

## References

- [A-H] Abarbanel, H. and Holm, D., *Nonlinear stability analysis of inviscid flows in three dimensions: incompressible fluids and barotropic fluids*, Phys. Fluids **30** (1987), no. 11, 3369–3382.
- [Adl] Adler, M., *On a trace functional for formal pseudo-differential operators and the symplectic structure of the Korteweg-de-Vries equations*, Inv. Math. **50** (1979), 219–248.
- [Aic] Aicardi, F., *Topological invariants of knots and framed knots in the solid torus*, C.R. Acad. Sci. Paris, Série I, **321** (1995), 81–86; *Topological invariants of Legendrian curves*, C.R. Acad. Sci. Paris, Série I, **321** (1995), 199–204.
- [A-R] Akhmetiev, P. and Ruzmaikin, A., *Borromeanism and bordism*, Topological aspects of the dynamics of fluids and plasmas, Kluwer Academic Publ. (1992), 249–264; *A fourth-order topological invariant of magnetic or vortex lines*, J. of Geometry and Physics **15** (1995), 95–101.
- [Ale] Aleksandryan, R.A., *On the Dirichlet problem for the equation of a chord and on the completeness of a system of functions on the circle*, (in Russian) Doklady Akad. Nauk SSSR **73** (1950), 869–872.
- [Al] Alekseev, V.M., *Quasirandom dynamical systems*, Mathematics of the USSR - Sbornik **5** (1968), 73–128.
- [A-L] Aleksovsky, V.A. and Lukatsky, A.M., *Nonlinear dynamics of ferromagnet magnetization and the motion of a generalized rigid body with a current group*, Theor. Math. Phys. **85** (1990), no. 1, 1090–1096.
- [ATL] Alvino, A., Trombetti, G., and Lions, P.-L., *On optimization problems with prescribed rearrangements*, Nonlinear Anal. **13** (1989), no. 2, 185–220.
- [AnS] Anufriev, A. and Sokoloff, D., *Fractal properties of geodynamo models*, Geophys. Astrophys. Fluid Dyn. **74** (1994), no. 1-4, 207–223.
- [ART] Aref, H., Rott, N., and Thomann, H., *Gröbli's solution of the three-vortex problem*, Annual Review of Fluid Mechanics **24** (1992), 1–20.
- [Arn1] Arnold, V.I., *On representing continuous functions of three variables as composition of continuous functions of two variables*, Mathematical Sbornik **48** (1959), no. 1, 3–74.
- [Arn2] Arnold, V.I., *Small denominators I. On mappings of a circle into itself*, Izvestia Akad. Nauk SSSR, Ser. Math. **25** (1961), no. 1, 21–86.
- [Arn3] Arnold, V.I., *Sur la topologie des écoulements stationnaires des fluides parfaits*, C.R. Acad. Sci. Paris **261** (1965), 17–20.
- [Arn4] Arnold, V.I., *Sur la géométrie différentielle des groupes de Lie de dimension infinie et ses applications à l'hydrodynamique des fluides parfaits*, Ann. Inst. Fourier **16** (1966), 316–361.
- [Arn5] Arnold, V.I., *The Hamiltonian nature of the Euler equation in the dynamics of rigid body and of an ideal fluid*, Uspekhi Mat. Nauk **24** (1969), no. 3, 225–226.
- [Arn6] Arnold, V.I., *On an apriori estimate in the theory of hydrodynamical stability*, Amer. Math. Soc. Transl. **19** (1969), 267–269.
- [Arn7] Arnold, V.I., *One-dimensional cohomology of Lie algebras of divergence-free vector fields and rotation numbers of dynamical systems*, Funct. Anal. Appl. **3** (1969), 319–321.
- [Arn8] Arnold, V.I., *Notes on the three-dimensional flow pattern of a perfect fluid in the presence of a small perturbation of the initial velocity field*, Appl. Math. and Mech. **36** (1972), no. 2, 255–262.
- [Arn9] Arnold, V.I., *The asymptotic Hopf invariant and its applications*, Proc. Summer School in Diff. Equations at Dilizhan, 1973 (1974), Erevan (in Russian); English transl.: Sel. Math. Sov. **5** (1986), 327–345.
- [Arn10] Arnold, V.I., *Some remarks on the antidynamo theorem*, Moscow Univ. Math. Bulletin **37** (1982), 57–66.
- [Arn11] Arnold, V.I., *On some nonlinear problems*, in Crafoord Prize in Math., Crafoord Lectures, The Royal Swedish Acad. Sci. (1982), 1–7.
- [Arn12] Arnold, V.I., *Magnetic analogues of the theorems of Newton and Ivory*, Uspekhi Mat. Nauk (in Russian) **38** (1983), no. 5, 145–146; *Some algebro-geometrical aspects of the*

- Newton attraction theory*, Progress in Math., vol. 36, Arithmetic and Geometry II (1983), Birkhäuser, Basel, 1–3.
- [Arn13] Arnold, V.I., *Evolution of a magnetic field under the action of translation and diffusion*, Uspekhi Mat. Nauk (in Russian) **38** (1983), no. 2, 226–227; *On the evolution of magnetic field under the action of translation and diffusion*, Some problems of contemporary analysis (V.M. Alekseev memorial volume) Moscow University Press (1984), 8–21.
- [Arn14] Arnold, V.I., *Exponential dispersion of trajectories and its hydrodynamical applications*, in N.E. Kostchin and Development in Mechanics, Moscow, Nauka (1984), 185–193.
- [Arn15] Arnold, V.I., *Geometrical methods in the theory of ordinary differential equations*, Springer-Verlag, New York–Berlin, 1988, pp. 351.
- [Arn16] Arnold, V.I., *Mathematical methods of classical mechanics*, Springer-Verlag, New York, 1989, pp. 516.
- [Arn17] Arnold, V.I., *Ten problems*, Advances in Soviet Math., vol. 1, AMS Providence (1990), 1–8.
- [Arn18] Arnold, V.I., *Kolmogorov's hydrodynamic attractors*, Proc. Roy. Soc. London Ser. A, **434** (1991), no. 1890, 19–22.
- [Arn19] Arnold, V.I., *Topological and ergodic properties of closed 1-forms with incommensurable periods*, Funct. Anal. and Appl. **25** (1991), no. 2, 1–12; *Polyintegrable flows*, St. Petersburg Math. J. **4** (1992), no. 6, 54–62.
- [Arn20] Arnold, V.I., *Mathematical problems in classical physics*, Trends and Perspectives in Applied Math., Appl. Math. Sci. **100** (1994), Springer, New York, 1–20.
- [Arn21] Arnold, V.I., *Topological Invariants of Plane Curves and Caustics*, University Lecture Series, vol. 5, AMS Providence, RI, 1994, pp. 60; *Plane curves, their invariants, perestroikas and classifications*, Adv. in Sov. Math., vol. 21, AMS, Providence (1994), 33–91; *Invariants and perestroikas of plane fronts*, Proc. Steklov Institute of Math., Moscow **209** (1995), 11–56; *Geometry of spherical curves and algebra of the quaternions*, Russ. Math. Surveys **50** (1995), no. 1, 3–68.
- [Arn22] Arnold, V.I., *Symplectic geometry and topology*, preprint Ceremade, Paris 24/02/94 (1994), 1–51.
- [Arn23] Arnold, V.I., *Remarks on eigenvalues and eigenvectors of Hermitian matrices, Berry phase, adiabatic connections, and quantum Hall effect*, Selecta Mathematica, New Series **1** (1995), no. 1, 1–19.
- [Arn24] Arnold, V.I., *Some remarks on symplectic monodromy of Milnor fibrations*, The Floer memorial volume, Progr. Math., 133 Birkhäuser, Basel (1995), 99–103.
- [A-G] Arnold, V.I. and Givental, A.B., *Symplectic geometry*, Itogi nauki. Fundamentalnye napravleniya **4** (1985), VINITI, Moscow, 5–139; English transl.: Encyclopaedia of Math. Sci. **4** (1990), Springer-Verlag, 1–136.
- [AKh] Arnold, V.I. and Khesin, B.A., *Topological methods in hydrodynamics*, Annual Review of Fluid Mechanics **24** (1992), 145–166.
- [AKo] Arnold, V.I. and Korkina, E.I., *The growth of a magnetic field in a three-dimensional steady incompressible flow*, Moscow Univ. Math. Bulletin **38** (1983), 50–54.
- [AKN] Arnold, V.I., Kozlov, V.V., and Neishtadt, A.I., *Mathematical aspects of classical and celestial mechanics*, Itogi Nauki. Fundamentalnye napravleniya **3** (1985), VINITI, Moscow, 1–304; English transl.: Encyclopaedia of Math. Sci. **3** (1988), Springer-Verlag, 1–291.
- [AVG] Arnold, V.I., Varchenko, A.N., and Gusein-Zade, S.M., *Singularities of differentiable mappings*, vol. 1, Monographs in Mathematics, 82, Birkhäuser Boston, 1985, pp. 382.
- [AZRS1] Arnold, V.I., Zeldovich, Ya.B., Ruzmaikin, A.A., and Sokolov, D.D., *A magnetic field in a stationary flow with stretching in Riemannian space*, Soviet Physics JETP **81** (1981), no. 6, 2052–2058.
- [AZRS2] Arnold, V.I., Zeldovich, Ya.B., Ruzmaikin, A.A., and Sokolov, D.D., *Magnetic field in a moving conducting liquid*, Uspekhi Mat. Nauk (in Russian) **36** (1981), no. 5, 220–221; *Stationary magnetic field in a periodic flow*, Doklady Akad. Nauk SSSR **266** (1982), no. 6, 1357–1358.

- [At] Atiyah, M.F., *Green's functions for self-dual four-manifolds*, Math. Anal. and Appl., Part A, Adv. in Math. Suppl. Stud., Acad. Press, New York-London (1981), 129–158.
- [AuS] Auckly, D. and Sadun, L., *A family of Möbius invariant 2-knot energies*, preprint (1994), 21pp.
- [BMN] Babin, A., Mahalov, A., and Nicolaenko, B., *Global splitting, integrability, and regularity of 3D Euler and Navier-Stokes equations for uniformly rotating fluids*, Europ. J. Mech. B/Fluids **15** (1996), no. 3, 291–300; *Regularity and integrability of rotating shallow-water equations*, C.R. Acad. Sci. Paris, Série I **324** (1997), 593–598; *Regularity and integrability of 3D Euler and Navier-Stokes equations for rotating fluids*, preprint (1997), 54pp.
- [B-V] Babin, A.V. and Vishik, M.I., *Attractors of evolution equations*, vol. 25, Studies in Math. and Appl., North-Holland Publ. Co, Amsterdam, 1992, pp. 532; *Attractors of evolution PDE and estimates of their dimension*, Russ. Math. Surv. **38** (1983), no. 4, 133–187.
- [Baj] Bajer, K., *Flow kinematics and magnetic equilibria*, Ph.D. Thesis, Cambridge Univ., UK (1989).
- [Ban] Banyaga, A., *Sur la structure du groupe des difféomorphismes qui préservent une forme symplectique*, Comment. Math. Helv. **53** (1978), no. 2, 174–227.
- [B-R] Bao, D. and Ratiu, T., *On the geometrical origin and the solutions of a degenerate Monge-Ampère equation*, Proc. Symp. Pure Math., AMS, Providence **54** (1993), 55–68.
- [BLR] Bao, D., Lafontaine, J., and Ratiu, T., *On a nonlinear equation related to the geometry of the diffeomorphism group*, Pacific J. Math. **158** (1993), no. 2, 223–242.
- [Bay1] Bayly, B.J., *Fast magnetic dynamos in chaotic flows*, Phys. Rev. Lett. **57** (1986), 2800–2803.
- [Bay2] Bayly, B.J., *Scalar dynamo models*, Geophys. Astrophys. Fluid Dyn. **73** (1993), 61–74.
- [B-C] Bayly, B.J. and Childress, S., *Construction of fast dynamos using unsteady flows and maps in three dimensions*, Geophys. Astrophys. Fluid Dyn. **44** (1988), 211–240.
- [Bej] Benjamin, B., *The alliance of practical and analytical insights into the nonlinear problems of fluid mechanics*, Lecture Notes in Math., Springer-Verlag, Berlin-Heidelberg-New York **503** (1976), 8–29.
- [Ben] Bennequin, D., *Entrelacements et équations de Pfaff*, Astérisque **107-108** (1983), 87–161.
- [Brd] Berdichevsky, V.I., *Statistical mechanics of point vortices*, Phys. Review E **51** (1995), no. 5, 4432–4452.
- [BFS] Berdichevsky, V., Fridlyand, A., and Sutyrin, V., *Prediction of turbulent velocity profile in Couette and Poiseuille flows from first principles*, Phys. Rev. Letters **76** (1996), no. 21, 3967–3970.
- [Ber] Berezin, F.A., *Several remarks on the associative hull of a Lie algebra*, Funct. Anal. and Appl. **1** (1967), no. 2, 1–14.
- [Be1] Berger, M.A., *Third order link invariant*, J. Phys. A: Math. Gen. **23** (1990), 2787–2793.
- [Be2] Berger, M.A., *Energy-crossing number relations for braided magnetic fields*, Phys. Rev. Lett. **70** (1993), no. 6, 705–708.
- [B-F] Berger, M.A. and Field, G.B., *The topological properties of magnetic helicity*, J. Fluid Mech. **147** (1984), 133–148.
- [Berr] Berry, M.V., *Quantal phase factors accompanying adiabatic changes*, Proc. Roy. Soc. London Ser. A **392** (1984), no. 1802, 45–57.
- [BKMR] Bloch, A.M., Krishnaprasad, P.S., Marsden, J.E., and Ratiu, T.S., *Dissipation induced instabilities*, Ann. Inst. H. Poincaré, Analyse Nonlinéaire **11** (1994), no. 1, 37–90; *The Euler-Poincaré equations and double bracket dissipation*, Comm. Math. Phys. **175**, no. 1, 1–42.
- [Bog] Bogaevsky, I., *Reconstructions of singularities of minimum functions, and bifurcations of shock waves of the Burgers equation with vanishing viscosity*, St.Petersburg Math. J. **1** (1989), no. 4, 1–16.
- [B-T] Bott, R. and Taubes, C., *On the self-linking of knots*, J. Math. Phys. **35** (1994), 5247–5287.

