

Alexei Vasiliev

CURRICULUM VITAE

Name: Alexei A. Vasiliev

Office Address: Laboratory of Nonlinear and Chaotic Dynamics, Space Research Institute,
Profsoyuznaya 84/32, Moscow 117997, Russia

Born: 1963, Moscow region

Education:

1981-1987 student at Moscow State University, Department of Physics (diploma with honor)

1987-1990 Graduate student at Space Research Institute, Russian Academy of Sciences

Degrees:

1991 First Doctor Degree (Ph.D.) in theoretical physics.
Space Research Institute, Russian Academy of Sciences

Thesis: "On the origin of stochastic dynamics in a magnetic field in systems possessing a small number of degrees of freedom"

Advisor: Prof. G. M. Zaslavsky

Professional Positions:

1990-1992 Junior Scientific Researcher

1992-1998 Researcher

1998-present Senior researcher at Space Research Institute, Russian Academy of Sciences, Moscow,
Laboratory of Nonlinear and Chaotic dynamics

2007, 2009 - Temporary (three months) research positions at Centre de Physique Theorique, Lumini
Marseilles, France

Research interests:

Nonlinear dynamics, dynamical chaos, Hamiltonian systems, volume-preserving systems, adiabatic invariants, resonance phenomena (capture into resonances, scattering on resonances, separatrix crossings); chaotic advection, mixing, motion of charged particles in electromagnetic fields, Rydberg atoms, dynamics of BECs.

Participation in scientific projects:

1993-1995 *Chaotic and regular motion of passively advected particle in viscous hydrodynamic flows,*

International Science Foundation Grants MQK000, MQK300, Principal investigator
 1994-1998 *Hamiltonian dynamics and bifurcations*, INTAS Grants 93-339, 93-339ext, investigator
 1997-1998 *Origin of complex behavior in several applied problems, in particular those involving fast forcing and break down of adiabatic invariance*, U.S. CIVILIAN RESEARCH AND DEVELOPMENT FOUNDATION (CRDF) Grant RM1-184, investigator
 1999-2001 *Hyperbolicity and diffusion in Hamiltonian systems*, INTAS Grant 97-10771, investigator
 1999-2001 *Dynamics in comet environment*, JURRISS NRA: 98-OSS-08, investigator
 2001-2003 *Chaotic motion and stability in conservative and near-conservative systems*, INTAS Grant 00-221, investigator
 2003-2005 *Averaging of perturbations in nonlinear resonant systems*, Russian foundation for basic research Grant 03-01-00158, investigator
 2006-2008 *Problems of asymptotical analysis of slow-fast systems' dynamics*, Russian foundation for basic research Grant 06-01-00117, investigator

2008-2010 *Physical mechanisms and conditions of origin of quasistable structures in plasma and their influence on kinetic and electrodynamical properties of turbulent plasma*, Russian foundation for basic research Grant 08-02-00201, investigator

2009-present *Passages through resonances and capture into resonances in nonlinear systems*, Russian foundation for basic research Grant 09-01-00333, investigator

Teaching

2010- present [Lecture course “Introduction to nonlinear dynamics and chaos”](#) for master students of [Moscow Institute of Physics and Technology](#)

RELEVANT PUBLICATIONS (more complete list can be found at www.iki.rssi.ru/people/avasilev)

- **"Hamiltonian dynamics of charged particles in a magnetic field and the field of an obliquely propagating finite wave packet"**, *Sov. Phys. JETP*, **72**, 826, (1991) (with G.M.Zaslavsky).
- **"Regular and chaotic transport of impurities in steady flows"**, *CHAOS* vol.4(4), p.673 (1994) (with A.I.Neishtadt).
- **"Changes of adiabatic invariant and chaos of streamlines in a confined incompressible Stokes flow"**, *CHAOS*, vol.6(1) (1996) 67-77 (with A.I.Neishtadt and D.L.Vainshtein).
- **"Chaotic advection in a cubic Stokes flow"**, *Physica D* **111** (1998) 227-242 (with A.I.Neishtadt and D.L.Vainshtein).
- **"Change of adiabatic invariant at a separatrix in a volume-preserving 3-D system"**, *Nonlinearity*, v.**12** (1999) 303-320 (with A.I.Neishtadt).
- **"Captures into resonance and scattering on resonance in dynamics of a charged relativistic particle in magnetic field and electrostatic wave"**, *Physica D*, v.**141** (2000) 281-296 (with A.I.Neishtadt and A.P.Itin).
- **"Evolution of comet nucleus rotation"**, *Icarus* **157**, 205-218, (2002), (with A.I.Neishtadt, D.Scheeres, and V.V.Sidorenko).

