

I EDUCATION AND DEGREES

Italian Doctoral Degree (Laurea in Ingegneria Elettronica), University of Padova, Italy, February 1967; summa cum laude

Ph.D. (specialization: mathematical control theory for infinite dimensional differential equations), University of Minnesota, Minneapolis, March 1973

Advisor: L. Markus, Regents' Professor, School of Mathematics, University of Minnesota

II EMPLOYMENT

Instructor, School of Mathematics, University of Minnesota, 1973

Research Fellow, Control Theory Center, University of Warwick, 1973–74

Visiting Assistant Professor, Mathematics Department, State University of New York, Albany, 1974–1975

Assistant Professor, Mathematics Department, Iowa State University, 1975–1978

Associate Professor (tenured), Iowa State University, 1978–1981

Sabbatical from Iowa State University, University of Florida, 1980–1981

Associate Professor (tenured), Mathematics Department, University of Florida, 1981–1983

Professor, Mathematics Department, University of Florida, 1983–1987

Professor (tenured), University of Virginia, 1987–1998, Applied Mathematics; 1998–present, Mathematics

Visiting appointments and long-stay visits:

Centre de Recherches Mathematiques, Université de Montreal, Canada, summer 1974 and winter 1975

Mathematics Research Center, University of Wisconsin, summer 1975

University of California, Los Angeles, Spring 1976; sabbatical from Iowa State University, 1979–1980

Mathematics Department, University of Bologna, Italy, summers 1977, 1991, 1992, 1993

Scuola Normale Superiore, Pisa, Italy, summers 1983–1989, 1991, 1992, 1997, 1998; March-August 2002 (Sabbatical)

International Institute Applied System Analysis, Vienna, Austria, August 1989 and 1991

Sabbatical at Mathematics Department, University of Trento, Italy, Fall Semester 1992

Institute of Applied Analysis, Rome, Italy, June-July 1994

Mittag-Leffler Institut, Stockholm, Sweden, February 1–8, 2003

III RESEARCH INTERESTS

Control Theory of Partial Differential Equations. Mixed problems for single parabolic, hyperbolic and Petrowski type (e.g., plate-like, Schrödinger) partial differential equations (PDE's), as well as

for systems of coupled PDE's (thermo-elastic equations, noise reduction models, shell equations) with parabolic/hyperbolic or hyperbolic/hyperbolic boundary coupling. Related optimization and control theory, including differential and algebraic Riccati operator equations for infinite-dimensional quadratic cost optimal control problems with unbounded operators. Related differential game problems. Optimal (sharp) regularity theory (interior regularity and boundary trace regularity) of wave, plate-like equations, Schrödinger equations, PDE thermoelastic systems, etc. Energy methods, functional analytic techniques, pseudo-differential and micro local analysis techniques. Riemann geometric methods. Exact controllability and uniform stabilization of conservative problems (e.g., wave, Schrödinger, plate, shell equations). Boundary stabilization of parabolic equations including Navier-Stokes equations. Abstract differential equations in Banach space with unbounded operators, such as they arise as models of mixed PDE problems. Operator theory. Semigroup theory. Retarded (functional) differential equations.

IV PUBLICATIONS

Books:

- (1) Differential and Algebraic Riccati Equations with applications to boundary/point control problems: Continuous theory and approximation theory (with I. Lasiecka), Vol. 164, *Springer-Verlag Lecture Notes Series in Control and Information Sciences*, 1991, 160 pp.
- (2) Research monographs: Control Theory for Partial Differential Equations: Continuous and Approximation Theories, Vol. 1 (680 pp.), and Vol. 2 (422 pp.) (with I. Lasiecka), *Encyclopedia of Mathematics and Its Applications Series*, Cambridge University Press, January 2000 (Vol. 3 in preparation, 6 chapters completed.) It contains numerous new results by the authors not appeared in print before.
- (3) Research monograph: Stabilization and controllability of nonlinear control systems governed by partial differential equations (with I. Lasiecka), in preparation, preliminary draft of 450 pages available, Springer-Verlag.