- [Bow] Bowen, R., *A horseshoe with positive measure*, Invent. Math. **29** (1975), 203–204.
- [BoR] Bowen, R. and Ruelle, D., *The ergodic theory of axiom A flows*, Invent. Math. **29** (1975), 181–202.
- [Bra] Braginsky, S.I., *Self-excitation of a magnetic field during the motion of a highly conducting fluid*, Soviet Physics JETP **20** (1965), 726–735; *Theory of the hydromagnetic dynamo*, Soviet Physics JETP **20** (1965), 1462–1471.
- [Bre1] Brenier, Y., *The least action principle and the related concept of generalized flows for incompressible perfect fluids*, J. Amer. Math. Soc. **2** (1989), no. 2, 225–255.
- [Bre2] Brenier, Y., *The dual least action problem for an ideal incompressible fluid*, Arch. Rational Mech. Anal. **122** (1993), no. 4, 323–351.
- [B-L] Bruno, O.P. and Laurence, P., *Existence of three-dimensional toroidal MHD equilibria with nonconstant pressure*, Comm. Pure Appl. Math. **49** (1996), no. 7, 717–764.
- [Bru] Brushlinskaya, N.N., *On the behavior of the equations of hydrodynamics as the Reynolds number passes through a critical value*, Dokl. Akad. Nauk SSSR **162** (1965), 731–734; English transl.: Sov. Math. Dokl. **6** (1965), 724–728.
- [Bry1] Brylinski, J.-L., *Loop spaces, Characteristic Classes and Geometric quantization*, vol. 107, Progress in Math.: Birkhäuser, 1993, pp. 300.
- [Bry2] Brylinski, J.-L., *Radon transform and functionals on the spaces of curves*, The Gelfand Mathematical Seminars, 1993–1995 (Editors: I.M. Gelfand, J. Lepovsky, M. Smirnov), Birkhäuser Boston (1996), 45–73.
- [BFHW] Bryson, S., Freedman, M.H., He, Z.-X. and Wang, Z., *Möbius invariance of knot energy*, Bull. Amer. Math. Soc. **28** (1993), 99–103.
- [B-E] Burns, D.M. and Epstein, C.L., *A global invariant for three-dimensional CR-manifolds*, Inven. Math. **92** (1988), 333–348.
- [Bur] Burton, G.R., *Rearrangements of functions, maximizations of convex functionals, and vortex rings*, Math. Annalen **276** (1987), 225–253; *Steady symmetric vortex pairs and rearrangements*, Proc. Royal Soc. Edinburgh **108A** (1988), 269–290; *Variational problems on classes of rearrangements and multiple configurations for steady vortices*, Ann. Inst. Henri Poincaré **6** (1989), no. 4, 295–319.
- [But] Buttke, T.F., *Fast vortex methods in three dimensions*, in Vortex dynamics and vortex methods, Lectures in Appl. Math., v.28, AMS Providence, RI (1991), 51–66; *Velocity methods: Lagrangian numerical methods which preserve the Hamiltonian structure of incompressible fluid flow*, in Vortex flows and related numerical methods, NATO Adv. Sci. Inst. Ser. C Math. Phys. Sci., v. 395, Kluwer Acad. Publ. Dordrecht (1993), 39–57.
- [Ca] Calabi, E., *On the group of automorphisms of a symplectic manifold*, Problems in analysis, Lectures at the Symposium in honor of S. Bochner, Princeton Univ. Press, Princeton, NJ (1970), 1–29.
- [Cal] Calugareanu, G., *L'intégrale de Gauss et l'analyse des noeuds tridimensionnelles*, Rev. Math. Pures Appl. **4** (1959), 5–20.
- [C-H] Camassa, R. and Holm, D., *An integrable shallow water equation with peaked solutions*, Phys. Rev. Lett. **71** (1993), no. 11, 1661–1664.
- [CLM] Cappell, S.E., Lee, R., and Miller, E.Y., *A symplectic geometry approach to generalized Casson's invariants of 3-manifolds*, Bull. Amer. Math. Soc. **22** (1990), 269–275.
- [Cha] Chaperon, M., *On generating families*, The Floer memorial volume, Progr. Math., 133 Birkhäuser, Basel (1995), 283–296.
- [Che] Chekanov, Yu.V., *Lagrangian intersections, symplectic energy, and holomorphic curves*, preprint (1995), 12pp.
- [Chm] Chemin, J.-Y., *Fluides parfaits incompressibles*, Astérisque **230** (1995), 1–177.
- [C-S] Cheng, C.-Q. and Sun, Y.-S., *Existence of invariant tori in three-dimensional measure-preserving maps*, Cel. Mech. Dyn. Ast. **47** (1990), 275–292.
- [CMa] Chern, S.J. and Marsden, J.E., *A note on symmetry and stability for fluid flows*, Geophys. Astrophys. Fluid Dyn. **51** (1990), no. 1–4, 19–26.
- [Chr] Chern, S.S., *Complex manifolds*, University of Chicago, 1955/56, Moscow, Nauka, 1961, pp. 239.

- [CLMS] Chicone, C., Latushkin, Y., and Montgomery-Smith, S., *The spectrum of the kinematic dynamo operator for an ideally conducting fluid*, Comm. Math. Phys. **173** (1995), 379–400.
- [Chi1] Childress, S., *Construction of steady-state hydromagnetic dynamos. I. Spatially periodic fields*, Report MF-53, Courant Inst. of Math. Sci. (1967); *New solutions of the kinematic dynamo problem*, J. Math. Phys. **11** (1970), 3063–3076.
- [Chi2] Childress, S., *Fast dynamo theory*, Topological aspects of the dynamics of fluids and plasmas (Eds: H.K. Moffatt, G.M. Zaslavsky, M. Tabor, and P. Comte), Kluwer Academic Publishers, Dordrecht (1992), 111–147.
- [Chi3] Childress, S., *On the geometry of fast dynamo action in unsteady flows near the onset of chaos*, Geophys. Astrophys. Fluid Dyn. **73** (1993), 75–90.
- [ChG] Childress, S. and Gilbert, A., *Stretch, twist, and fold: the fast dynamo*, Lecture Notes in Physics, vol. 37, Springer-Verlag, 1995.
- [C-M] Chui, A.Y.K. and Moffatt, H.K., *The energy and helicity of knotted magnetic flux tubes*, Proc. Roy. Soc. London Ser. A **451** (1995), no. 1943, 609–629.
- [CFT] Constantin, P., Foias, C., and Temam, R., *Attractors representing turbulent flows*, Mem. Amer. Math. Soc. **53** (1985), no. 314, 1–67.
- [Cow] Cowling, T.G., *The magnetic field of sunspots*, Mon. Not. Roy. Astr. Soc. **140** (1934), 39–48.
- [D-L] Delshams, A. and de La Llave, R., *Existence of quasiperiodic orbits and absence of transport for volume-preserving transformations and flows*, preprint (1990), 1–28.
- [DeR] De Rham, G., *Variétés différentiables. Formes, courantes, formes harmoniques*, Hermann, Paris, 1955, pp. 196.
- [Dez] Dezin, A.A., *Invariant forms and some structure properties of the Euler equations of hydrodynamics*, Zeit. Anal. Anwend. (in Russian) **2** (1983), 401–409.
- [Dik] Dikii, L.A., *On the non-linear theory of hydrodynamical stability*, J. Appl. Math. Mech. **29** (1965), no. 5, 852–855.
- [DoM] Dobrokhotov, S.Yu. and Martinez-Olive, V., *Localized asymptotic solutions of the magnetic dynamo equation in ABC-fields*, Math. Notes **54** (1993), no. 3-4, 1010–1025.
- [DoS] Dobrokhotov, S.Yu. and Shafarevich, A.I., *Parametrix and asymptotic behavior of localized solutions of the Navier–Stokes equations in  $\mathbb{R}^3$  that are linearized on a smooth flow*, Math. Notes **51** (1992), no. 1-2, 47–54; *Some asymptotic solutions of the linearized Navier–Stokes equations*, Math. Notes **53** (1993), no. 1, 25–35.
- [Dom] Dombre, T., Frisch, U., Greene, J.M., Hénon, M., Mehr, A., and Soward, A.M., *Chaotic streamlines in the ABC flows*, J. Fluid Mech. **167** (1986), 353–391.
- [Don] Donaldson, S.K., *Symmetric spaces, Kähler geometry and Hamiltonian dynamics*, preprint (1997), 22pp.
- [D-O] Douady, A. and Osterlé, J., *Dimension de Hausdorff des attracteurs*, C.R. Acad. Sci. Paris Sér. A-B **290** (1980), no. 24, A1135–A1138.
- [D-S] Doyle, P. and Schramm, O., *Personal communications to D. Auckly and L. Sadun, R.B. Kusner and J.M. Sullivan*, see [AuS], [KuS].
- [DKN] Dubrovin, B.A., Krichever, I.M., and Novikov, S.P., *Integrable systems. I*, Itogi nauki. Fundamentalnye napravleniya **4** (1985), VINITI, Moscow, 179–284; English transl.: Encyclopaedia of Math. Sci. **4** (1990), Springer-Verlag, 173–280.
- [D-N] Dubrovin, B.A. and Novikov, S.P., *On Poisson brackets of hydrodynamic type*, Sov. Math. Dokl. **30** (1984), 651–654.
- [DFN] Dubrovin, B., Fomenko, A., and Novikov, S., *Modern geometry – methods and applications*, vol. 1-2, Springer-Verlag, New York, 1984–85.
- [Duf] Dufour, J.-P., *Bi-stabilité des franges*, C.R. Acad. Sci., Sér. A-B **285** (1977), A445–A448; *Stabilité simultanée de deux fonctions différentiables*, Ann. Inst. Fourier **29** (1979), no. 1, 263–282.
- [Dyn] Dynnikov, I.A., *Intersections of level surfaces of pseudoperiodic functions*, Russ. Math. Surveys **49** (1994), no. 1, 213–214.
- [Eb] Ebin, D.G., *The motion of slightly compressible fluids viewed as a motion with strong constraining force*, Annals of Math. **105** (1977), 141–200; *Motion of a slightly compressible fluid*, Proc. Nat. Acad. Sci. U.S. **72** (1975), no. 2, 539–542; *The initial boundary*

