VASSILIS G. PAPANICOLAOU

Curriculum Vitae

Date of Birth: November 12, 1956
Place of Birth: Athens, Greece
Citizenship: USA**,** Greek
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Education

September 1988: Ph. D. in Mathematics, Stanford University
Thesis Title: *The Probabilistic Solution of the Third Boundary Value Problem for the Schroedinger Equation and its Path Integral Representation*
Thesis Advisor: Kai-Lai Chung

June 1982: M. Sc. . in Mathematics, Courant Institute of Mathematical Sciences

May 1980: Diploma in Electrical Engineering, National Technical University of Athens

Present Position

Professor, Department of Mathematics, National Technical University of Athens

Previous Positions

January 2013− June 2013: Visiting Professor/Research Fellow, Boeing Center for Technology, Information and Manufacturing, Olin School of Business, Washington University in St. Louis (MO, U.S.A.)

May 1997− September 2002: Associate Professor (with Tenure), Department of Mathematics and Statistics, Wichita State University (KS, U.S.A.)

August 1992− May 1997: Assistant Professor, Department of Mathematics and Statistics, Wichita State University (KS, U.S.A.)

May 1992−August 1992: Scientific Researcher, Center for Stochastic Processes, University of North Carolina at Chapel Hill (NC, U.S.A.)

September 1988– May 1992: Assistant Professor, Department of Mathematics, Duke University (NC, U.S.A.)

Selected Publications

[1] Short Time Asymptotics for the Trace of One- and Multi-Dimensional Schroedinger Semigroups, *Proceedings of the American Mathematical Society*, **107 (4) (Dec. 1989) 927–935**

[2] The Probabilistic Solution of the Third Boundary Value Problem for Second Order Elliptic Equations, *Probability Theory and Related Fields*, **87 (1990) 27–77**

[3] On the Convergence of the Feynman Path Integral for a Certain Class of Potentials, *Journal of Mathematical Physics*, **31 (2) (Feb. 1990) 342–347**

[4] Almost Periodic Potentials in Higher Dimensions, *Transactions of the American Mathematical Society*, **329 (2) (Feb. 1992) 679–696**

[5] Trace Formulas and the Behavior of the Large Eigenvalues, *SIAM Journal on Mathematical Analysis*, **20 (1) (Jan. 1995) 218–237**

[6] The Spectral Theory of the Vibrating Periodic Beam, *Communications in Mathematical Physics*, **170 (1995) 359–373**

[7] (with P. Kouvelis) Explicit Formulas for the Optimal Boundaries of a Two-Class-Based Automated Storage/Retrieval System, *International Journal of Production Research*, **33 (10) (1995) 2889–2905**

[8] On the Asymptotic Stability of a Class of Linear Difference Equations, *Mathematics Magazine*, **69 (1) (Feb. 1996) 34–43**

[9] (with S. Boneh) A Combinatorial Queueing Model Related to the Ballot Problem*, Journal of Combinatorial Mathematics and Combinatorial Computing*, **19 (1995) 231–244**

[10] (with S. Boneh) General Asymptotic Estimates for the Coupon Collector Problem, *Journal of Computational and Applied Mathematics*, **67 (2) (Mar. 1996) 277–289**

[11] The Second Periodic Eigenvalue and the Alikakos-Fusco Conjecture, *Journal of Differential Equations*, **130 (2) (Sept. 1996) 321–332**

[12] (with G. Athanassoulis) Eigenvalue Asymptotics of Layered Media and their Applications to the Inverse Problem, *SIAM Journal on Applied Mathematics*, **57 (2) (April 1997) 453–471**

[13] (with A. Elcrat) On the Inverse Problem of a Fourth Order Self-Adjoint Binomial Operator, *SIAM Journal on Mathematical Analysis*, **28 (4) (1997) 886–896**

[14] (with D. Kravvaritis) An Inverse Spectral Problem for the Euler-Bernoulli Equation for the Vibrating Beam, *Inverse Problems*, **13 (1997) 1083–1092**

[15] On the Asymptotics of the Dirichlet Eigenfunctions of $\Delta^2 + q$ on the Square, *Journal of Mathematical Analysis and Applications*, **218 (1998) 561–568**

[16] (with B. Fridman, P. Kuchment, and Daowei Ma) Solution of the Linearized Inverse Conductivity Problem in the Half Space via Integral Geometry, *25 Years of the Voronezh Winter Mathematical School, AMS Translations, Series 2*, **Vol. 184 (1998) 85–95**

