – Preprint MIEM, 1992, A Math-QDS-92-01, 56pp. (with Yu.M.Vorobjev).

36. Connections and excited wavepackets over invariant isotropic torus. – ``Quantization and Coherent States Methods, Proc. XI-th Coll. Geometrical Methods in Physics", S.T.Ali, I.M.Mladenov, A.Odzijewicz (ed.), World Scientific, Singapore, 1993, pp.179–189, (with Yu.M.Vorobjev).

37. Floquet solutions for Hamiltonians over su(2) from viewpoint of symplectic geometry. – Algebra and Analysis, 1994, 6, N5, 231–251 (with M.B.Kozlov).

38. Representations of compact Lie algebras over Lagrangian submanifolds. – Funct. Anal. and Appl., 1994, 28, N4, 238–246 (with M.B.Kozlov).

39. Integrals over Membranes, Transition Amplitudes and Quantization. – Russ. J. Math. Phys., 1993, 1, N4, 523–526.

40. Quantization by Membranes. Integral representations for wave-functions. – Proc. XIIth Coll. Geom. Methods in Physics (Bialowieza, 1993), Plenum, New York, 1994, pp. 9–19.

41. Quantization by means of two-dimensional surfaces (membranes). Geometrical formulas for wave-functions. – Contemp. Math., 1994, 179, 83–113.

42. Symplectic curvature and Arnold form over isotropic submanifolds. – J. Math. Sci., 1996, 82, N6, 3789–3799 (with Yu.M.Vorobjev).

43. Formulas for noncommutative products of functions by means of membranes and strings. – Russ. J. Math. Phys.,1994, 2, N4, 445–462.

44. Logarithmic corrections to the quantization rule. The spectrum of a polaron. – Teoret. Mat. Fiz., 1993, 97, N1, 78–93. Engl. transl. in: Theor. Math. Phys., 1994, 97, 1160–1170 (with A.V.Pereskokov).

45. Quadratic Poisson brackets in the Zeeman effect. Irreducible representations and coherent states. Uspekhi Mat. Nauk, 1994, 49, N5, 169–170. Engl. Transl. in: Russian Math. Surveys, 1994, 49, N5 (with E.M.Novikova).

46. Quantization and coherent states over lagrangian submanifolds. – Russ. J. Math. Phys., 1995, 3, N3, 393–400.

47. Representation of the evolution operator via membrane amplitudes. – Matem. Zametki, 1996, 60, N6, 930–934. Engl. transl. in: Math. Notes, 1996, 60, 703–707.

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49. Integral representations over isotropic submanifols and equations of zero curvature. – Advances in Math., 1998, 135, N2, 220–286 (with Yu.M.Vorobjev).

50. Advances in quantization: quantum tensors, explicit star-products, and restriction to irreducible leaves. – Diff. Geom. Appl. (1998) 9, N1–2, 89–134.

51. Non-Lie permutation representations, coherent states, and quantum embedding, in: Coherent Transform, Quantization and Poisson Geometry, Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, Providence, RI, 1998, 1-202 (with E.M.Novikova).

52. Adapted connections, Hamilton dynamics, geometric phases and quantization over isotropic submanifolds, in: Coherent Transform, Quantization and Poisson Geometry Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, Providence, RI, 1998, 203–326 (with Yu.M.Vorobjev).

53. Infinitesimal Poisson cohomology, in: Coherent Transform, Quantization and Poisson Geometry Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, Providence, RI, 1998, 327-360 (with V.Itskov and Yu. 42. Symplectic curvature and Arnold form over isotropic submanifolds. – J. Math. Sci., 1996, 82, N6, 3789–3799 (with Yu.M.Vorobjev).

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45. Quadratic Poisson brackets in the Zeeman effect. Irreducible representations and coherent states. Uspekhi Mat. Nauk, 1994, 49, N5, 169–170. Engl. Transl. in: Russian Math. Surveys, 1994, 49, N5 (with E.M.Novikova).

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50. Advances in quantization: quantum tensors, explicit star-products, and restriction to irreducible leaves. – Diff. Geom. Appl. (1998) 9, N1–2, 89–134.
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submanifolds, in: Coherent Transform, Quantization and Poisson Geometry Ser. Advances
in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, Providence, RI, 1998, 203–326 (with Yu.M.Vorobjev).
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Geometry Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, Providence,
RI, 1998, 327-360 (with V.Itskov and Yu. Vorobjev).
54. Coherent transform of the spectral problem and algebras with nonlinear commutation relations. – J. Math. Sci., 1999, 95, N6, 2703–2798 (with E.M.Novikova).
55. Coherent transforms and irreducible representations corresponding to complex structures on
the cylinder, Matem. Zametki, 2001, 70, N6, 54–874. Engl. transl. in: Math. Notes, 2001,
(with E.M.Novikova).
56. Quantum surfaces, special functions, and the tunneling effect, Lett. Math. Phys., 2001, 56,
229–269.
57. Nonlinear commutation relations: representations by pointwise operators, Matem. Zametki,
2002, 72, N1, 54--73. Engl. transl. in: Math. Notes, 2002, 72 (with E.M. Novikova).
58. Symplectic areas, quantization, and dynamics in electromagnetic fields, – J. Math. Phys., 2002, 43, 756–788 (with T.Osborn).
59. Quantization and intrinsic dynamics, in: Asymptotic Methods for Wave and Quantum
Problems, Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.208, Providence,
RI, 2003, 1–32.