- value problem for sub-sonic fluid motion*, Comm. Pure and Appl. Math. **32** (1979), 1–19; *Motion of slightly compressible fluids in a bounded domain*, Comm. Pure and Appl. Math. **35** (1982), 451–485.
- [E-M] Ebin, D.G. and Marsden, J., *Groups of diffeomorphisms and the motion of an incompressible fluid*, Ann. of Math. **92** (1970), 102–163; *Groups of diffeomorphisms and the solution of the classical Euler equation for a perfect fluid*, Bull. Amer. Math. Soc. **75** (1969), 962–967.
- [El1] Eliashberg, Ya., *A theorem on the structure of wave fronts and its application in symplectic topology*, Funct. Anal. Appl. **21** (1987), no. 3, 65–72.
- [El2] Eliashberg, Ya., *Topological characterization of Stein manifolds of dim > 2*, Internat. J. Math. **1** (1990), no. 1, 29–46.
- [E-P] Eliashberg, Ya. and Polterovich, L., *Bi-invariant metrics on the group of Hamiltonian diffeomorphisms*, Internat. J. Math. **4** (1993), no. 5, 727–738.
- [ER1] Eliashberg, Ya. and Ratiu, T., *On the diameter of the symplectomorphism group of the ball*, Math. Sci. Res. Inst. Publ. **20** (1991), Springer, New York, 169–172.
- [ER2] Eliashberg, Ya. and Ratiu, T., *The diameter of the symplectomorphism group is infinite*, Invent. Math. **103** (1991), no. 2, 327–340.
- [E-K] Etingof, P.I. and Khesin, B.A., *Affine Gelfand-Dickey brackets and holomorphic vector bundles*, Geom. and Funct. Anal. **4** (1994), no. 4, 399–423.
- [Eul] Euler, L., *Theoria motus corporum solidorum seu rigidorum ex primis nostrae cognitionis principiis stabilita et ad omnes motus qui inhuiusmodi corpora cadere possunt accommodata.*, Mémoires de l’Académie des Sciences Berlin, 1765; *Leonhardi Euleri Opera Omnia. Series secunda. Opera mechanica et astronomica.*, Natur. Sci. Soc. Switzerland; Orell Füssli, Zürich; B.G. Teubner, Leipzig, vol. III, 1948, pp. 327; vol. IV, 1950, pp. 359; *Commentationes mechanicae ad theoriam corporum fluidorum pertinentes*, Mémoires de l’Académie des Sciences Berlin; *Leonhardi Euleri Opera Omnia. Series secunda. Opera mechanica et astronomica.*, Soc. Sci. Natur. Helveticae; C.A. Truesdell, Lausanne, vol. XII, 1954, pp. 288; vol. XIII, 1955, pp. 375.
- [E-B] Evans, N.V. and Berger, M.A., *A hierarchy of linking integrals*; (1992), in Topological Aspects of the Dynamics of Fluids and Plasmas, Kluwer Acad. Publ., 237–248.
- [Fad] Faddeev, L.D., *Towards a stability theory of stationary planar-parallel flows of an ideal fluid*, Boundary Problems in Math. Phys. vol. 5, Zap. Nauchn. Sem. LOMI, Nauka, Moscow **21** (1971), 164–172.
- [FZ] Fairlie, D.B. and Zachos, C.K., *Infinite-dimensional algebras, sine brackets, and  $SU(\infty)$* , Phys. Letters B **224** (1989), no. 1-2, 101–107.
- [FFZ] Fairlie, D.B., Fletcher, P., and Zachos, C.K., *Trigonometric structure constants for new infinite-dimensional algebras*, Phys. Letters B **218** (1989), no. 2, 203–206.
- [Fer] Ferrand, E., *On the Bennequin invariant and the geometry of wave fronts*, Geometriae Dedicata **65** (1997), no. 2.
- [Fey] Feynman, R.P., *Statistical mechanics*, New-York: Benjamin, 1972.
- [F-R] Fiedler, B. and Rocha, C., *Heteroclinic orbits of semilinear parabolic equations*, J. Diff. Equations **125** (1996), no. 1, 239–281.
- [Fj] Fjørtoft, R., *Applications of integral theorems in deriving criteria of stability for laminar flows and for the baroclinic circular vortex*, Geofys. Publ. Norske Vid.– Akad. Oslo **17** (1950), no. 6, 52pp.
- [Fock] Fock, V.V., *Asymptotics of the Fokker–Planck equation*, preprint MGU, Moscow (1986).
- [FNRS] Fock, V.V., Nekrasov, N.A., Rosly, A.A., and Selivanov, K.G., *What we think about the higher dimensional Chern–Simons theories*, Sakharov Memorial Lectures in Physics **1-2** (1992), Nove Sci. Publ., Commack, NY, 465–471.
- [FKR] Fock, V.V., Khesin, B.A., and Rosly, A.A., *in preparation*.
- [FoT] Foias, C. and Temam, R., *Some analytic and geometric properties of the solutions of the evolution Navier–Stokes equations*, J. Math. Pures Appl. **58** (1979), no. 3, 339–368.
- [Fr1] Freedman, M.H., *A note on topology and magnetic energy in incompressible perfectly conducting fluids*, J. Fluid Mech. **194** (1988), 549–551.
- [Fr2] Freedman, M.H., *Trivial magnetic froth*, Lectures at Santa Barbara (1991).

- [FrB] Freedman, M.H. and Berger, M.A., *Combinatorial relaxation of magnetic fields*, Geophys. Astrophys. Fluid Dynamics **73** (1993), no. 1-4, 91–96.
- [FH1] Freedman, M.H. and He, Z.-X., *Links of tori and the energy of incompressible flows*, Topology **30** (1991), no. 2, 283–287.
- [FH2] Freedman, M.H. and He, Z.-X., *Divergence-free fields: energy and asymptotic crossing number*, Annals of Math. **134** (1991), no. 1, 189–229.
- [FHW] Freedman, M.H., He, Z.-X., and Wang, Z., *Möbius energy for knots and unknots*, Annals of Math. **139** (1994), no. 1, 1–50.
- [F-W] Freidlin, M.I. and Wentzell, A.D., *Random perturbations of dynamical systems*, Fund. Principles of Math. Sci. **260**, Springer-Verlag, New York - Berlin, 1984, pp. 326; *Reaction-diffusion equations with randomly perturbed boundary conditions*, Ann. Probab. **20** (1992), no. 2, 963–986.
- [F-K] Frenkel, I.B. and Khesin, B.A., *Four-dimensional realization of two-dimensional current groups*, Comm. Math. Phys. **178** (1996), no. 3, 541–562.
- [FKT] Frenkel, I.B., Khesin, B.A., and Todorov, A.N., *Chern-Simons-Witten theory and holomorphic linking number*, preprint (to appear).
- [FGV] Friedlander, S., Gilbert, A.D., and Vishik, M.M., *Hydrodynamic instability for certain ABC flows*, Geophys. Astrophys. Fluid Dynam. **73** (1993), no. 1-4, 97–107.
- [FV1] Friedlander, S. and Vishik, M.M., *Instability criteria for the flow of an inviscid incompressible fluid*, Phys. Rev. Lett. **66** (1991), no. 17, 2204–2206; *Instability criteria for steady flows of a perfect fluid*, Chaos **2** (1992), no. 3, 455–460.
- [FV2] Friedlander, S. and Vishik, M.M., *On stability and instability criteria for magnetohydrodynamics*, Chaos **5** (1995), no. 2, 416–423.
- [Fri] Frisch, U., *Turbulence*, Cambridge University Press, 1995, pp. 296.
- [FuT] Fuchs, D. and Tabachnikov, S., *Invariants of Legendrian and transverse knots in the standard contact space*, Topology **36** (1997), no. 5, 1025–1053.
- [Fuks] Fuks, D.B., *Cohomology of infinite-dimensional Lie algebras*, Consultants Bureau, New York, 1986, pp. 339.
- [Ful] Fuller, F.B., *The writhing number of a space curve*, Proc. Nat. Acad. Sci. USA **68** (1971), 815–819; *Decomposition of the linking number of a closed ribbon: a problem from molecular biology*, Proc. Nat. Acad. Sci. USA **75** (1978), no. 8, 3557–3561.
- [GaS] Gabov, S.A. and Sveshnikov, A.G., *Lineinyye zadachi teorii nestatsionarnykh vnutrennikh voln*, (in Russian) Moscow, Nauka, 1990, pp. 344.
- [Gal] Galileo Galilei, *Le opere*, vol. 8, p.491, Ristampa della Edizione Nazionale, Firenze, 1890–1909.
- [G-F] Galloway, D.J. and Frisch, U., *A numerical investigation of magnetic field generation in a flow with chaotic streamlines*, Geophys. Astrophys. Fluid Dyn. **29** (1984), no. 1, 13–18.
- [GmF] Gama, S. and Frisch, U., *Local helicity, a material invariant for the odd-dimensional incompressible Euler equations*, Solar and Planetary Dynamos (Cambridge, 1992), Publ. Newton Inst. **1** (1993), Cambridge Univ. Press, Cambridge, 115–119.
- [G-G] Gambaudo, J.M. and Ghys, É., *Enlacements asymptotiques*, Topology **36** (1997), no. 6, 1355–1379.
- [GST] Gambaudo, J.M., Sullivan, D., and Tresser, C., *Infinite cascades of braids and smooth dynamical systems*, Topology **33** (1994), no. 1, 85–94.
- [GDj] Gelfand, I.M., and Dickey, L.A., *A family of Hamiltonian structures related to integrable nonlinear differential equations*, Akad. Nauk SSSR Inst. Prikl. Mat. Preprint **136** (1978), 1–41; English translation in: I.M. Gelfand, Collected papers, Vol.1, Eds: S.G. Gindikin et al, Berlin - Heidelberg - New York: Springer (1987).
- [GDo] Gelfand, I.M. and Dorfman, I.Ya., *Hamiltonian operators and algebraic structures related to them*, Funct. Anal. and Appl. **13** (1979), no. 4, 248–262.
- [GFu] Gelfand, I.M. and Fuchs, D.B., *Cohomology of the Lie algebra of vector fields on the circle*, Funct. Anal. and Appl. **2** (1968), no. 4, 92–93.
- [GGZ] Gelfand, I.M., Graev, M.I., and Zelevinskii, A.V., *Holonomic systems of equations and series of hypergeometric type*, Sov. Math. Dokl. **36** (1988), no. 1, 5–10.