Invited review papers:

- (1) Algebraic Riccati equations arising in boundary/point control: a review of the theoretical and numerical results: Part 1: continuous case (with I. Lasiecka), *Perspectives in Control Theory*, Birkhäuser (1990), 175–210.
- (2) Algebraic Riccati equations arising in boundary/point control: A review of the theoretical and numerical results: Part II: Approximation theory (with I. Lasiecka), *Perspectives in Control Theory*, Birkhäuser (1990), 210–235.
- (3) Recent advances in regularity of second-order hyperbolic mixed problems, and applications (with I. Lasiecka), invited paper for Book Series, *Dynamics Reported*, Springer-Verlag, 3 (1994), 104–158.
- (4) Min-max game theory and H^∞ -problems for partial differential equations with boundary/point control and disturbance. INRIA-IFIP Conference, held at Universite de Technologie de Compiègne, France, July 1993, *Springer-Verlag Lecture Notes* 197 (1994), 70–89.

Books edited:

- (1) Control Problems for systems described by partial differential equations and applications (with I. Lasiecka), *Springer-Verlag Lecture Notes* 97. Proceedings of the IFIP-WG 7.2 Working Conference held at University of Florida, Gainesville, 1986, pp. 396.

- (2) Differential geometric methods in the control of partial differential equations (with R. Gulliver and W. Littman) *Contemporary Mathematics*, Vol. 268 (2000), AMS Publication. *Proceedings of AMS-IMS-SIAM Summer Research Conference*, held at the University of Colorado, Boulder, June 27–July 2, 1999.
- (3) Control Theory for Partial Differential Equations (with G. Leugering, O. Imannvilov, B. Zhang), *CRC* formerly Marcel Dekker *Lecture Notes in Pure and Applied Mathematics*, May 2005. Proceedings of NSF-supported Conference, held at Georgetown University, June 2004.
- (4) Control Methods in PDE-Dynamical Systems (with F. Ancona, I. Lasiecka, W. Littman), *Contemporary Mathematics*, expected to be published in 2006, AMS Publication. *Proceedings of AMS-IMS-SIAM Summer Research Conference*, held at Snowbird Resort, Utah, July 2–7, 2005.

Refereed research articles:

- (1) Delayed control action controllable systems in Banach space, *Control and Cybernetics*, Polish Academy of Science 3 (1974), 95–117.
- (2) Controllability and observability in Banach space with bounded operators, *SIAM J. Control Optimiz.* 13(1) (1975), 462–49.
- (3) Pathological asymptotic behavior of control systems in Banach space, *J. Math. Anal. Appl.* 49 (1975), 411–429.
- (4) On the lack of exact controllability for mild solutions in Banach space, *J. Math. Anal. Appl.* 50 (1975), 438–446.
- (5) Extensions of rank conditions for controllability and observability to Banach spaces and unbounded operators, *SIAM J. Control Optimiz.* 14 (1976), 313–338.
- (6) On the stabilizability problem in Banach space, *J. Math. Anal. Appl.* 52 (1975), 383–403. Addendum: On the stabilizability problem. . . , *J. Math. Anal. Appl.* 56 (1976), 492–493.
- (7) A note on the lack of exact controllability for mild solutions in Banach Space, *SIAM J. Control Optimiz.* 15(3) (1977), 407–411.
- (8) Function space controllability of linear retarded systems: A derivation from abstract operator conditions (with A. Manitius), *SIAM J. Control Optimiz.* 16 (1978), 599–645.
- (9) Sufficient conditions for function space controllability and feedback stabilizability of linear retarded system (with A. Manitius), *IEEE Transaction of Automatic Control*, (1978), 659–665. (Also, announcement in *Proceedings of the Decision and Control Conference*, Florida, December 1976.
- (10) On the relationship between first and second order controllable systems in Banach space, *SIAM J. Control Optimiz.* 16 (1978), 847–859. (Also, preliminary versions in *Proceedings of the International Workshop on Infinite Dimensional Systems*, University of Rome, Italy, June 1976, *Springer-Verlag Lecture Notes*, and *Proceedings of 1976 Allerton Conference on System Theory*, University of Illinois, Urbana.)
- (11) A cosine operator approach to modeling boundary inputs problems for hyperbolic systems, *Proceedings of 8th IFIP Conference on Differential Equations and Optimization Techniques*, University of Wurzburg, West Germany, September 1977. *Springer-Verlag Lecture Notes on Control Sciences* 6 (1978), 380–390.