- **"Resonant phenomena in slowly perturbed rectangular billiards"**, *Physics Lett. A* **291** (2001) 133-138, (with A.I.Neishtadt and A.P.Itin).
- **"Geometric and statistical properties induced by separatrix crossings in volume-preserving systems"**, *Nonlinearity* **16**, 521-557, (2003), (with A.I.Neishtadt and C.Simo).
- **"Phase change between separatrix crossings in slow-fast Hamiltonian systems"**, *Nonlinearity* **18**, 1393--1406 (2005), (with A.I.Neishtadt).
- **"Capture into resonance in dynamics of a classical hydrogen atom in an oscillating electric field"**, *Phys. Rev. E* **71**, 056623 (2005), (with A.I.Neishtadt).
- **Destruction of adiabatic invariance at resonances in slow-fast Hamiltonian systems**, *Nuclear Instruments & Methods in Physics Research A* **561**, 158-165, (2006) (with A.Neishtadt).
- **Change in the adiabatic invariant in a nonlinear two-mode model of Feschbach resonance passage**, *Physica D* **232**, 108-115, (2007), (with A.P.Itin, G.Krishna, and S.Watanabe).
- **Adiabatic invariance in volume-preserving systems**, in "IUTAM Symposium on Hamiltonian Dynamics, Vortex Structures, Turbulence" Proceedings of the IUTAM Symposium held in Moscow, 25-30 August, 2006. Series: IUTAM Bookseries , Vol. 6; Borisov, A.V.; Kozlov, V.V.; Mamaev, I.S.; Sokolovskiy, M.A. (Eds.), Springer Verlag, Berlin, pp. 89-108, (2007), (with A.Neishtadt and D.Vainshtein).
- **Shock wave surfing acceleration**, In: *Advances in Plasma Physics Research, Volume 5*, Eds.: Francois Gerard, Nova Science Publishers, pp.129-134, (2007).
- **On the absence of stable periodic orbits in domains of separatrix crossings in non-symmetric slow-fast Hamiltonian systems**, *Chaos* **17**, 043104, (2007), (with A.I.Neishtadt).
- **Stability islands in domains of separatrix crossings in slow-fast Hamiltonian systems**, *Proceedings of the Steklov Mathematical Institute* **259**, 236-247, (2007), see also at <http://www.arxiv.org/abs/math.DS/0611468> , (with A.Neishtadt, C. Simó, and D. Treschev).
- **Periodic orbits and stability islands in chaotic seas created by separatrix crossings in slow-fast systems**, *Discrete and Continuous Dynamical Systems Series B* **10**, 621-650, (2008), (with A.Neishtadt, C. Simó, and D. Treschev).
- **Directed transport in a spatially periodic harmonic potential under periodic nonbiased forcing**, *Phys. Rev. E* **79**, 026213, (2009), (with X. Leoncini and A. Neishtadt).
- **Electron dynamics in a parabolic magnetic field in the presence of an electrostatic wave**, *Fizika Plazmy* **35** No 12, pp. 1102-1113 (2009) (in Russian); translated in: *Plasma Physics Reports* **35** No 12, pp. 1021-1031 (2009) (with A.Neishtadt and D.Vainshtein).
- **Surfatron acceleration of a relativistic particle by electromagnetic plane wave**, <http://arxiv.org/abs/1011.2236>, (2010) , (with A.Neishtadt and A.Artemyev).
- **Resonance-induced surfatron acceleration of a relativistic particle**, to appear in *Moscow Mathematical Journal*, (2011) , (with A.Neishtadt and A.Artemyev).
- **Dynamics of electrons in a parabolic magnetic field perturbed by an electromagnetic wave**, *Plasma Physics and Controlled Fusion* **53**, 085014 (15pp) (2011), (with A.Neishtadt and D.Vainshtein).

- **Resonant particle acceleration in an oblique electromagnetic wave**, *Physics Letters A* **375**, 3075–3079, (2011), (with A.Neishtadt and A.Artemyev).
- **Jump of the adiabatic invariant at a separatrix crossing: Degenerate cases**, *Physica D* **241**, 566--573 (2012) (with A.Neishtadt, A.Artemyev, and L.Zelenyi).
- **Resonant interaction of charged particles with electromagnetic waves**, *Chaos, Complexity and Transport : Proceedings of the CCT '11*, eds Xavier Leoncini, Marc Leonetti, 2012, 3-15, Springer (with A.Neishtadt, A.Artemyev, D. Vainchtein, and L.Zelenyi).
- **Directed transport in a stochastic layer**, In: "From Hamiltonian Chaos to Complex Systems", eds Xavier Leoncini, Marc Leonetti, Springer (to appear).