- [GPS] Gelfand, I.M. and Piatetski-Shapiro, I.I., *A theorem of Poincaré*, Dokl. Akad. Nauk SSSR **127** (1959), 490–493.
- [Ger] Gerasimov, A., *Personal communication*.
- [Gé] Gérard, P., *Résultats récents sur les fluides parfaits incompressibles bidimensionnels (d'après J.-Y. Chemin et J.-M. Delort)*, Séminaire Bourbaki, 44ème année, 1992/92, Astérisque **206** (1992), no. 757:5, 411–444.
- [Gil1] Gilbert, A.D., *Magnetic field evolution in steady chaotic flows*, Phil. Trans. Roy. Soc. Lond. **A339** (1992), 627–656.
- [Gil2] Gilbert, A.D., *Towards a realistic fast dynamo: models based on cat maps and pseudo-Anosov maps*, Phil. Trans. R. Soc. Lond. **A443** (1993), 585–606.
- [GK1] Ginzburg, V. L. and Khesin, B. A., *Topology of steady fluid flows*, Topological aspects of the dynamics of fluids and plasmas, eds. H.K. Moffatt et al. (1992), Kluwer Acad. Publ., Dordrecht, 265–272.
- [GK2] Ginzburg, V. L. and Khesin, B. A., *Steady fluid flows and symplectic geometry*, J. Geometry and Physics **14** (1994), no. 2, 195–210.
- [G-P] Goncharov, V.P. and Pavlov, V.I., *Problemy gidrodinamiki v gamiltonovom opisanii*, (in Russian) Mosc. Univ. Press, Moscow, 1993, pp. 198.
- [Gor] Goryunov, V., *Vassiliev invariants of knots in  $\mathbb{R}^3$  and in a solid torus*, preprint Univ. of Liverpool (1995), AMS Transl. (to appear), 34pp.
- [Gri] Grinfeld, M.A., *Variational principles and stability of stationary flows of barotropic ideal fluid*, Geophys. Astrophys. Fluid Dynamics **28** (1984), no. 1, 31–54.
- [Gro] Gromov, M., *Pseudoholomorphic curves in symplectic manifolds*, Invent. Math. **82** (1985), no. 2, 307–347.
- [Grö] Gröbli, W., *Specielle Probleme über die Bewegung geradliniger paralleler Wirbelfäden*, Zürich und Furrer, 1877, pp. 86.
- [GS1] Guillemin, V. and Sternberg, S., *The moment map and collective motion*, Ann. Phys. **127** (1980), no. 1, 220–253.
- [GS2] Guillemin, V. and Sternberg, S., *Symplectic techniques in physics*, Cambridge University Press, 1984, pp. 468.
- [Gur] Gurarie, D., *Symmetries and conservation laws of two-dimensional hydrodynamics*, Physica D **8** (1995), no. 4, 621–636.
- [GZ] Gusein-Zade, S.M., *The number of critical points of a quasiperiodic potential*, Funct. Anal. Appl. **23** (1989), no. 2, 129–130.
- [Has] Hasimoto, R., *A soliton on a vortex filament*, J. Fluid Mechanics **51** (1972), 477–485.
- [Helf] Helffer, B., *Semi-classical analysis for the Schrödinger operator and applications*, Lecture Notes in Math., vol. 1336, Springer-Verlag, 1988, pp. 107.
- [Helm] Helmholtz, H., *On integrals of the hydrodynamical equations which express vortex motion* (1858); transl. P. G. Tait in Phil. Mag. **33** (1867), no. 4, 485–512.
- [Hen] Hénon, M., *Sur la topologie des lignes de courant dans un cas particulier*, C. R. Acad. Sci. Paris **262** (1966), 312–314.
- [Herm] Herman, M.-R., *Majoration du nombre de cycles périodiques pour certaines familles de difféomorphismes du cercle*, An. Acad. Brasil, Ciênc. **57** (1985), no. 3, 261–263.
- [Hof] Hofer, H., *Estimates for the energy of a symplectic map*, Comment. Math. Helv. **68** (1993), no. 1, 48–72.
- [H-Z] Hofer, H. and Zehnder, E., *Symplectic invariants and Hamiltonian dynamics*, Birkhäuser, Basel-Boston-Berlin, 1994, pp. 341.
- [HMRW] Holm, D.D., Marsden, J.E., Ratiu, T., and Weinstein, A., *Nonlinear stability of fluid and plasma equilibria*, Phys. Rep. **123** (1985), 1–116.
- [H-K] Holm, D.D. and Kupershmidt, B.A., *Noncanonical Hamiltonian formulation of ideal magnetohydrodynamics*, Physica D **7** (1983), no. 1–3, 330–333.
- [Hop] Hoppe, J., *Diffeomorphism groups, quantization, and  $SU(\infty)$* , Int. J. Mod. Phys. A **4** (1989), no. 19, 5235–5248.
- [HOT] Hoppe, J., Olshanetsky, M., and Theisen, S., *Dynamical systems on quantum tori Lie algebras*, Comm. Math. Phys. **155** (1993), no. 3, 429–448.
- [Ilsh] Il'yashenko, Yu.S., *Weakly contracting systems and attractors of the Galerkin approximations of the Navier-Stokes equations on a two-dimensional torus*, Adv. in Mech. (in

- Russian) **5** (1982), no. 1-2, 31–63; English transl.: Selecta Math. Soviet. **11** (1992), no. 3, 203–239.
- [Ily] Ilyin, A.A., *Partially dissipative semigroups generated by the Navier-Stokes system on two-dimensional manifolds and their attractors*, Mat. Sbornik **184** (1993), no. 1, 55–88; *Attractors for Navier-Stokes equations in domains with finite measure*, Nonlinear Anal. **27** (1996), no. 5, 605–616.
- [Ish] Ishlinskii, A.Yu., *Mechanics of special gyroscopic systems*, (in Russian) Ukr. Acad. Sci., Kiev, 1952; *Orientation, gyroscopes, and inertial navigation*, (in Russian) Nauka, Moscow, 1976, pp. 195.
- [Ivo] Ivory, J., *On the attraction of homogeneous ellipsoids*, Philos. Trans. **99** (1809), 345–372.
- [Jac] Jacobi, C.G., *Vorlesungen über Dynamik*, Berlin, G. Reimer, 1884, pp. 578.
- [Jak] Jakobson, M.V., *Number of periodic trajectories for analytic diffeomorphisms of the circle*, Funct. Anal. and Appl. **19** (1985), no. 1, 79–80.
- [KNH] Kambe, T., Nakamura, F., and Hattori, Y., *Kinematic instability and line-stretching in relation to the geodesics of fluid motion*, Topological aspects of the dynamics of fluids and plasmas, eds. H.K. Moffatt et al, Kluwer Acad. Publ. (1992), 493–504.
- [KHZ] Kambe, T., Hattori, Y., and Zeitlin, V., *On the stretching of line elements in fluid and an approach from differential geometry*, Proc. NATO ASI Theory of Solar and Planetary Dynamos, eds. M. Proctor, P. Matthews, A. Rucklidge (1993), 1–9.
- [Ka] Kato, T., *On classical solutions of the two-dimensional non-stationary Euler equation*, Arch. Rational. Mech. Anal. **25** (1967), 188–200.
- [Kat1] Katok, A., *Bernoulli diffeomorphisms on surfaces*, Annals of Math. **110** (1979), no. 3, 529–547.
- [Kat2] Katok, A., *Lyapunov exponents, entropy, and periodic points for diffeomorphisms*, Publ. Math. IHES **51** (1980), 137–174.
- [Kel] Kelvin, L., *On vortex motion*, Trans. Roy. Soc. Edin. **25** (1869), 217–260; *Maximum and minimum energy in vortex motion*, Mathematical and Physical Papers, vol. 4, Cambridge Univ. Press, 172–183.
- [KhL] Khalatnikov, I.M. and Lebedev, V.V., *Hamiltonian equations of hydrodynamics of anisotropic superfluid He-A*, Phys. Lett. A **61** (1977), 319–320.
- [Kha] Khanin, K.M., *Quasi-periodic motion of vortex systems*, Physica D **4** (1982), no. 2, 261–269.
- [Kh1] Khesin, B.A., *Ergodic interpretation of integral hydrodynamic invariants*, J. Geometry and Physics **9** (1992), no. 1, 101–110.
- [Kh2] Khesin, B.A., *Informal complexification and Poisson structures on moduli spaces*, Amer. Math. Soc. Transl., Series 2, Providence, RI **180** (1997), 147–155.
- [KhC] Khesin, B.A. and Chekanov, Yu.V., *Invariants of the Euler equation for ideal or barotropic hydrodynamics and superconductivity in D dimensions*, Physica D **40** (1989), no. 1, 119–131.
- [KLR] Khesin, B.A., Lyubashenko, V., and Roger, C., *Extensions and contractions of the Lie algebra of q-pseudodifferential symbols on the circle*, J. Funct. Anal. **143** (1997), no. 1, 55–97.
- [KhR] Khesin, B.A., and Rosly, A.A., *Holomorphic linking and homology of complex manifolds*, in preparation.
- [KhS] Khesin, B.A., and Shapiro, B.Z., *Nondegenerate curves on  $S^2$  and orbit classification of the Zamolodchikov algebra*, Comm. Math. Phys. **145** (1992), no. 2, 357–362.
- [KiT] Kida, S. and Takaoka, M., *Vortex reconnection*, Annual Review of Fluid Mechanics **26** (1994), 169–189.
- [KiN] Kidambi, R. and Newton, P.K., *Motion of three point vortices on a sphere*, preprint CMS-97-2, USC Los Angeles (1997), 34pp.
- [Kir] Kirchhoff, G.R., *Vorlesungen über mathematische Physik. Mechanik*, Leipzig, Teubner, 1876, pp. 466.
- [Ki1] Kirillov, A.A., *Unitary representations of nilpotent Lie groups*, Rus. Math. Surv. **17** (1962), no. 4, 57–101.

- [Ki2] Kirillov, A.A., *Infinite-dimensional Lie groups: their orbits, invariants and representations. Geometry of moments*, Lect. Notes in Math., Springer-Verlag **970** (1982), 101–123.
- [Ki3] Kirillov, A.A., *Kähler structure on coadjoint orbits of the group of diffeomorphisms of a circle*, Funct. Anal. and Appl. **21** (1987), no. 2, 122–125.
- [Kl] Klein, F., *Einleitung in die höhere Geometrie*, 3-d Aufl., Berlin, 1926.
- [KLM] Klein, R. and Majda, A.J., *Self-stretching of a perturbed vortex filaments. I. The asymptotic equation for deviations from a straight line*, Physica D **49** (1991), no. 3, 323–352; *II. Structure of solutions*, Physica D **53** (1991), no. 2-4, 267–294.
- [K-Y] Klapper, I. and Young, L.-S., *Rigorous bounds on the fast dynamo growth rate involving topological entropy*, Comm. Math. Phys. **173** (1995), 623–646.
- [K-N] Kobayashi, S. and Nomizu, K., *Foundations of differential geometry*, vol. 1-2, Interscience Publishers NY-London-Sydney, 1969.
- [Kol] Kolmogorov, A.N., *New metric invariant of transitive dynamical systems and endomorphisms of Lebesgue spaces*, Doklady Akad. Nauk SSSR **115** (1958), no. 5, 861–864.
- [KLe] Kop'ev, V.F. and Leont'ev, E.A., *Acoustic instability of plane vortex flows with circled flow lines*, (in Russian) Acoustichesky J. **34** (1988), no. 2, 475–480.
- [KdV] Korteweg, D.J. and de Vries, G., *On the change of form of long waves advancing in a rectangular canal, and on a new type of long stationary waves*, Philos. Mag. **39** (1895), 422–443.
- [Kos] Kostant, B., *Quantization and unitary representations*, Springer, Berlin, Lect. Notes Math. **170** (1970), 87–208.
- [Ko1] Kozlov, V.V., *Hydrodynamics of Hamiltonian systems*, Moscow Univ. Math. Bull. **33** (1983), no. 6, 10–22; *Hydrodynamics of noncommutative integration of Hamiltonian systems*, Dynamical systems in classical mechanics, AMS Transl. Ser. 2, Providence, RI **168** (1995), 227–238.
- [Ko2] Kozlov, V.V., *On invariant measures of the Euler–Poincaré equations on Lie algebras*, Funct. Anal. and Appl. **22** (1988), no. 1, 58–59.
- [Ko3] Kozlov, V.V., *Dynamical systems determined by the Navier–Stokes equations*, Russ. J. Math. Phys. **1** (1993), no. 1, 57–69.
- [Koz1] Kozlovsky, O., *Personal communication*.
- [Koz2] Kozlovsky, O., *An integral formula for topological entropy of  $C^\infty$  maps*, Ergodic theory and dynamical systems (to appear) (1997), 19pp.
- [K-R] Krause, F. and Rädler, K.-H., *Mean-field magnetohydrodynamics and dynamo theory*, Pergamon Press, Oxford - Elmsford, NY, 1980, pp. 271.
- [Kri] Krishnamurti, T.N., *Numerical weather prediction*, Annual Review of Fluid Mechanics **27** (1995), 195–224.
- [KrM] Krishnaprasad, P.S. and Marsden, J.E., *Hamiltonian structure and stability for rigid bodies with flexible attachments*, Arch. Rat. Mech. Anal. **98** (1987), 137–158.
- [Kui] Kuiper, N.H., *Locally projective spaces of dimension one*, Michigan Math. J., **2** (1953–1954), no. 2, 95–97.
- [Kup] Kupershmidt, B.A., *A super Korteweg de Vries equation: an integrable system*, Phys. Lett. A **102** (1984), no. 5-6, 213–215; *Super Korteweg de Vries equation associated to super extensions of the Virasoro algebra*, Phys. Lett. A **109** (1985), no. 9, 417–423.
- [KuS] Kusner, R.B. and Sullivan, J.M., *Möbius energies for knots and links, surfaces and submanifolds*, preprint MSRI 026-94 (1994), 30pp.
- [Lad] Ladyzhenskaya, O., *The mathematical theory of viscous incompressible flows*, Mathematics and its Appl, Vol.2. Second English edition. Gordon and Breach, New York-London-Paris, 1969, pp. 224.
- [LL] La Llave, R.D., *Hyperbolic dynamical systems and generation of magnetic fields by perfectly conducting fluids*, Geophys. Astrophys. Fluid Dyn. **73** (1993), 123–131.
- [LaM] Lalonde, F. and McDuff, D., *The geometry of symplectic energy*, Annals of Math. **141** (1995), no. 2, 349–371.
- [Lam] Lamb, H., *Hydrodynamics*, Cambridge University Press, 1932.
- [LaP] Langer, J. and Perline, R., *Poisson geometry of the filament equation*, J. Nonlinear Science **1** (1991), 71–93.