[17] (with S. Boneh and G. Kokolakis) Asymptotics for the Random Coupon Collector Problem, *Journal of Computational and Applied Mathematics*, **93 (1998) 95–105**

[18] (with D. Kravvaritis) The Floquet Theory of the Periodic Euler-Bernoulli Equation, *Journal of Differential Equations*, **150 (1998) 24–41**

[19] Ewald's Method Revisited: Rapidly Convergent Series Representations of Certain Green's Functions, *Journal of Computational Analysis and Applications*, **1 (1) (1999) 105–114**

[20] (with N. Radyno) Fundamental Solutions of Linear Differential Equations in the Sense of Mnemofunctions, *Journal of Computational Analysis and Applications*, **1 (2) (1999) 163–176**

[21] (with S. Venakides and M. Haider) Boundary Integral Calculations of Two-Dimensional Electromagnetic Scattering by Photonic Crystal Fabry-Perot Structures, *SIAM Journal on Applied Mathematics*, **60 (5) (2000) 1686 – 1706**

[22] (with G. Kallianpur) Exact Computation of Feynman-Type Integrals Involving Gaussian Random Fields, *Stochastic Environmental Research and Risk Assessment*, **14 (1) (2000) 33–49**

[23] (with B. Fridman, P. Kuchment, K. Lancaster, S. Lissianoi, D. Ma, L. Mogilevskaya, and I. Ponomariev) Numerical Harmonic Analysis on the Hyperbolic Plane, *Applicable Analysis*, **76 (3–4) (2000) 351–362**

[24] (with G. Christakos) Norm-Dependent Covariance Permissibility of Weakly Homogeneous Spatial Random Fields and its Consequences in Spatial Statistics, *Stochastic Environmental Research and Risk Assessment*, **14 (6) (2000) 471–478**

[25] (with P. Newton) Power Law Asymptotics for Nonlinear Eigenvalue Problems, *Springer Applied Mathematical Sciences Series*, **p.**. Perspectives and Problems in Nonlinear Science. A Celebratory Volume for the Occasion of the 70th Birthday of Larry Sirovich, Editors: Ehud Kaplan, Jerry Marsden, and Katepalli Sreenivasan. Springer, New York (**March 1, 2003) 319–341**

[26] The Periodic Euler-Bernoulli Equation, *Transactions of the American Mathematical Society*, **355 (9) (2003) 3727–3759**

[27] (with T. Aktosun) Recovery of a Potential from the Ratio of Reflection and Transmission Coefficients, *Journal of Mathematical Physics*, **44 (No. 11) (Nov. 2003) 4875–4883**

[28] An Inverse Spectral Result for the Periodic Euler-Bernoulli Equation, *Indiana Univ. Math. Journal*, **53 (No. 1) (2004) 223–242**

[29] (with T. Aktosun and V. Zisis) Inverse Scattering on the Line for a Generalized Nonlinear Schroedinger Equation, *Inverse Problems*, **20 (2004) 1267–1280**

[30] (with P. Newton) Nonlinear Dissipative Problems with Large Initial Conditions, *Journal of Mathematical Physics*, **46 (No. 1) (2005) 013502 (10pp)**

[31] The Inverse Periodic Spectral Theory of the Euler-Bernoulli Equation, *Dynamics of Partial Differential Equations*, **2 (No. 2) (2005) 127–148**

[32] (with G. Smyrlis) Some Initial Value Problems Containing a Large Parameter, *Journal of Applied Functional Analysis*, **1 (4) (2006) 441–451**

[33] (with D. Kravvaritis and A. N. Yannacopoulos) Similarity Solutions for a Replicator Dynamics Equation, *Indiana University Mathematics Journal*, **57 (4) (2008) 1929–1946**

[34] (with T. Aktosun) Time Evolution of the Scattering Data for a Fourth-Order Linear Differential Operator, *Inverse Problems*, **24 (2008) 055013 (14pp)**

[35] (with G. Smyrlis) Similarity solutions for a multi-dimensional replicator dynamics equation, *Nonlinear Analysis*, **71 (7-8) (2009) 3185–3196**

[36] (with D. Kravvaritis, A. Xepapadeas, and A.N. Yannacopoulos) On a class of operator equations arising in infinite dimensional replicator dynamics, *Nonlinear Anal. Real World Appl.*, **11 (4) (2010) 2537–2556**

