CURRICULUM VITAE

Alexander Y. Khapalov

DEPARTMENT OF MATHEMATICS
COLLEGE OF SCIENCES
WASHINGTON STATE UNIVERSITY

http://www.math.wsu.edu/math/faculty/khapala/welcome.php

GENERAL INFORMATION

EDUCATION

Urals State University	M. A.	1976
Institute of Mathematics and Mechanics of the Russian (former USSR) Academy of Science	Ph. D.	1982

EXPERIENCE

Research Associate, Urals State University	1976-78
Research Scholar, Russian Academy of Sciences	1978-87
Staff Scientist in Math, Intern. Institute for Appl. Systems Analysis (Austria)	1987-92
Visiting Professor, Oregon State University	1992-96
Assistant Professor, Washington State University	1996-00
Associate Professor, Washington State University	2000-05
Professor, Washington State University	2005- present
Professor, Associate Chair for Graduate Education	2008- 2011

Sabbatical:

INdAM and University of Rome II ``Tor Vergata'', Spring 2008.
INdAM and University of Rome II ``Tor Vergata'', Fall 2013.

RESEARCH INTERESTS

- Applied Analysis; Mathematical Control Theory for Linear and Nonlinear Partial Differential Equations; Modeling, Wellposedness and Motion Capabilities for Swimming Phenomenon; Systems Theory: Controllability, Stabilization, Observability and Unique Continuation; Control of Power Systems. Granular matter formation problem.
- *Current Emphasis:* Analysis of swimming models, described by the coupled fluid and (integro-) ordinary differential equations, and their motion capabilities from the viewpoint of controllability theory. Controllability of linear and nonlinear partial differential equations, governed by multiplicative (bilinear) controls. Smart materials, point sensors and actuators, including mobile ones. Granula matter formation problem: Modeling and wellposedness.

EITORIAL SERVICE

Member of the Editorial Board of **NonLinear Analysis B: Real World Problems.**

PROFESSIONAL SOCIETIES

Society for Industrial and Applied Mathematics (SIAM)
Member of Working Group WG 7.2 within IFIP Committee.

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TEACHING AWARDS

- *1999 A letter of appreciation from the Honors College for teaching Math 283 (Honors Calculus III).*
- *2004 College of Sciences Faculty Advising Excellence Award*
- *2007 Faculty Excellence Award from the students of the Naval ROTC Battalion at the University of Idaho and Washington State University*

PUBLICATIONS

Research Monographs:

[1] A.Y. Khapalov, *Controllability of partial differential equations governed by multiplicative controls*, Research Monograph, Lecture Notes Series, v. 1995, Springer, Heidelberg-Dordrecht-London-New York, 296p., 2010. **ISBN 978-3-642-12413-6, © 2010, Available Formats: eBook, Softcover. https://www.springer.com/gp/book/9783642124129**

[2] A.Y. Khapalov, *Mobile point sensors and actuators in the controllability theory of partial differential equations*, Springer, Heidelberg-Dordrecht-London-New York, 235p., 2017. ISBN 978-3-319-60414-5, © 2017, Available Formats: eBook, Hardcover. https://www.springer.com/gp/book/9783319604138

Refereed papers (including some refereed conference papers):