- [LaR] Larchev, V.D. and Reznik, G.M., *Two-dimensional Rossby soliton: An exact solution*, Dokl. Acad. Sci. USSR **231** (1976), 1077–1079.
- [Lat] Lattes, S., *Sur l'itération des substitutions rationnelles et les fonctions de Poincaré*, C.R. Acad. Sci. Paris **16** (1918), 26–28.
- [L-A] Laurence, P. and Avellaneda, M., *On Woltjer's variational principle for force-free fields*, J. Math. Phys. **32** (1991), no. 5, 1240–1253; *A Moffatt-Arnold formula for the mutual helicity of linked flux tubes*, Geophys. Astrophys. Fluid Dynam. **69** (1993), no. 1-4, 243–256; *Woltjer's variational principle. II. The case of unbounded domains*, Geophys. Astrophys. Fluid Dynam. **69** (1993), no. 1-4, 201–241.
- [LS1] Laurence, P. and Stredulinsky, E.W., *A gradient bound for the Grad-Kruskal-Kulsrud functional*, Comm. Pure Appl. Math. **49** (1996), no. 3, 237–284.
- [LS2] Laurence, P. and Stredulinsky, E.W., *A third order helicity for magnetic fields in linked tori*, preprint (1996), 8pp.
- [LS3] Laurence, P. and Stredulinsky, E.W., *Topological decomposition of Sobolev functions and the localization of energy in ideal plasmas*, C.R. Acad. Sci., Paris Série I Math. **324** (1997), no. 4, 403–408.
- [LS4] Laurence, P. and Stredulinsky, E.W., *Axisymmetric MHD equilibria from Kruskal-Kulsrud to Grad*, IMA Vol. Math. Appl., Springer, New York **53** (1993), 111–134.
- [Lax] Lax, P.D., *Approximation of measure preserving transformations*, Comm. Pure Appl. Math. **24** (1971), 133–135.
- [LPa] Lazutkin, V.P. and Pankratova, T.F., *Normal forms and versal deformations for Hill's equations*, Funct. Anal. and Appl. **9** (1975), no. 4, 41–48.
- [LeM] Lebedev, D.R. and Manin, Yu.I., *The Gelfand-Dickey Hamiltonian operator and the coadjoint representation of the Volterra group*, Funct. Anal. and Appl. **13** (1979), no. 4, 40–46.
- [Lem] Lempert, L., *Loop spaces as complex manifolds*, J. of Diff. Geometry **38** (1993), no. 3, 519–543.
- [LMa] Leonard, N.E. and Marsden, J.E., *Stability and drift of underwater vehicle dynamics: mechanical systems with rigid motion symmetry*, Physica D **105** (1997), 130–162.
- [Ler] Leray, J., *La calcul différentiel et intégral sur une variété analytique complexe (Problème de Cauchy, III)*, Bull. Soc. Math. France **87** (1959), 81–180.
- [Lew] Lewis, D., *Lagrangian block diagonalization*, J. Dyn. Diff. Eq. **4** (1992), no. 1, 1–41.
- [LMMR] Lewis, D., Marsden, J.E., Montgomery, R., and Ratiu, T.S., *The Hamiltonian structure for dynamic free boundary problems*, Physica D **18** (1986), no. 1-3, 391–404.
- [LMR] Lewis, D., Marsden, J.E., and Ratiu, T.S., *Stability and bifurcation of a rotating liquid drop*, J. Math. Phys. **28** (1987), 2508–2515.
- [LRSM] Lewis, D., Ratiu, T.S., Simo, J.C., and Marsden, J.E., *The heavy top: a geometric treatment*, Nonlinearity **5** (1992), no. 1, 1–48.
- [LeS] Lewis, D. and Simo, J.C., *Nonlinear stability of rotating pseudo-rigid bodies*, Proc. Roy. Soc. London Ser. A **427** (1990), no. 1873, 281–319.
- [Lich] Lichnerowicz, A., *Algèbre de Lie des automorphismes infinitésimaux d'une structure unimodulaire*, Ann. Inst. Fourier **24** (1974), no. 3, 219–266.
- [Lie] Lie, S., *Theorie des Transformationsgruppen*, Leipzig, Zweiter Abschnitt, B.G. Teubner, 1980, pp. 554.
- [Lieb] Lieb, E.H., *Sharp constants in the Hardy-Littlewood-Sobolev and related inequalities*, Ann. of Math. **118** (1983), 349–374.
- [Lif] Lifschitz, A., *Essential spectrum and local stability condition in hydrodynamics*, Phys. Lett. A **152** (1991), no. 3-4, 199–204; *On the instability of certain motions of an ideal incompressible fluid*, Adv. in Appl. Math. **15** (1994), 404–436.
- [L-W] Lin, X.-S. and Wang, Z., *Integral geometry of plane curves and knot invariants*, J. Diff. Geom. **44** (1996), no. 1, 74–95.
- [Lor] Lorenz, E.N., *Deterministic nonperiodic flow*, J. Atmosph. Sci. **20** (1963), no. 2, 130–141.
- [Loj] Lojasiewicz, S., *Ensembles semi-analytique*, Lecture Notes IHES, Bures-sur-Yvette, 1965.

- [Luk1] Lukatsky, A.M., *Curvature of groups of measure-preserving diffeomorphisms of a two-dimensional sphere*, Func. Anal. Appl. **13** (1979), no. 3, 174–178.
- [Luk2] Lukatsky, A.M., *On the curvature of the group of measure-preserving diffeomorphisms of an  $n$ -dimensional torus*, Russ. Math. Surv. **36** (1981), no. 2, 179–180.
- [Luk3] Lukatsky, A.M., *The structure of the curvature tensor of the group of measure-preserving diffeomorphisms of a two-dimensional compact manifold*, Siber. Math. J. **29** (1988), no. 6, 947–951.
- [Luk4] Lukatsky, A.M., *Negativity of curvatures of the diffeomorphism groups for locally Euclidean manifolds*, Russ. Math. Surv. **45** (1990), no. 6, 160–161.
- [Luk5] Lukatsky, A.M., *On the curvature of the diffeomorphism group*, Ann. of Global Anal. Geom. **11** (1993), no. 2, 135–140.
- [Lyub] Lyubich, M., *Dynamics of rational transformations: topological picture*, Rus. Math. Surveys **41** (1986), no. 4, 43–117.
- [Mag] Magri, F., *A simple model of the integrable Hamiltonian equation*, J. Math. Phys. **19** (1978), no. 5, 1156–1162.
- [MPa] Mallet-Paret, J., *Negatively invariant sets of compact maps and an extension of a theorem of Cartwright*, J. Diff. Equations **22** (1976), no. 2, 331–348.
- [Man] Manakov, S.V., *Note on the integration of Euler's equations of the dynamics of an  $n$ -dimensional rigid body*, Funct. Anal. and Appl. **10** (1976), no. 4, 328–329.
- [Ma] Manin, Yu.I., *Algebraic aspects of nonlinear differential equations*, (in Russian) Modern Problems in Math., VINITI **11** (1978), 5–152.
- [M-P] Marchioro, C. and Pulvirenti, M., *Mathematical theory of incompressible nonviscous fluids*, Appl. Math. Sci., vol. 96, Springer-Verlag, 1994, pp. 283.
- [MMe] Markus, L. and Meyer, R., *Generic Hamiltonian systems are neither integrable nor ergodic*, Memoirs of the AMS, vol. 144, Providence, RI, 1974, pp. 52.
- [Mar] Marsden, J.E., *Lectures on Mechanics*, London Mathematical Society Lecture note series, vol. 174, Cambridge University Press, 1992, pp. 254.
- [MMR] Marsden, J.E., Montgomery, R., and Ratiu, T.S., *Reduction, symmetry, and phases in mechanics*, Memoirs of the AMS, vol. 436, Providence, RI, 1990, pp. 110.
- [MaR] Marsden, J.E. and Ratiu, T.S., *Introduction to mechanics and symmetry: A basic exposition of classical mechanical systems*, Texts Appl. Math., vol. 17, Springer-Verlag, New York, 1994, pp. 500.
- [MRW] Marsden, J., Ratiu, T., and Weinstein, A., *Semidirect product and reduction in mechanics*, Trans. Am. Math. Soc. **281** (1984), 147–177.
- [MaS] Marsden, J.E. and Simo, J.C., *The energy-momentum method*, La “Mecanique Analytique” de Lagrange et son Heritage, Atti della Accademia delle Scienze di Torino **124** (1990), 245–268.
- [M-W] Marsden, J. and Weinstein, A., *Coadjoint orbits, vortices, and Clebsch variables for incompressible fluids*, Physica D **7** (1983), no. 1-3, 305–323.
- [Mas] Massey, W., *Some higher order cohomology operations*, Symp. Intern. Topologia Algebraica (1958), Mexico, UNESCO.
- [Max] Maxwell, J.C., *A treatise on Electricity and Magnetism*, vol. 2, Clarendon Press, Oxford, 1877.
- [MSi] Meshalkin, L.D. and Sinai, Ya.G., *Investigation of the stability of a stationary solution of a system of equations for the plane movement of an incompressible viscous fluid*, J. Appl. Math. Mech. **25** (1961), 1700–1705.
- [Mil1] Milnor, J.W., *On the total curvature of knots*, Ann. of Math. **52** (1950), 248–257.
- [Mil2] Milnor, J.W., *Link groups*, Ann. of Math. **59** (1954), 177–195.
- [Mil3] Milnor, J.W., *Morse theory*, Princeton Univ. Press, Princeton, NJ, 1963, pp. 153.
- [Mil4] Milnor, J.W., *Curvatures of left invariant metrics on Lie groups*, Advances in Math. **21** (1976), no. 3, 293–329.
- [MiZ] Millson, J.J. and Zombro, B., *A Kähler structure on the moduli space of isometric maps of a circle into Euclidean space*, Invent. Math. **123** (1996), no. 1, 35–59.
- [Mish] Mishchenko, A.S., *Integrals of geodesic flows on Lie groups*, Funct. Anal. Appl. **4** (1970), no. 3, 232–235.