[37] (with A.V. Doumas) On the discrete one-dimensional inverse transmission eigenvalue problem, *Inverse Problems* **27**, **no. 1 (2011) 015004 (13pp)**

[38] An example where separation of variables fails, *Journal of Mathematical Analysis and Applications* **373, no. 2 (2011) 739–744**

[39] (with E. Papageorgiou and D. Lepipas) Random motion on simple graphs, *Methodology and Computing in Applied Probability* **14 (2012) 285–297**

[40] (with D. Kouloumpou) The random motion on the sphere generated by the Laplace-Beltrami operator, *Journal of Applied Functional Analysis* **7 (1-2) (2012) 26–41**

[41] (with C.D. Kravvaritis) Singular equilibrium solutions for a replicator dynamics model, *Electronic Journal of Differential Equations*, **2011 (2011), No. 87, 1–8**

[42] (with T. Aktosun, D. Gintides) The spherically symmetric inverse transmission eigenvalue problem, *Inverse Problems* **27 (2011) 115004 (17 pp)**

[43] (with A.V. Doumas) The coupon collector's problem revisited: Asymptotics of the variance, *Advances in Applied Probability* **44 (1) (2012) 166–195**

[44] (with A.V. Doumas) Asymptotics of the rising moments *Electron. J. Probab.* **18 (2012), no. 41, 1–15.** ISSN: 1083-6489 DOI: 10.1214/EJP.v18-1746

[45] (with D. Kouloumpou) Certain Calculation Regarding the Brownian Motion on the Sphere, *J. Concrete and Applicable Mathematics* **11 (3-4) (2012) 303–316**

[46] (with D. Kanoussis) The *R*-Transform of a Real-Valued Function and some of Its Applications, *Journal of Applied Functional Analysis* **8 (3-4) (2013) 301–316**

[47] (with T. Amdeberhan, V. H. Moll) A family of palindromic polynomials, *SCIENTIA Series A: Mathematical Sciences* **Vol. 24 (2013) 25–32**

[48] (with D. Kanoussis) On the Inverse of the Taylor Operator, *SCIENTIA Series A: Mathematical Sciences* **Vol. 24 (2013) 55–66**

[49] (with T. Aktosun) Reconstruction of the wave speed from transmission eigenvalues for the spherically symmetric variable-speed wave equation, *Inverse Problems* **29 (2013) 065007 (19pp)**

[50] (with A.V. Doumas) Some new aspects for the random coupon collector's problem, *ALEA Latin American Journal of Probability and Mathematical Statistics* **XI, (2014) 197–208**

[51] (with T. Aktosun) Transmission eigenvalues for the selfadjoint Schrödinger operator on the half line, *Inverse Problems* **30 (2014) 075001 (23pp)**

[52] (with A.V. Doumas) The Maximum of Independent Geometric Random Variables as the Time for Genomic Evolution, *Stochastic Models*, **30 (2014) 125–141**
DOI: 10.1080/15326349.2014.868742

[53] (with T. Aktosun) Inverse problem with transmission eigenvalues for the discrete Schroedinger equation, *Journal of Mathematical Physics* **56 (2015) 082101 (36pp)**

[54] (with K. Vasilakopoulou) Similarity Solutions for a Replicator Dynamics Equation Associated with a Continuum of Pure Strategies, *Electronic Journal of Differential Equations,* **Vol. 2015, No. 231, 1–16.**
ISSN: 1072-6691. URL: http://ejde.math.txstate.edu or http://ejde.math.unt.edu
ftp ejde.math.txstate.edu **(2015)**

[55] Some Results on Ordinary Differential Operators with Periodic Coefficients, *Complex Anal. Oper. Theory*, **(2015) (39pp)**
DOI 10.1007/s11785-015-0498-z

[56] (with K. Vasilakopoulou) Similarity Solutions of a Multidimensional Replicator Dynamics Integrodifferential Equation, *J. Dyn. Games* **3, No. 1 (2016), 51–74**

[57] (with A.V. Doumas) A randomized version of the Collatz 3x+1 problem, *Stat. Probab. Lett.* **109, (2016), 39–44**

[58] An arctangent law, *Stat. Probab. Lett.***, 116 (2016), 62–64**

[59] (with A.V. Doumas) The Coupon Collector's Problem Revisited: Generalizing the Double Dixie Cup Problem of Newman and Shepp, *ESAIM*: *Probability and Statistics*, **PS 20 (2016), 367–399**
DOI: 10.1051/ps /2016016