[1] The problem of minimax mean square filtering in parabolic systems. J. Appl. Math. Mech., 42 (1978), no. 6, 1016-1025.
[2] Information sets of parabolic systems with a quadratic constraint. In Optimal control of systems with uncertain information, pp. 120-131, 151, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1980.
[3] Information sets of parabolic systems in the absence of information on the initial state. In Control and estimation in dynamical systems, 90-106, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1982.
[4] Approximation of a problem of minimax filtering for a parabolic system. In Estimation under conditions of uncertainty, 84-93, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1982.
[5] Minimax mean-square filtering for a hyperbolic system. In Estimation under conditions of uncertainty, 94-105, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1982.
[6] The boundedness property of information domains of an observable hyperbolic system. In Evolution systems in problems of estimation, 93-103, 141, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1985.
[7] Estimation of distributed fields from results of observations (with A.B. Kurzhanskii). In Partial differential equations, dedicated to V.J. Sobolev, 102-108, 221, "Nauka", Novosibirsk, 1986.
[8] On the state estimation problem for distributed systems (with A.B. Kurzhanskii). In Analysis and optimization of systems (Antibes, 1986), 102-113, Lecture Notes in Control and Inform. Sci., 83, Springer, Berlin, 1986.
[9] On the boundedness of information domains of parabolic systems in the absence of in-formation on the initial state. In Guaranteed estimation and control problems, 110-116, 135-136, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1986.
[10] On approximation of the optimal sensor allocation problem (with E.K. Kostousova). In Dynamics Estimation of Motions under Control, Acad. of Sci. of the USSR, Institute of Mathematics and Mechanics, Sverdlovsk, 1988, pp. 65-81.
[11] On the modeling of the distributed process in non-invertible evolutionary system (with A.B. Kurzhanski and I.F. Sivergina). In Proc. Conf. Control in Mechanical Systems, Sverdlovsk, USSR, 1990.
[12] Observers for distributed parameter systems (with A.B. Kurzhanskii). In M. Amouroux and A. El Jai (Eds.), the 5-th IFAC Symp. on Control of Distributed Parameter Systems, Perpignan, 1989. Pergamon Press, 1990, pp. 497 - 500.
[13] An observation theory for distributed-parameter systems (with A.B. Kurzhanskii), J. Math. Systems Estim. Control, 1 (1991), no. 4, 389{440.
[14] Mathematical problem motivated by environmental monitoring (with A.B. Kurzhanski). Proc. XI IFAC World Congress, Tallinn, Estonia, 1990, Oxford, U.K., Pergamon, 1991, 5p.
[15] The state estimation problem for parabolic systems (with A.B. Kurzhanskii). In Estimation and control of distributed parameter systems (Vorau, 1990), 219-246, Internat. Ser. Numer. Math., 100, Birkhuser, Basel, 1991.
[16] Optimal measurement trajectories for distributed parameter systems, Systems Control Letters, 18 (1992), no. 6, 467-477.
[17] Observability of parabolic systems with scanning sensors. Proc. 31st IEEE-SIAM Conf. on Decision and Control, Tucson, Arizona, USA, December 16-18, 1992, pp. 1311-1312.