- [Mis1] Misiołek, G., *Stability of flows of ideal fluids and the geometry of the group of diffeomorphisms*, Indiana Univ. Math. J. **42** (1993), no. 1, 215–235.
- [Mis2] Misiołek, G., *Conjugate points in  $S \text{Diff}(T^2)$* , Proc. Amer. Math. Soc. **124** (1996), no. 3, 977–982.
- [Mis3] Misiołek, G., *Conjugate points in the Bott-Virasoro group and the KdV equation*, Proc. Amer. Math. Soc. **125** (1997), no. 3, 935–940.
- [Mis4] Misiołek, G., *A shallow water equation as a geodesic flow on the Bott-Virasoro group*, preprint Univ. of Notre Dame (1996).
- [Miu] Miura, R.M., *The Korteweg-de-Vries equation: a survey of results*, SIAM Rev. **18** (1976), no. 3, 412–459.
- [Mof1] Moffatt, H.K., *The degree of knottedness of tangled vortex lines*, J. Fluid. Mech. **106** (1969), 117–129.
- [Mof2] Moffatt, H.K., *Some developments in the theory of turbulence*, J. Fluid Mech. **106** (1981), 27–47; *Magnetostatic equilibria and analogous Euler flows of arbitrarily complex topology*, Part 1: J. Fluid Mech. **159** (1985), 359–378; Part 2: J. Fluid Mech. **166** (1986), 359–378.
- [Mof3] Moffatt, H.K., *Magnetic Field Generation in Electrically Conducting Fluid*, Cambridge University Press, 1978, pp. 343.
- [Mof4] Moffatt, H.K., *Structure and stability of solutions of the Euler equations: a Lagrangian approach*, Phil. Trans. Roy. Soc. London, Ser. A **333** (1990), no. 1631, 321–342.
- [Mof5] Moffatt, H.K., *The energy spectrum of knots and links*, Nature **347** (1990), 367–369.
- [MoR] Moffatt, H.K. and Ricca, R.L., *Helicity and Calugareanu invariant*, Proc. Roy. Soc. London, Ser. A **439** (1992), 411–429.
- [MoT] Moffatt, H.K. and Tsinober, A., *Helicity in laminar and turbulent flow*, Annual Review of Fluid Mechanics **24** (1992), 281–312.
- [MRe] Monastyrsky, M.I. and Retakh, V.S., *Topology of linked defects in condensed matter*, Comm. Math. Phys. **103** (1986), 445–459.
- [MSa] Monastyrsky, M.I. and Sasorov, P.V., *Topological invariants in magnetic hydrodynamics*, Sov. Phys. JETP **93** (1987), 1210–1220; *Conservation of topological invariants of magnetic field in magnetohydrodynamics*, preprint ITEP 63-88 (1988).
- [Mor1] Moreau, J.-J., *Une méthode de “cinématique fonctionnelle” en hydrodynamique*, C.R. Acad. Sci. Paris **249** (1959), 2156–2158.
- [Mor2] Moreau, J.-J., *Constantes d’un îlot tourbillonnaire en fluide parfait barotrope*, C.R. Acad. Sci. Paris **252** (1961), 2810–2812.
- [MYZ] Morgulis, A., Yudovich, V.I., and Zaslavsky, G.M., *Compressible helical flows*, Comm. Pure and Appl. Math. **48** (1995), no. 5, 571–582.
- [MoG] Morrison, P.J. and Greene, J.M., *Noncanonical Hamiltonian density formulation of hydrodynamics and ideal magnetohydrodynamics*, Phys. Rev. Lett. **45** (1980), no. 10, 790–794.
- [Mos1] Moser, J., *On the volume elements on a manifold*, Trans. Amer. Math. Soc. **120** (1965), 286–294.
- [Mos2] Moser, J., *On the approximation of measure-preserving mappings by smooth ones and by symplectic diffeomorphisms*, preprint Forschungsinstitut für Mathematik, ETH Zürich (1995), 12pp.
- [MVe] Moser, J. and Veselov, A.P., *Two-dimensional “discrete hydrodynamics” and the Monge-Ampère equation*, preprint ETH Zürich, April (1993), 7pp.
- [Moy] Moyal, J., *Quantum mechanics as a statistical theory*, Proc. Cambridge Phil. Soc. **45** (1949), 99–124.
- [MuR] Murometz, Y. and Razboynik, S., *Integrability of models of two-dimensional turbulence*, Integrable and superintegrable systems, ed. B.A. Kupershmidt, London: World Scientific (1990), 34–45.
- [Nad] Nadirashvili, N.S., *Wandering solutions of the Euler 2D equation*, Funct. Anal. Appl. **25** (1991), no. 3, 220–221.
- [NHK] Nakamura, F., Hattori, Y., and Kambe, T., *Geodesics and curvature of a group of diffeomorphisms and motion of an ideal fluid*, J. Phys. A **25** (1992), no. 2, L45–L50.

- [Nash] Nash, J., *The imbedding problem for Riemannian manifolds*, Ann. Math. **63** (1956), no. 1, 20–63.
- [Ner1] Neretin, Yu.A., *Representations of the Virasoro algebra and affine algebras*, Itogi nauki. Fundamentalnye napravleniya **22** (1988), VINITI, Moscow, 163–224; English transl.: Encyclopaedia of Math. Sci., Springer-Verlag.
- [Ner2] Neretin, Yu.A., *Categories of bistochastic measures, and representations of some infinite-dimensional groups*, Rus. Acad. Sci. Sb. Math. **75** (1993), no. 1, 197–219; *Mantles, trains, and representations of infinite-dimensional groups*, First European Congress of Math., Vol. II (Paris 1992), Progress Math. 120, Birkhäuser, Basel (1994), 293–310.
- [N-N] Newlander, A. and Nirenberg, L., *Complex analytic coordinates in almost complex manifolds*, Ann. of Math. **65** (1957), 391–404.
- [NewI] Newton, I., *Philosophiae Naturalis Principia Mathematica*, London, 1687; *Mathematical principles of natural philosophy*, Dawsons of Pall Mall, London, 1969.
- [NewP] Newton, P.K., *Hannay–Berry phase and the restricted three-vortex problem*, Physica D **79** (1994), no. 2-4, 416–423.
- [NovE] Novikov, E.A., *Dynamics and statistics of a system of vortices*, Sov. Phys. JETP **41** (1975), 937–943.
- [Nov1] Novikov, S.P., *The analytic generalized Hopf invariant. Multivalued functionals*, Rus. Math. Surveys **39** (1984), no. 5, 113–124.
- [Nov2] Novikov, S.P., *The Hamiltonian formalism and a many-valued analogue of Morse theory*, Rus. Math. Surveys **37** (1982), no. 5, 1–56.
- [Nov3] Novikov, S.P., *Quasiperiodic structures in topology*, Topological methods in modern math. (Stony Brook, NY, 1991), Publish or Perish, Houston, TX (1993), 223–233; *The semiclassical electron in a magnetic field and lattice. Some problems in low-dimensional “periodic” topology*, Geom. Funct. Anal. **5** (1995), no. 2, 434–444.
- [Ob] Obukhov, A.M., *On integral invariants in systems of hydrodynamic type*, (in Russian) Doklady Akad. Nauk SSSR **184** (1969), no. 2.
- [OH1] O’Hare, J., *Energy of a knot*, Topology **30** (1991), no. 2, 241–247.
- [OH2] O’Hare, J., *Criticality for the knot energy*, preprint MSRI 047–94 (1994), 1–13.
- [Ol] Olver, P., *Applications of Lie groups to differential equations*, Springer-Verlag, New York – Berlin, 1986, pp. 497.
- [Ono] Ono, T., *Riemannian geometry of the motion of an ideal incompressible magnetohydrodynamical fluid*, Physica D **81** (1995), no. 3, 207–220; *A Riemannian geometrical description for the Lie–Poisson systems and its application to idealized magnetohydrodynamics*, J. Phys. A **28** (1995), no. 6, 1737–1751.
- [Ose1] Oseledets, V.I., *A multiplicative ergodic theorem. Lyapunov characteristic numbers for dynamical systems*, Trans. Moscow Math. Soc. **19** (1968), 197–231.
- [Ose2] Oseledets, V.I., *A new form of writing out the Navier–Stokes equation. Hamiltonian formalism*, Rus. Math. Surv. **44** (1989), no. 3, 210–211.
- [Ose3] Oseledets, V.I., *Fast dynamo problem for a smooth map on a two-torus*, Geophys. Astrophys. Fluid Dyn. **73** (1993), no. 1-4, 133–145.
- [Ovs] Ovsepjan, S.G., *On the generating set of boundary points in the Dirichlet problem for the equation of the vibrating string in multiconnected regions*, Doklady AN Arm. SSR **39** (1964), 193–200; *Ergodicity of continuous automorphisms and uniqueness of the solution of the Dirichlet problem for the equation of vibration of a string, I, II*, Izv. AN Arm. SSR **2** (1967), no. 2, 128–136; **2** (1967), no. 3, 195–209; *On the generating set of boundary points and on the completeness of system of generalized eigenfunctions of the Dirichlet problem for the equation of string vibrations*, Doklady AN Arm. SSR **47** (1968), no. 1, 3–8; *A construction of the generating set and the generalized eigenfunctions of the Dirichlet problem for the equation of string vibrations in a class of measurable functions*, Izv. AN Arm. SSR **4** (1969), no. 2, 102–121; *The approximation of generalized eigenfunctions of the Dirichlet problem for the vibrating string equation that belong to  $L^p(D)$  by smoother generalized eigenfunctions*, Izv. AN Arm. SSR **4** (1969), no. 4, 278–287.
- [OK1] Ovsienko, V.Yu. and Khesin, B.A., *Korteweg-de Vries super-equation as an Euler equation*, Funct. Anal. Appl. **21** (1987), no. 4, 329–331.

- [OK2] Ovsienko, V.Yu. and Khesin, B.A., *Symplectic leaves of the Gelfand–Dickey brackets and homotopy classes of nonflattening curves*, Funct. Anal. Appl. **24** (1990), no. 1, 33–40.
- [OKC] Ovsienko, V.Yu., Khesin, B.A., and Chekanov, Yu.V., *Integrals of the Euler equations in multidimensional hydrodynamics and superconductivity*, (in Russian) Diff. Geom., Lie Groups, and Mechanics, Zap. Sem. LOMI **172** (1988), 105–113; English transl.: J. of Sov. Math. **59** (1992), no. 5, 1096–1102.
- [Pan] Panov, D.A., *Multicomponent pseudoperiodic mappings*, Funct. Anal. and Appl. **30** (1996), no. 1, 30–38.
- [Pat] Patrick, G.W., *Relative equilibria in Hamiltonian systems: the dynamic interpretation of nonlinear stability on a reduced phase space*, J. Geom. and Phys. **9** (1992), no. 2, 111–119.
- [PeS] Penna, V. and Spera, M., *A geometric approach to quantum vortices*, J. Math. Phys. **30** (1989), no. 12, 2778–2784; *Geometry of quantum vortices and link invariants*, Internat. J. Modern Phys. B **6** (1992), no. 11–12, 2209–2216.
- [PSS] Plykin, R.V., Sataev, E.A., and Shlyachkov, S.V., *Strange attractors*, Dynamical systems, vol. 9, Encyclopaedia Math. Sci. **66** (1995), Springer, Berlin, 93–139.
- [Poh] Pohl, W.F., *The self-linking number of a closed space curve*, J. Math. Mech. **17** (1967/68), 975–985.
- [Poi1] Poincaré, H., *Théorie des Tourbillons*, ed. G. Carré, Paris: Cours de la Faculté des Sciences de Paris, 1893.
- [Poi2] Poincaré, H., *Sur la précession des corps déformables*, Bull. Astronomique **21** (1910), p.321.
- [Poi3] Poincaré, H., *Méthodes Nouvelles de la Mécanique Céleste*, G.V. Paris 1895, Chelsey 1980.
- [Plt] Polterovich, L., *Hamiltonian loops and Arnold's principle*, preprint Tel-Aviv Univ. (1996), 8pp.
- [Pl1] Polyak, M., *Invariants of curves and fronts via Gauss diagrams*, Topology (to appear) (1997), 10pp.
- [Pl2] Polyak, M., *On the Bennequin invariant of Legendrian curves and its quantization*, C.R. Acad. Sci. Paris, Sér. I **322** (1996), no. 1, 77–82.
- [PlV] Polyak, M. and Viro, O., *Gauss diagram formulas for Vassiliev invariants*, Internat. Math. Res. Notices **11** (1994), 8pp.
- [Pol] Polyakov, A.M., *Fermi–Bose transmutations induced by gauge fields*, Mod. Phys. Lett. A **3** (1988), no. 3, 325–328.
- [PPS] Ponty, Y., Pouquet, A., and Sulem, P.L., *Dynamos in weakly chaotic two-dimensional flows*, J. Geophys. Astrophys. Fluid Dynamics **79** (1995), 239–257.
- [Por] Porter, R., *Milnor's  $\mu$ -invariants and Massey products*, Trans. Amer. Math. Soc. **257** (1980), no. 1, 39–71.
- [PrS] Pressley, A. and Segal, G., *Loop groups*, Clarendon Press, Oxford, 1986, pp. 318.
- [Ra] Rakhimov, A.Kh., *Singularities of solutions of quasilinear equations*, St.Petersburg Math. J. **4** (1992), no. 4, 217–224; *Singularities of Riemann invariants*, Funct. Anal. and Appl. **27** (1993), no. 1, 39–50.
- [RiM] Ricca, R.L. and Moffatt, H.K., *The helicity of a knotted vortex filament*, Topological aspects of the dynamics of fluids and plasmas, Kluwer Acad. Publ., Dordrecht (1992), 225–236.
- [Rob] Roberts, G.O., *Dynamo action in fluid motions with two-dimensional periodicity*, Phil. Trans. Roy. Soc. Lond. A **271** (1972), 411–454.
- [R-S] Roberts, G.O. and Soward, A.M., *Dynamo theory*, Annual Review of Fluid Mechanics **24** (1992), 459–512.
- [Rog] Roger, C., *Extensions centrales d'algèbres et de groupes de Lie de dimension infinie, algèbre de Virasoro et généralisation*, Rep. Math. Phys. **35** (1995), no. 2–3, 225–266.
- [Roe] Roesch, M., *Solutions d'un problème variationnel relaxé en mécanique des fluides parfaits incompressible*, C.R. Acad. Sci. Paris Sér. I **318** (1994), no. 9, 811–816.
- [Rou1] Rouchon, P., *On the Arnol'd stability criterion for steady-state flows of an ideal fluid*, European J. Mech., B/Fluids **10** (1991), no. 6, 651–661.