[60] (with A.V. Doumas) The Siblings of the Coupon Collector, *Theory of Probability and its Applications* (*Teoriya Veroyatnostei i ee Primeneniya* - TVP), **62, No. 3 (2017)** *Theory Probab. Appl.*, **62(3), 444–470**

[61] (with T. Aktosun and A.E. Choque-Rivero) Bound states of the discrete Schrodinger equation with compactly supported potentials, *Electronic Journal of Differential Equations,* **Vol. 2019 (2019), Paper No. 23 (19pp)**

[62] (with T. Aktosun and A.E. Choque-Rivero) Darboux transformation for the discrete Schrodinger equation, *Electronic Journal of Differential Equations,* **Vol. 2019 (2019), Paper No. 112 (34pp)**

[63] (with A.V. Doumas) Uniform versus Zipf distribution in a mixing collection process, *Stat. Probab. Lett.* **155, 108559, 7pp (December 2019)**

[64] (with A.V. Doumas) The Logarithmic Zipf Law in a General Urn Problem, *ESAIM*: *Probability and Statistics*, **24 (2020), 275–293**
DOI: 10.1051/ps/2020011

[65] (with A.V. Doumas) Sampling from a Mixture of Different Groups of Coupons, *Acta Mathematica Sinica, English Series*, **Published online (September 20, 2020), 1–26**
doi.org/10.1007/s10114-020-9425-y

[66] (with E. Kallitsi and G. Smyrlis) Entire Solutions of the Heat Equation, *Electronic Journal of Differential Equations,* **Vol. 2021 (2021), Paper No. 44 (25pp)**

[67] Periodic Jacobi operators with complex coefficients, *Journal of Spectral Theory*, **11, no. 2 (2021), 781–819**

[68] A binary search scheme for determining all contaminated specimens, *Journal of Mathematical Biology*, **Vol. 83, issue 4, Article number: 35 (October 2021) (31pp)**
doi.org/10.1007/s00285-021-01663-6

Selected Publications in Refereed Conference Proceedings:

- **(with W. Krassowska) Electrostatic Potential on the Boundary of Cardiac Tissue,** *Proceedings of the 13th Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, **Orlando, Florida, (Oct. 31 - Nov. 3, 1991)**

- **(with S. Venakides and M. Haider) Wave propagation in photonic crystal models, Dassios, G. (ed.) et al., Scattering theory and biomedical engineering modelling and**

applications. *Proceedings of the 4th international workshop*, **Perdika, Greece, October 8-10, 1999. Singapore: World Scientific. 120-134 (2000).**

- **Ewald's Method Revisited (Rapidly Convergent Series Representations of Certain Green's Functions)** *Proceedings of the 1st Interdisciplinary Symposium on Nonlinear Problems*, **Edited by N. M. Stavrakakis and G. A. Athanassoulis, National Technical University of Athens, Greece, January 21-22 (2000) 331-341.**

- **(with D.C. Kravvaritis, A. Xepapadeas, and A.N. Yannacopoulos) Infinite dimensional replicator dynamics.** *Dynamics and Applications*, **In Honour of M. Peixoto and D. Rand, Ed. A. Pinto, Springer 2010 (in press).**

- **(with D. Kouloumpou) Brownian motion on spheres.** *Proceedings of the 13th Panhellenic Conference of Mathematical Analysis*, **Ioannina, May 2010.**

- **(with D. Kouloumpou) Random motion on symmetric spaces.** *Proceedings of the Joint Statistical Meeting*, **Vancouver, BC, Canada, July 31-August 5, 2010.**

<u>Submitted Articles</u>:

- **(with A.V. Doumas) The coupon collector's problem in the logarithmic Zipf case**

Selected Invited Presentations

- Seminar on Stochastic Processes 1988, University of Florida at Gainesville (March 1988)

- Seminar on Stochastic Processes 1989, University of California at San Diego (March-April 1989)

- Talk at the Courant Institute (May 1989)

- IMA Workshop on Twist Maps and their Applications, University of Minnesota (March 1990)

- Statistics Seminar, University of North Carolina at Chapel Hill (September 1991)

- 1992 Spring Seminar Series on Stochastic Analysis of Environmental Systems. Department of Environmental Sciences and Engineering, University of North Carolina at Chapel Hill (March 1992)

- Plenary talk at the 13th Annual Western States Mathematical Physics Meeting, Caltech, Pasadena, CA (February-March 1994)