[18] Observability of hyperbolic systems with interior moving sensors. In Analysis and optimization of systems: state and frequency domain approaches for in_nite-dimensional systems (Sophia-Antipolis, 1992), 489-499, Lecture Notes in Control and Inform. Sci., 185, Springer, Berlin, 1993.
[19] Moving sensors for parabolic systems. In C. Perell, C. Sim and J. Sol-Morales (Eds.) "Equa diff/dt _ 91," World Scienti_c, Singapore - New-Jersey - London - Hong-Kong, (1993), V 1-2, pp. 627-632.
[20] Observability of hyperbolic systems with interior moving sensors. In R.F. Curtain, A. Bensoussan, J.L. Lions (Eds.) Lecture Notes in Control and Inform. Sci., 185, Springer-Verlag, Berlin, Heidelberg, New-York, (1993), pp. 489-499.
[21] Continuous observability for parabolic system under observations of discrete type, IEEE Trans. on Autom. Control, 38 (1993), pp. 1388-1391.
[22] Exact Observability of Nonstationary Hyperbolic System with Scanning Finite-Dimensional Observations, Proc. 32d IEEE-SIAM Conf. on Decision and Control, San-Antonio, Texas, USA, December 15-17, (1993), pp. 1866-1867.
[23] Localization of unknown sources for parabolic systems on the basis of available observations, Int. J. Syst. Sci., 25 (1994), pp. 1305-1322.
[24] L-infinity-exact observability of the heat equation with scanning pointwise sensor, SIAM J. Control and Optimization, 32 (1994), pp. 1037-1051.
[25] Controllability of the wave equation with moving point control, Applied Mathematics and Optimization (AMO), 31 (1995), pp. 155-175.
[26] Exact observability of the time-varying hyperbolic equation with finitely many moving internal observations, SIAM J. Control and Optimization, 33 (1995), pp. 1256-1269.
[27] Some aspects of the asymptotic behavior of the solutions of the semilinear heat equation and approximate controllability, J. Math. Anal. Appl., 194 (1995), pp. 858-882.
[28] Controllability and placement of FACTS devices for power modulation and transient stability control (with R.R. Mohler, W. Kolodziej, and D. Kosterev). Proc. 1995 Stockholm Power Tech, Intern. Symp. Electr. Power Engineering, paper SPT IS-06-3, Stockholm, Sweden, June (1995), 18-22.
[29] On bilinear control design methodology (with R.R. Mohler, R. Vedam, and R. Zakrzewski), IFAC'96, San Francisco, Pergamon Press, 6p.
[30] Global controllability of the power transmission network (with R.R. Mohler), Proc. 35th IEEE Conf. on Decision and Control, Kyoto, Japan, (1996), 6 p.
[31] Reachable sets and controllability of bilinear time-invariant systems: A qualitative approach (with R.R. Mohler), IEEE Trans. on Autom. Control, 41 (1996), pp. 1342-1346.
[32] On unique continuation of the solutions of the parabolic equation from a curve, Control and Cybernetics, Quarterly, 25 (1996), pp. 451-463 (Special Issue on: Distributed Parameter Systems: Modeling and Control).
[33] Interior point control and observation for the wave equation, Abstract and Applied Analysis, 1 (1996), pp. 219-236.
[34] Some aspects of the approximate controllability properties of the semilinear distributed parameter systems, Special Issues of Zeitschrift fr Angewandte Mathematik und Mechanik, ZAMM, Issue 3: Applied Stochastics and Optimization, Oskar Mahrenholtz/Kurt Marti/Reinhard Mennicken (eds.), (1996), pp. 93-96.
[35] Exact controllability of second-order hyperbolic equations under impulse controls, Applicable Analysis, 63 (1996), pp. 223-238.
[36] Exponential decay for the one dimensional wave equation with internal pointwise damping, Mathematical Methods in Applied Sciences, 20 (1997).
[37] Global asymptotic stabilizability of the bilinear time-invariant system via piecewise constant feedback (with R.R. Mohler), Systems & Control Letters, 33 (1998), 47-54.
[38] On global controllability of time-invariant nonhomogeneous bilinear system (with R.R. Mohler). In F. Udvadia (Ed.), Advances in Dynamics and Control, Gordon and Breach, London, 1998.
[39] Approximate controllability properties of the semilinear heat equation with superlinear nonlinear term, Revista Matematica, 12 (1999), 511-535.
[40] Approximate controllability and its well-posedness for the semilinear reaction-diffusion equation with internal lumped controls, ESAIM: Controle, Optimisation et Calcul des Variations, 4 (1999).
[41] Approximate controllability properties of the semilinear heat equation with lumped controls, Int. J. Appl. Math. & Comp. Sci., 9 (1999), 751-765.
[42] A class of a globally controllable semilinear heat equation with superlinear term, J. Math. Anal. Appl., 242 (2000), 271-283.
[43] Bilinear System Control and FACTS Application (with R.R. Mohler), J. Opt. Th. Appl. (JOTA), Special Issue Honoring D.G. Luenberger, 105 (2000), 621-637.
[44] Exact null-controllability for the semilinear heat equation with superlinear term and mobile internal controls, Nonlinear Analysis: Theory, Methods & Applications, 43 (2001), 785-801.
[45] Mobile point controls versus locally distributed ones for the controllability of the semilinear parabolic equation, SIAM J. Contr. Opt., 40 (2001), 231-252.
[46] Observability and stabilization for the vibrating string equipped with bouncing point sensors and actuators, Mathematical Methods in Applied Sciences, 24 (2001), pp. 1055-1072.
[47] Bilinear control for global controllability of the semilinear parabolic equation with superlinear term. "Control Of Nonlinear