- [Rou2] Rouchon, P., *The Jacobi equation, Riemannian curvature, and the motion of a perfect incompressible fluid*, European J. Mech., B/Fluids **11** (1992), no. 3, 317–336.
- [Rue] Ruelle, D., *Rotation numbers for diffeomorphisms and flows*, Ann. Inst. Henri Poincaré (Physique Théoretique) **42** (1985), no. 1, 109–115.
- [R-T] Ruelle, D. and Takens, F., *On the nature of turbulence*, Comm. Math. Phys. **20** (1971), no. 2, 167–192; Comm. Math. Phys. **23** (1971), no. 3, 343–344.
- [Ryl] Rylov, A.I., *Monotonicity properties of certain two-dimensional vortex flows of an incompressible fluid and of subsonic gas flows*, J. Appl. Math. Mech. **56** (1992), no. 3, 319–323.
- [Ryt] Rytov, S.M., *On the transition from wave to geometric optics*, (in Russian) Doklady Akad. Nauk SSSR **18** (1938), no. 2, 263–266.
- [S-V] Sadun, L. and Vishik, M., *The spectrum of the second variation of the energy for an ideal incompressible fluid*, Phys. Lett. A **182** (1993), no. 4-6, 394–398.
- [Sakh] Sakharov, A.D., *Personal communication*.
- [Sat] Sato, N., *Cobordisms of semi-boundary links*, Topology Appl. **18** (1984), no. 2-3, 225–234.
- [SaV] Saveliev, M.V. and Vershik, A.M., *New examples of continuum graded Lie algebras*, Phys. Lett. A **143** (1990), no. 3, 121–128.
- [STZ] Schonbek, M.E., Todorov, A.N., and Zubelli, J.P., *Geodesic flow on diffeomorphisms of the circle, Grassmannians, and the geometry of the periodic KdV equation*, preprint UC Santa Cruz (1995), 29pp.
- [SchL] Schwartz, L., *Théorie des distributions*, Hermann, Paris, 1966, pp. 420.
- [SchA] Schwarz, A.S., *The partition function of degenerate quadratic functional and Ray-Singer invariants*, Lett. Math. Phys. **2** (1977/78), no. 3, 247–252.
- [SchS] Schwartzman, S., *Asymptotic cycles*, Ann. of Math. **66** (1957), 270–284.
- [SYu] Sedenko, V.I. and Yudovich, V.I., *Stability of steady flows of perfect incompressible fluid with a free boundary*, J. Appl. Math. Mech. **42** (1978), no. 6, 1148–1155.
- [Seg] Segal, G., *Unitary representations of some infinite-dimensional groups*, Comm. Math. Phys. **80** (1981), no. 3, 301–342; *The geometry of the KdV equation*, Internat. J. Modern Phys. A **6** (1991), no. 16, 2859–2869.
- [SeW] Segal, G. and Wilson, G., *Loop groups and equations of KdV type*, Publ. Math. IHES **61** (1985), 5–65.
- [Ser1] Serre, D., *Invariants et dégénérescence symplectique de l'équation d'Euler des fluids parfaits incompressibles*, C.R. Acad. Sci. Paris, Sér. A **298** (1984), 349.
- [Ser2] Serre, D., *Sur le principe variationnel des équations de la mécanique des fluides parfaits*, RAIRO Modél. Math. Anal. Numér. **27** (1993), no. 6, 739–758.
- [Shf] Shafarevich, A.I., *Behavior for  $t \rightarrow \infty$  of rapidly decreasing asymptotic solutions of the linearized Navier–Stokes equations*, Math. Notes **55** (1994), no. 5-6, 632–647.
- [Sha] Shapiro, M.Z., *Topology of the space of nondegenerate curves*, Funct. Anal. Appl. **26** (1992), no. 3, 227–229; Izv. Ross. Akad. Nauk, Ser. Mat. **57** (1993), no. 5, 106–126.
- [ShV] Shapiro, B. and Vainshtein, A., *Multidimensional analogues of the Newton and Ivory theorems*, Funct. Anal. Appl. **19** (1985), no. 1, 17–20.
- [SAF] She, Z.S., Aurell, E., and Frisch, U., *The inviscid Burgers equation with initial data of Brownian type*, Comm. Math. Phys. **148** (1992), no. 3, 623–641.
- [Shn1] Shnirelman, A., *The geometry of the group of diffeomorphisms and the dynamics of an ideal incompressible fluid*, Matem. Sbornik **128** (1985), no. 1, 82–109; English transl: Math. USSR, Sbornik **56** (1987), no. 1, 79–105.
- [Shn2] Shnirelman, A., *Attainable diffeomorphisms*, Geom. and Funct. Analysis **3** (1993), no. 3, 279–294.
- [Shn3] Shnirelman, A., *Lattice theory and flows of ideal incompressible fluid*, Russ. J. Math. Phys. **1** (1993), no. 1, 105–114.
- [Shn4] Shnirelman, A., *Personal communication*.
- [Shn5] Shnirelman, A., *Generalized fluid flows, their approximation and applications*, Geom. and Funct. Analysis **4** (1994), no. 5, 586–620.

- [Shn6] Shnirelman, A., *Evolution of singularities, generalized Liapunov function and generalized integral for an ideal incompressible fluid*, Amer. J. Math. **119** (1997), no. 3, 579–608.
- [Shn7] Shnirelman, A., *On the non-uniqueness of weak solution of the Euler equations*, Journées “Équations aux Dérivées Partielles” (Saint-Jean-de-Monts, 1996), Exp. no. XVIII, École Polytech., Palaiseau (1996), 10pp; preprint IHES/M/96/31 (1996), 25pp.
- [Shn8] Shnirelman, A., *Weak solution of incompressible Euler equations with decreasing energy*, preprint IHES (1997), 9pp.
- [Sh1] Shubin, M.A., *Semiclassical asymptotics on covering manifolds and Morse inequalities*, Geom. Funct. Anal. **6** (1996), no. 2, 370–409.
- [Sh2] Shubin, M.A., *Novikov inequalities for vector fields*, The Gelfand mathem. seminars 1993–1995 (Eds. I.M. Gelfand, J. Lepovsky, M. Smirnov), Birkhäuser (1996), 243–274.
- [Shm] Shumakovich, A.N., *Explicit formulas for strangeness of plane curves*, St. Petersburg Math. J. **7** (1996), no. 3, 445–472; Algebra i Analiz **7** (1995), no. 5, 252–254.
- [Sik] Sikorav, J.-C., *Systèmes Hamiltoniens et topologie symplectique*, Dipartimento di Matematica dell’Università di Pisa ETS, Editrice Pisa (1990).
- [SLM] Simo, J.C., Lewis, D.R., and Marsden, J.E., *Stability of relative equilibria I: The reduced energy momentum method*, Arch. Rat. Mech. Anal. **115** (1991), no. 1, 15–59.
- [SPM] Simo, J.C., Posbergh, T.A., and Marsden, J.E., *Stability of coupled rigid body and geometrically exact rods: block diagonalization and the energy-momentum method*, Physics Reports **193** (1990), no. 6, 280–360; *Stability of relative equilibria II: Application to nonlinear elasticity*, Arch. Rat. Mech. Anal. **115** (1991), no. 1, 61–100.
- [Si1] Sinai, Ya.G., *On the concept of entropy for a dynamical system*, (in Russian) Doklady Akad. Nauk SSSR **124** (1959), no. 4, 768–771.
- [Si2] Sinai, Ya.G., *Statistics of shocks in solutions of inviscid Burgers equation*, Comm. Math. Phys. **148** (1992), no. 3, 601–621.
- [SiK] Sinai, Ya. and Khanin, K., *Mixing of some classes of special flows over rotations of the circle*, Funct. Anal. and Appl. **26** (1992), no. 3, 155–169.
- [Smo1] Smolentsev, N.K., *A bi-invariant metric on the group of diffeomorphisms of a three-dimensional manifold*, Sib. Math. J. **25** (1983), no. 1, 152–159.
- [Smo2] Smolentsev, N.K., *The curvature of classical diffeomorphism groups*, Sib. Math. J. **35** (1994), no. 1, 155–161.
- [Sob1] Sobolev, S.L., *On a theorem in functional analysis*, Mat. Sborn. **46** (1938), 471–497; AMS Transl., Ser. 2 **34** (1963), 39–68.
- [Sob2] Sobolev, S.L., *On a new problem of mathematical physics*, (in Russian) Izvestia Akad. Nauk SSSR, Ser. Mat. **18** (1954), 3–50; Doklady Akad. Nauk SSSR **109** (1956), 707; *On the motion of a symmetric top with a cavity filled by a fluid*, J. Appl. Mech. Tech. Phys. (1960), no. 3, 20–55.
- [Sow1] Soward, A.M., *Fast dynamo action in a steady flow*, J. Fluid Mech. **180** (1987), 267–295.
- [Sow2] Soward, A.M., *An asymptotic solution of a fast dynamo in a two-dimensional pulsed flow*, Geophys. Astrophys. Fluid Dyn. **73** (1993), no. 1–4, 179–215.
- [Squ] Squire, H.B., *On the stability of the three-dimensional disturbances of viscous flow between parallel walls*, Proc. Roy. Soc. A **142** (1933).
- [Sul] Sullivan, D., *Cycles for the dynamical study of foliated manifolds and complex manifolds*, Invent. Math. **36** (1976), 225–255.
- [Tab1] Tabachnikov, S.L., *Two remarks on asymptotic Hopf invariants*, Funct. Anal. Appl. **24** (1990), no. 1, 74–75.
- [Tab2] Tabachnikov, S.L., *Invariants of smooth triple point free plane curves*, J. Knot Theory Ramifications **5** (1996), no. 4, 531–552.
- [Tab3] Tabachnikov, S.L., *Projective connections, group Vey cocycle and deformation quantization*, Int. Math. Res. Notices **14** (1996), 705–722.
- [Tar] Tartar, L., *Personal communication to D. Serre*, see [Ser1].
- [Tay] Taylor, J.B., *Relaxation of toroidal plasma and generation of reversed magnetic field*, Phys. Rev. Lett. **33** (1974), 1139.