- AMS 890th Meeting, University of Kentucky, Special Session: Inverse Spectral Problems: Theory and Computation, Lexington, KY (March 1994)

- Talk at Stanford University (January 1995)

- Talk at the IMA Workshop on Inverse Problems in Wave Propagation, Title: Eigenvalue Asymptotics of Layered Media and Oceanographic Inverse Problems, University of Minnesota (March 1995)

- Talk at Brown University (March 1996)

- AMS 916th Meeting, University of Missouri--Columbia, Special Session on Spectral Theory and Completely Integrable Systems, Title: ``The Periodic Beam Equation'' (November 1996)

- International Workshop on Dynamics of Patterns, Euroconference in Mathematics on Crete, Training and Mobility of Researchers Programme, Anogia, Crete, GREECE (June 1999)

- Talk at the Mathematical Geophysics Summer School, Stanford University (August 2002)

- Talk at the University of Florence, Italy (April 2003)

- Talk at the 4ECM Satellite Conference: *Spectrum and Quantum Mechanics*, Royal Institute of Technology (KTH), Stockholm, Sweden (July 2004)

- Talk at the Stanford Financial Mathematics Seminar, Stanford University, Stanford, CA, Title: *A Diffusion Model for Reinsurance* (March 2007)

- Workshop on Analysis and its Applications, University of Athens, Greece, Title: *A Diffusion Model for Reinsurance* (June 2007)

- Equadiff 2007, Minisymposium on *Integrable Systems*, Vienna University of Technology, Vienna, Austria, Title: *Higher-Order Periodic Operators* (August 2007)

- Mathematical Challenges Motivated by Multi-Phase Materials: Analytical, Stochastic, and Discrete Aspects, Anogia, Crete, Greece, Title: *How many trials it takes to find all different species of a kind* (June 2009)

- Dynamics in Samos, Samos, Greece (September 2010).

- Colloquium Talk at the University of Tennessee in Knoxville. Title: Asymptotics and Limit Distributions for the General Collector's Problem (March 2013).

- Talk at the Probability Seminar at the University of Tennessee in Knoxville. Title: *The Siblings of the Coupon Collector* (March 2013).

- Colloquium Talk at the University of Texas in Arlington. Title: *The Special Transmission Eigenvalues* (April 2013).

- Talk at the 2014 NSF-CBMS Conference on Inverse Scattering and Transmission Eigenvalues, University of Texas in Arlington (May 2014).

Conference Organization

- Co-organizer (with Ari Laptev) of the *Meeting on Spectrum, Differential Equations, and Mathematical Physics* (Sponsors: European Science Foundation, National Technical University of Athens), Loutraki, Greece (October 16–17, 2005)

Grants

Principal Investigator:

1990–1992: NSF Grant no. DMS-9011641, Program: Modern Analysis, Cumulative Award Amount $33,731, Title of Project: ``Spectral Considerations and Inverse Problems for Schroedinger Operators''

October 1993–September 1995: NSF EPSCoR Grant. Title: "Some Problems of Integral Geometry with Medical and Industrial Applications'' (one of the four principal investigators; cumulative award amount: $199,791)

January 1997– December 1998: National Research Council, Twinning Program 1997–1998, with Belarus, Kazakstan, Moldova, and Romania. Title of Proposed Project: ``Applications of the Theory of Mnemofunctions to Problems of Nonlinear and Stochastic Equations, and to the Spectral Theory of Unbounded Operators'' (cumulative award amount: $13,100)

January 2000 –December 2002: ΠΕΝΕΔ

October 2008 – : ΠΕΒΕ 2008. Title: "Deterministic and Stochastic Dynamical Systems and applications to Economical and Environmental Sciences" (cumulative award amount: €15,000)

Participant:

1990–1992: Partial funding from the Whitaker Foundation (total amount awarded: two month salary), Title of Project: ``Modeling of the Electrophysiology of the Heart'' (collaboration with prof. W. Krassowska, Department of Biomedical Engineering, Duke University)

August 2002: NSF-funded, grant No. DMS97-09320, Mathematical Geophysics Summer School, Stanford University (Principal Investigator: Prof. G. Papanicolaou)

2006 –: ΠΕΒΕ Caratheodory. Title: "Nonlinear Differential equations and Applications in Game Theory" (Principal Investigator: Prof. D. Kravvaritis)

Ph. D. Students (Thesis Supervisor)

- **Demetra Kouloumpou (2012)**

- **Aris Doumas (2012)**