Distr. Par. Systems", Lecture Notes in Pure and Appl. Math., 218, Dekker, New York, special volume dedicated to D. Russell, Ed. Chen/Lasiecka /Zhou, Marcel Decker, 2001, 139-155.
[48] On bilinear controllability of the parabolic equation with the reaction-diffusion term satisfying Newton's Law, Special issue of the Journal of Computational and Applied Mathematics, dedicated to the memory of J.-L. Lions, 21 (2002), pp. 1-23.
[49] Global non-negative controllability of the semilinear parabolic equation governed by bilinear control, ESAIM: Controle, Optimisation et Calcul des Variations, 7 (2002), pp. 269-284.
[50] Mobile point sensors vs locally distributed ones for the controllability of the semilinear parabolic equation, Proc. of the 41st IEEE Conference on Decisions and Control, Los Vegas, Dec 11-15, 2002, pp. 3384-3389.
[51] Controllability of the semilinear parabolic equation governed by a multiplicative control in the reaction term: A qualitative approach, Proc. of the 42nd IEEE Conference on Decision & Control (CDC 2003), December 9-12, 2003, in Maui, Hawaii, 3384-3389.
[52] Controllability of the semilinear parabolic equation governed by a multiplicative control in the reaction term: A qualitative approach, SIAM. J. Contr. Opt., 41 (2003), pp. 1886- 1900.
[53] Energy Decay Estimates for Lienard's equation with Quadratic Viscous Feedback, (with P. Nag) Electr J. Di_. Eqs., 2003, pp 1-12.
[54] Bilinear controllability properties of a vibrating string with variable axial load and damping gain, Dynamics of Cont., Discrete and Impulsive Systems, 10 (2003), 721 - 743.
[55] Progress in partial differential equations. Papers from the Conference on Partial Di_erential Equations held in honor of the 65th birthday of John R. Cannon at Washington State University, Pullman, WA, May 23{25, 2002. Edited by R. Dillon, A. Khapalov, V. S. Manoranjan and H. M. Yin. Dyn. Contin. Discrete Impuls. Syst. Ser. A Math. Anal., 10 (2003), no. 5. Watam Press, Waterloo, ON, 2003. pp. i-iv and 635-861.
[56] Controllability properties of a vibrating string with variable axial load, Discrete and Continuous Dynamical Systems, 11 (2004), pp. 311-324.
[57] The well-posedness of a model of an apparatus swimming in the 2-D Stokes fluid, Washington State University, Department of Mathematics, Techn. Rep. Ser., 2005-5, http://www.math.wsu.edu/TRS/2005-5.pdf).
[58] Reachability of nonnegative equilibrium states for the semilinear vibrating string by varying its axial load and the gain of damping, ESAIM: Contrle, Optimisation et Calcul des Variations, 12 (2006), pp. 231-252.
[59] Energy decay estimate for a power system model using FACTS stabilizer (with P. Nag), Dyn. Contin. Discrete Impuls. Syst., Ser. A: Mathematical Analysis, 14 (2007), pp. 213-228.
[60] Local controllability for a swimming" model, SIAM J. Contr. Optim., 46 (2007), pp. 655-682.
[61] Local controllability for a swimming" model, Proc. of the 46th IEEE Conference on Decisions and Control, New Orleans, LA, Dec. 12 - 14, 2007, 6p.
[62] Geometric aspects of force controllability for a swimming model, preprint, Appl. Math. Opt. (AMO), 57 (2008), pp. 98-124.
[63] The wellposedness of a 2-D swimming model governed in the nonstationary Stokes fluid by multiplicative controls (with S. Eubanks), Applicable Analysis, 88 (2009), pp. 1763-1783.
[64] Micro motions of a 2-D swimming model governed by multiplicative controls, Nonlinear Analysis: Theory, Methods and Appl.: Special Issue: WCNA 2008, 71 (2009), 1970-1979.
[65] Swimming models and controllability, Proc. Intern. Conf.: Systems Theory, Analysis and Control: FES2009, May 25-28, 2009, Fes, Morocco, pp.241-248 (University of Perpignan).
[66] Source localizations and sensor placement in environmental monitoring, Int. J. Appl. Math. and Comp. Sci., 20 (2010), pp. 445-458.
[67] Multiplicative controllability for the one dimensional parabolic equation with target states admitting finetely many changes of sign (with P. Cannarsa), Discrete and Continuous Dynamical Systems-Ser. B, 14 (2010), pp. 1293-1311.
[68] Controllability properties for the one-dimensional Heat equation under multiplicative or nonnegative additive controls with local mobile support (with L.A. Fenandez, University of Cantabria, Spain), ESAIM: Controle, Optimisation et Calcul des Variations, Vol. 18 (2012), pp. 1207-1224, DOI: 10.1051/cocv/2012004 .
[69] Geometric aspects of transformations of forces acting upon a swimmer in a 3-D incompressible fluid (with G. Trinh), Journal Discrete and Continuous Dynamical System – A, (2012) Vol. 33, No. 4, pp. 1513-1544. doi:**10.3934/dcds.2013.33.1513.**
[70] Wellposedness of a swimming model in the 3-D incompressible fluid governed by the nonstationary Stokes equation, Int. J. Appl. Math. Comp. Sci. 23, No. 2, 277-290 (2013). DOI:10.2478/amcs-2013-0021.
[71] Micro motions of a swimmer in the 3-D incompressible fluid governed by the nonstationary Stokes equation, SIAM J. Math. Analysis (SIMA), 2013, Vol. 45, Issue 6 (2013), pp. 3360-3381, URL:http://epubs.siam.org/toc/sjmaah/45/6.DOI: 10.1137/120876460.
[72] Addendum to ``Wellposedness of a swimming model in the 3-D incompressible fluid governed by the nonstationary Stokes equation'', the International Journal of Applied Mathematics and Computer Science (AMCS), 2013, Vol. 23, No. 4, 905–906
DOI: 10.2478/amcs-2013-0067.
[73] Wellposedness results for swimming models in the 2-D and 3-D incompressible fluids described
by the nonstationary Stokes equation, Washington State University, Department of Mathematics, Techn. Rep. Ser., 2014-1,