- [Tem] Temam, R., *Infinite-dimensional dynamical systems in mechanics and physics*, Appl. Math. Sci. 68, Springer-Verlag, New York - Berlin, 1988, pp. 500.
- [Th1] Thurston, W.P., *Noncobordant foliation of  $S^3$* , Bull. Amer. Math. Soc. **78** (1972), 511–514; *Foliations and groups of diffeomorphisms*, Bull. Amer. Math. Soc. **80** (1974), 304–307.
- [Th2] Thurston, W.P., *Three-dimensional manifolds, Kleinian groups, and hyperbolic geometry*, Bull. Amer. Math. Soc. **6** (1982), no. 3, 357–381.
- [Tod] Todorov, A.N., *Personal communication*.
- [T-F] Trofimov, V.V. and Fomenko, A.T., *Geometric and algebraic mechanisms of the integrability of Hamiltonian systems on homogeneous spaces and Lie algebras*, (in Russian) Itogi nauki. Fundamentalnye napravleniya **16** (1987), VINITI, Moscow; English transl.: Encyclopaedia of Math. Sci. **16** (1994), Springer-Verlag, 261–333.
- [Tro] Troshkin, O.V., *On topological analysis of structure of hydrodynamical flows*, Russ. Math. Surv. **43** (1988), no. 4, 153–190; *Nontraditional methods in mathematical hydrodynamics*, vol. 144, Transl. Math. Monogr., AMS Providence, RI, pp. 197.
- [Tu1] Turaev, V.G., *Milnor invariants and Massey products*, Zap. Semin. LOMI **66** (1976), 189–203, 209–210; English transl.: J. Sov. Math. (1979), 128–137.
- [Tu2] Turaev, V.G., *Quantum invariants of knots and 3-manifolds*, de Gruyter Studies in Math. 18, Walter de Gruyter & Co., Berlin, 1994, pp. 588.
- [Tur] Turski, L.A., *Hydrodynamical description of the continuous Heisenberg chain*, Canad. J. Phys. **59** (1981), no. 4, 511–514.
- [Vai] Vainshtein, S.I., *Force-free magnetic fields with constant alpha*, Topological aspects of the dynamics of fluids and plasmas, eds. H.K. Moffatt et al. (1992), Kluwer Acad. Publ., Dordrecht, 177–193.
- [V-Z] Vainshtein, S.I. and Zeldovich, Ya.B., *Origin of magnetic fields in astrophysics*, Sov. Phys. Usp. **15** (1972), 159–172.
- [V-K] Vakulenko, A.F. and Kapitansky, L.V., *Stability of solutions in  $S^2$  in the nonlinear  $\sigma$ -model*, Sov. Phys. Dokl. **24** (1979), no. 6, 433–434.
- [Var] Varopoulos, N.Th., *Brownian motion can see a knot*, Math. Proc. Camb. Phil. Soc. **97** (1985), 299–309.
- [VasO] Vassiliev, O.F., *Foundations of mechanics of helical and circular flows*, (in Russian) Gosenergo, Moskva-Leningrad, 1958.
- [VasV] Vassiliev, V.A., *Cohomology of knot spaces*, Adv. Soviet Math., vol. 1 (ed. V. Arnold) AMS Providence, RI (1990), 23–69.
- [V-F] Verjovsky, A. and Freyer, R.F.V., *The Jones-Witten invariant for flows on a three-dimensional manifold*, Comm. Math. Phys. **163** (1994), no. 1, 73–88.
- [Vir] Viro, O., *Generic immersions of the circle to surfaces and the complex topology of real algebraic curves*, Topology of real algebraic varieties and related topics, Transl. AMS, Ser. 2, Providence, RI **173** (1996), 231–252.
- [VshM] Vishik, M.M., *Magnetic field generation by the motion of a highly conducting fluid*, Geophys. Astrophys. Fluid Dyn. **48** (1989), no. 1-3, 151–167.
- [VshS] Vishik, S.M., *Euler hydrodynamic equation on the two-dimensional sphere and the dodecahedron group symmetries*, Izv. Akad. Nauk, Fizika Atmosfery i Okeana **4** (1993), 477–483.
- [V-D] Vishik, S.M. and Dolzhanskii, F.V., *Analogs of the Euler-Lagrange equations and magnetohydrodynamics equations related to Lie groups*, Sov. Math. Doklady **19** (1978), 149–153.
- [Vit] Viterbo, C., *Symplectic topology as the geometry of generating functions*, Math. Ann. **292** (1992), no. 4, 685–710.
- [Vla1] Vladimirov, V.A., *Integrals of two-dimensional motions of a perfect incompressible fluid of nonuniform density*, Fluid Dynamics **22** (1987), no. 3, 340–343.
- [Vla2] Vladimirov, V.A., *On the instability of equilibrium of fluids*, J. Appl. Mech. Tech. Phys. **30** (1989), no. 2, 269–276; *Direct Lyapunov method in problems of fluid equilibrium instability*, Arch. Mech. **42** (1990), no. 4-5, 595–607.

- [Vla3] Vladimirov, V.A., *Analogue of the hydrodynamics of whirling and stratified liquids and its application to stability theory*, in Methods of hydrophysical studies. Waves and vortices (in Russian), Gorky (1985), 76–90.
- [VIB] Vladimirov, V.A. and Belov, S.Ya., *The example of conversion of Lagrange theorem in two-layer liquid*, Dynamics of Continuous Media, Lavrentyev Institute for Hydrodynamics Press **84** (1988), 21–27; The examples of inversion of the Lagrange theorem in hydrodynamics, GAKUTO Internat. Series, Math. Science and Appl. **1** (1993), 611–622.
- [VII] Vladimirov, V.A. and Il'in, K.I., *Stability of a rigid body in a vortex flow of an ideal fluid*, J. Appl. Mech. Tech. Phys. **35** (1994), no. 1, 84–92; *On the stability of a dynamical system “rigid body+inviscid fluid.” Part I. Variational principles*, Preprint, submitted to J. Fluid Mech. (1997), 1–32.
- [VIM] Vladimirov, V.A. and Moffatt, H.K., *On general transformations and variational principles for the magnetohydrodynamics of ideal fluids. Part I. Fundamental principles*, J. Fluid Mech. **283** (1995), 125–139.
- [VMI] Vladimirov, V.A., Moffatt, H.K., and Il'in, K.I., *On general transformations and variational principles for the magnetohydrodynamics of ideal fluids. Part II. Stability criteria for two-dimensional flows*, J. Fluid Mech. **329** (1996), 187–205.
- [Vld] Vladimirsy, V.V., *On the rotation of the polarization plane along a curved ray*, (in Russian) Doklady Akad. Nauk SSSR **31** (1941), no. 3, 222–225.
- [Vor] Voronin, S.M., *Analytic classification of pairs of involutions and its applications*, Funct. Anal. and Appl. **16** (1982), no. 2, 21–29.
- [Wan] Wang, R.G., *A Frobenius problem on the knot space*, Pacific J. of Math. **171** (1995), no. 2, 545–567.
- [War] Ward, R.S., *Infinite-dimensional gauge groups and special nonlinear gravitons*, J. Geometry and Physics **8** (1992), no. 1–4, 317–325.
- [We] Weinstein, A., *The local structure of Poisson manifolds*, J. Diff. Geometry **18** (1983), no. 3, 523–557; J. Diff. Geometry **22** (1985), no. 2, 255.
- [Wh] White, J.H., *Self-linking and the Gauss integral in higher dimensions*, Amer. J. Math. **91** (1969), 693–728.
- [Wit1] Witten, E., *Supersymmetry and Morse theory*, J. Diff. Geom. **17** (1982), no. 4, 661–692.
- [Wit2] Witten, E., *Quantum field theory and the Jones polynomial*, Comm. Math. Phys. **121** (1989), no. 3, 351–399.
- [Wit3] Witten, E., *Chern–Simons gauge theory as a string theory*, The Floer memorial volume, Progr. Math., vol. 133, Birkhäuser, Basel (1995), 637–678.
- [W-G] Wolansky, G. and Ghil, M., *An extension of Arnold second stability theorem for the Euler equations*, Physica D **94** (1996), no. 4, 161–167.
- [Wol] Woltjer, L., *A theorem on force-free magnetic fields*, Proc. Nat. Acad. Sci. USA **44** (1958), 489–491.
- [Yo] Yoshida, K., *Riemannian curvature on the group of area-preserving diffeomorphisms (motions of fluid) on 2-sphere*, Physica D **100** (1997), no. 3–4, 377–389.
- [Yu1] Yudovich, V.I., *Nonstationary flow of an ideal incompressible liquid*, (in Russian) Zhurn. Vych. Mat. **3** (1963), no. 6, 1032–1066.
- [Yu2] Yudovich, V.I., *Cosymmetry, degeneration of solutions of operator equations, and the onset of filtration convection*, Math. Notes **49** (1991), no. 5–6, 540–545; *Secondary cycle of equilibria in a system with cosymmetry, its creation by bifurcation and impossibility of symmetric treatment of it*, Chaos **5** (1995), no. 2, 402–411; *Cosymmetry and dynamical systems*, Proc. of the Third Int. Congress on Indust. and Appl. Math., Hamburg, July 1995, ZAMP (1996), 556–559; *The cosymmetric version of the implicit function theorem*, Linear Topol. Spaces Complex Analysis **2** (1995), 105–125; *The implicit function theorem for cosymmetric equations*, Math. Notes **60** (1996), no. 2, 313–317; *Branching of a self-oscillatory regime from an equilibrium in a dynamical system with cosymmetry*, Appl. Math. and Mech., to appear (1997).
- [Yu3] Yudovich, V.I., *Uniqueness theorem for the basic nonstationary problem in the dynamics of an ideal incompressible fluid*, Math. Res. Letters **2** (1995), 27–38.
- [Yu4] Yudovich, V.I., *Secondary flows and fluid instability between rotating cylinders*, J. Appl. Math. Mech. **30** (1966), 822–833.

- [Yur] Yurkin, M.Yu., *On finite-dimensionality of the problem of small oscillations of a top with a cavity filled by an ideal fluid*, Funct. Anal. Appl. **31** (1997), no. 1, 51–66.
- [Zak] Zakharov, V.E., *The algebra of integrals of motion of two-dimensional hydrodynamics in Clebsch variables*, Funct. Anal. and Appl. **23** (1989), no. 3, 189–196.
- [Ze1] Zeitlin, V., *Finite-mode analogs of 2D ideal hydrodynamics: Coadjoint orbits and local canonical structure*, Physica D **49** (1991), no. 3, 353–362.
- [Ze2] Zeitlin, V., *On the structure of phase-space, Hamiltonian variables and statistical approach to the description of two-dimensional hydrodynamics and magnetohydrodynamics*, J. Phys. A **25** (1992), no. 4, L171–L175.
- [ZeK] Zeitlin, V. and Kambe, T., *Two-dimensional ideal magnetohydrodynamics and differential geometry*, J. Phys. A **26** (1993), no. 19, 5025–5031.
- [Zel1] Zeldovich, Ya.B., *The magnetic field in the two-dimensional motion of a conducting turbulent fluid*, Sov. Phys JETP **4** (1957), 460–462.
- [Zel2] Zeldovich, Ya.B., *Collected works*, (in Russian) Nauka, Moscow, 1986.
- [Z-R] Zeldovich, Ya.B. and Ruzmaikin, A., *Dynamo problems in astrophysics*, (in Russian) Itogi Nauki, Astronomy, vol. 21, VINITI Moscow (1982), 151–187.
- [ZRS] Zeldovich, Ya.B., Ruzmaikin, A., and Sokolov, D., *Magnetic fields in astrophysics*, Gordon Breach, 1983.
- [ZBM] Zenkov, D.V., Bloch, A.M., and Marsden, J.E., *The energy momentum method for the stability of nonholonomic systems*, preprint (1997).
- [Zhel] Zheligovsky, V.A., *Numerical solution of the kinematic dynamo problem for Beltrami flows in a sphere*, J. Sci. Comput. **8** (1993), no. 1, 41–68.
- [Zig1] Ziglin, S.L., *The nonintegrability of the problem on the motion of four vortices of finite strengths*, appendix to [Kha], Physica D **4** (1982), no. 2, 268–269.
- [Zig2] Ziglin, S.L., *Dichotomy of the separatrices and the nonexistence of first integrals in systems of differential equations of Hamiltonian type with two degrees of freedom*, Math. USSR – Izv. **31** (1988), no. 2, 407–421; *On the nonintegrability of the ABC-flow for  $A = B$* , Funct. Anal. Appl. **30** (1996), no. 2, 80–81.
- [Zor] Zorich, A.V., *Novikov's problem of the semiclassical motion of an electron in a homogeneous magnetic field that is close to rational*, Rus. Math. Sur. **39** (1984), no. 5, 235–236; *The quasiperiodic structure of level surfaces of a Morse 1-form close to a rational form – the problem of S.P. Novikov*, Math. USSR - Izv. **31** (1988), no. 3, 635–655.