60. Global asymptotics and quantization rules for nonlinear differential equations, in: Asymptotic Methods for Wave and Quantum Problems, Ser. Advances in Math. Sci., Amer. Math. Soc. Transl.(2), vol.208, Providence, RI, 2003, 165–234 (with A.V.Pereskokov).

61. Intrinsic quantum dynamics and its operator representation over a plane with a nonstandard
connection. – Russ. J. Math. Phys., 2003, 10, N4, 422–435 (with O.N.Grigor'ev).

62. Quantum magnetic algebra and magnetic curvature. – J. Phys. A, 2004, 37, 2345–2363
(with T.Osborn).

63. Intrinsic dynamics of symplectic manifolds: membrane representation and phase product,
Russ. J. Math. Phys., 2004, 11, N2, 140–156.

64. Intrinsic dynamics of manifolds: quantum paths, holonomy, and trajectory localization. –
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65. Algebra with quadratic commutation relations for axially perturbed Coulomb–Dirac field. –
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field. – Teoret. Mat. Fiz., 2004, 142, 1, 127-147 (with E.M.Novikova).

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atom. – Teoret. Mat. Fiz., 2005, 142, 3, 530-555 (with E.M.Novikova).

68. Noncommutative algebras, nanostructures, and quantum dynamics generated by resonances,
in: Quantum Algebras and Poisson Geometry in Mathematical Physics, Ser. Advances in
Math. Sci., Amer. Math. Soc. Transl.(2), vol.216, Providence, RI, 2005, 1–18 .

69. Noncommutative algebras, nano-structures, and quantum dynamics generated by resonances. II. Advanced Studies in Contemporary Mathematics, 2005, 11, 33–56.

70. Cotangent bundle quantization: Entangling of metric and magnetic field.
J. Phys., 2005, 38, 8549--8578 (with T.A.Osborn).

54. Coherent transform of the spectral problem and algebras with nonlinear commutation relations. – J. Math. Sci., 1999, 95, N6, 2703–2798 (with E.M.Novikova).

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the cylinder, Matem. Zametki, 2001, 70, N6, 54–874. Engl. transl. in: Math. Notes, 2001,
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2002, 72, N1, 54--73. Engl. transl. in: Math. Notes, 2002, 72 (with E.M.Novikova).
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connection. – Russ. J. Math. Phys., 2003, 10, N4, 422–435 (with O.N.Grigor'ev).
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field. – Teoret. Mat. Fiz., 2004, 142, 1, 127-147 (with E.M.Novikova).
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atom. – Teoret. Mat. Fiz., 2005, 142, 3, 530-555 (with E.M.Novikova).
68. Noncommutative algebras, nanostructures, and quantum dynamics generated by resonances,
in: Quantum Algebras and Poisson Geometry in Mathematical Physics, Ser. Advances in
Math. Sci., Amer. Math. Soc. Transl.(2), vol. 216, Providence, RI, 2005, 1–18 .
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List of Books

1.. – Higher School Pub., Moscow 1979, 80 pp. (in Russian).

1.. – Moscow, ``Nauka", 1991, 368 pp. (with V.P. Maslov, in Russian; Engl. translation in ser. ``Transl. Math. Monographs", v.119, AMS Publ., 1993).

1.(coauthors V.M. Itskov, E.M. Novikova, Yu. M.Vorobjev) – Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.187, 360pp., Providence, RI, 1998.

1.(coauthors V.G. Danilov, G.A. Omel'yanov, V.M. Shelkovich, A.V. Pereskokov, P. Zhevandrov, A. Merzon) – Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.208, 284pp., Providence, RI, 2003.

1.*Quantum Algebras and Poisson Geometry in Mathematical Physics*, RI, (coauthors E.M. Novikova, Yu.M. Vorobjev) – Ser. Advances in Math. Sci., Amer. Math. Soc. Transl. (2), vol.216, 277pp., Providence, RI, 2005.

Comité Organizador
VIII Taller de Geometría y Sistemas Dinámico