http://www.math.wsu.edu/TRS/2014-1.pdf.
[74] On modeling for the dynamic granular matter formation process (with P. S. Lapin), http://arxiv.org/abs/1312.2038.
[75] Well-posedness of 2-D and 3-D swimming models in incompressible fluids governed by Navier--Stokes equations (with P. Cannarsa, F. Priuli, and G. Floridia), Journal of Mathematical Analysis and Applications 429 (2015), pp. 1059-1085. DOI information: 10.1016/j.jmaa.2015.04.044. Link to the article: http://www.math.wsu.edu/faculty/khapala/NSEpaper.pdf.

[76] Dynamic discrete models for the granular matter formation process (with S. Lapin), IMA Journal of Applied Mathematics 2016 (Oxford journals). Volume 83, Issue 1, 25 January 2018, Pages 1–23, **doi:10.1093/imamat/.**

- Abstract:
  https://academic.oup.com/imamat/article-abstract/83/1/1/2884408

- Article (free access):
  https://academic.oup.com/imamat/article/83/1/1/2884408?guestAccessKey=b5d94fbd-9792-43fc-ac0e-ca9c34ae518d

[77] Local controllability of a swimming model in an incompressible fluid described by 2-D Navier--Stokes equations (with P. Cannarsa), aXiv.org.math>arXiv:1510.03415.
[78] Multiplicatve controllability for semilinear reaction-diffusion equations with finitely many changes of sign (with P. Cannarsa and G. Floridia), aXiv.org.math>arXiv:1510.04203.
[79] Multiplicatve controllability for semilinear reaction-diffusion equations with finitely many changes of sign (with P. Cannarsa and G. Floridia), J. Math. pures et appl. (JMPA), v. 108, issue 4, pp. 425-458, https://doi.org/10.1016/j.matpur.2017.07.002.
[80] Micromotions and controllability of a swimming model in an incompressible fluid governed by 2D or 3D Navier--Stokes equations (with P. Cannarsa), arXiv:1510.03415, 28p.
[81] Micromotions and controllability of a swimming model in an incompressible fluid governed by 2-D or 3-D Navier--Stokes equations (with P. Cannarsa), J. Math. Anal. Appl. 465 (2018), 100-124. Public link to the article (up to July 12, 2018): https://authors.elsevier.com/a/1X5ze,WNxYr7p

Some technical reports in 1987-1995:

[1] On the guaranteed state estimation problem for parabolic systems (with A.B. Kurzhanski), WP-87-114, IIASA, Laxenburg, Austria, 1987, 11p.
[2] An observation theory for distributed parameter systems (with A.B. Kurzhanski), WP-90-079, IIASA, Laxenburg, Austria, 1990, 59p.
[3] Optimal moving sensors for parabolic systems, WP-91-51, IIASA, Laxenburg, Austria, 1991, 18 p.
[4] Observability of parabolic systems under scanning sensors, WP-91-52, IIASA, Laxenburg, Austria, 1991, 18 p.
[5] Observability of the parabolic systems with interior observations of discrete type, WP-92-45, IIASA, Laxenburg, Austria, 1992, 12 p.
[6] Source localization problem for parabolic systems, WP-92-46, IIASA, Laxenburg, Austria, 1992, 22 p.
[7] Exact observability of hyperbolic systems with scanning _nite-dimensional observations, WP-92-74, IIASA, Laxenburg, Austria, 1992, 25 p.
[8] Controllability of the wave equation with pointwise moving control, WP (Working Paper)-92-82, International Institute for Applied Systems Analysis (IIASA), Laxenburg, Austria, 1992, 23 p.
[9] A qualitative approach to the study of reachable sets and controllability of bilinear systems. (with R.R. Mohler), TRECE 93.001, Oregon State University, Corvallis, Oregon, 1993, 24 p.
[10] Pointwise control of the wave equation, TRECE 93.002, Oregon State University, Corvallis, Oregon, 1993, 28 p.
[11] Observability and controllability of the time-varying parabolic equation with moving scalar observation and control, TRECE 93.003, Oregon State University, Corvallis, Oregon, 24 p.
[12] Some aspects of the asymptotic behavior of the solutions of the semilinear heat equation with application to approximate controllability, TRECE 94.003, Oregon State University, Corvallis, Oregon, 21 p.
[13] Global asymptotic stabilizability of the bilinear time-invariant system via piecewise constant feedback (with R.R. Mohler), TRECE 94.006, Oregon State University, Corvallis, Oregon, 12 p.
[14] Huygens' principle and the problem of exact controllability for second order hyperbolic equations. TRECE 95.001, Oregon State University, Corvallis, Oregon, 17 p.
[15] On unique continuation of the solutions of the parabolic equation from a curve and control, TRECE 95.002, Oregon State University, Corvallis, Oregon.

GRANT AWARDS for 1996-present:

Title	Submitted to		
1. Distributed systems observability & controllability with finite dimensional sensors & actuators: Application to thermal & fluid dynamics, ECCS 9312745, CO-PI.	NSF	(1/94 – 12/97)	$86,000
2. Sandia National Laboratories, CO-PI.	Sandia Nat. Lab.	(9/1/96 – 8/31/97)	$20,000
3. Global controllability & stabilization of bilinear Systems with applications to Large Power Network, CO-PI.	NSF	(8/31/96 – 9/1/99)	$171,473

The above grant proposals were prepared and submitted before I moved to WSU.

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4. Conference on Progress in Partial Differential Equations, DMS 0140261, CO-PI.	NSF	(01/01/02 – 08/01/02)	$10,000
5. Bilinear controllability of semilinear Partial Differential Equations, DMS 0204037, a single PI.	NSF	(05/16/02 – 05/15/06)	$103,192
6. Controllability for swimming phenomenon, DMS 0504093, a single PI.	NSF	(07/15/05 – 06/30/09)	$96,534
7. Swimming phenomenon from the viewpoint of controllability theory of PDE's, DMS 10007981, a single PI.	NSF	(01/10/10 – 09/30/14)	$240,000

International collaboration grants:

8. Controllability of Semilinear PDE's & its Approximations (Project-Coordinator, Collaborative Research Grant with the Dept of Applied Math., Univ. Complutence, Madrid, Spain)	NATO	(1998 – 2000)	$5,712

9. 2008-2010 GNAMPA research project, the *Istituto Nazionale di Alta Matematica (INdAM, the National Institute of Advanced Mathematics, Italy*).

10. 2009 GNAMPA research project, the *Istituto Nazionale di Alta Matematica (INdAM, the National Institute of Advanced Mathematics, Italy*).

11. 2010 GNAMPA research project ``Comportamento asintotico e stabilizzazione per sistemi di evoluzione'' (coordinator F. Ancona), the *Istituto Nazionale di Alta Matematica (INdAM, the National Institute of Advanced Mathematics, Italy*).
12. GNAMPA Research Project 2014: "Controllo moltiplicativo per modelli diffusivi nonlineari" (coordinator G. Floridia).

13. Modeling, wellposedness and control for swimming phenomenon (*collaborative research between WSU and the University of Rome ``Tor Vergata''*), PI, Simons Foundation, award number 317297, 10/01/2014-09/30/2019, $35,000.