- (12) Analytic properties of cosine operators (with S. Nelson). *Proceedings Amer. Math. Soc.* 74 (1978), 101–104.
- (13) Boundary stabilization of parabolic equations, *International Conference on Recent Advances in Differential Equations*, Miramare-Trieste (Italy), R. Conti (editor), Academic Press, August 1978. (Also, Proceedings of International Conference on Systems Analysis, I.R.I.A., Paris, *Springer-Verlag LNCIS* 14 (1978), 305–313.)
- (14) On Nambu’s boundary stabilizability problem for diffusion processes, *J. Diff. Eqns.* 33 (1979), 189–200.
- (15) Well-posedness and regularity of boundary feedback parabolic systems, *J. Diff. Eqns.* 36 (1980), 347–362.
- (16) Boundary feedback stabilizability of parabolic equations, *Appl. Math. Optimiz.* 6 (1980), 201–220.
- (17) A cosine operator approach to modelling $L_2(0, T; L_2(\Omega))$ boundary input hyperbolic equations (with I. Lasiecka), *Appl. Math. Optimiz.* 7 (1981), 35–83.
- (18) Hyperbolic equations with Dirichlet boundary feedback via position vector: Regularity and almost periodic stabilization, Part I (with I. Lasiecka), *Appl. Math. Optimiz.* 8 (1981), 1–37.
- (19) Hyperbolic equations with Dirichlet boundary feedback via position vector: regularity and almost periodic stabilization, Part II (with I. Lasiecka), *Appl. Math. Optimiz.* 8 (1982), 103–130.
- (20) Hyperbolic equations with Dirichlet boundary feedback via position vector: regularity and almost periodic stabilization, Part III (with I. Lasiecka), *Appl. Math. Optimiz.* 8 (1982), 199–221.
- (21) Structural assignment of Neumann boundary feedback parabolic equations: The case of trace in the feedback loop (with I. Lasiecka), *Annali Matem. Pura Appl.* (IV) XXXII (1982), 131–175.
- (22) An L_2 -theory for the quadratic optimal cost problem of hyperbolic equations with control in the Dirichlet B.C. (with I. Lasiecka), *Springer-Verlag Lecture Notes* 54 (1982), 138–153.
- (23) Stabilization and structural assignment of Dirichlet boundary feedback parabolic equations (with I. Lasiecka), *SIAM J. Control Optimiz.* 21 (1983), 766–803.
- (24) Dirichlet boundary control problem for parabolic equation with quadratic cost: Analyticity and Riccati’s feedback synthesis (with I. Lasiecka), *SIAM J. Control Optimiz.* 21 (1983), 41–67.
- (25) Stabilization of Neumann boundary feedback parabolic equations: The case of trace in the feedback loop (with I. Lasiecka), *Appl. Math. Optimiz.* 10 (1983), 307–350. (Preliminary version in *Springer-Verlag Lecture Notes* 54 (1983), 238–246.)
- (26) Boundary feedback stabilization problems for hyperbolic equations, *Springer-Verlag Lecture Notes* 54 (1983), 238–246.
- (27) Feedback semigroups and cosine operators for boundary feedback parabolic and hyperbolic equations (with I. Lasiecka), *J. Diff. Eqns.* 47 (1983), 246–272.
- (28) Dirichlet boundary stabilization of the wave equation with damping feedback of finite range (with I. Lasiecka), *J. Math. Anal. Appl.* 97 (1983), 112–130.

- (29) Regularity of hyperbolic equations under $L_2(0, T; L_2(\Gamma))$ -Dirichlet boundary terms (with I. Lasiecka), *Appl. Math. Optimiz.* 10 (1983), 275–286.
- (30) Nondissipative boundary stabilization of hyperbolic equations with boundary observation (with I. Lasiecka), *J. Math. Pures Appl.* 63, (1984), 59–80.
- (31) A^ϵ -bounded, finite rank perturbations of s.c. group generators A : Counterexamples to generation and another condition for well posedness. *Springer-Verlag Lecture Notes in Mathematics* (1984), 227–233. Proceedings of Workshop on Operator-Semigroups and Applications, University of Graz, Retzhof (Austria) June 1983.
- (32) Finite rank, relatively bounded perturbations of C_0 -semigroups, Part I: Well posedness and boundary feedback hyperbolic dynamics (with I. Lasiecka), *Annali Scuola Normale Superiore di Pisa* (IV) XII(4) (1985), 641–668.
- (33) Improving stability properties of hyperbolic damped equations by boundary feedback, *Springer-Verlag Lecture Notes* 75 (1985), 400–409. *Proceedings of Workshop on Control Theory for Partial Differential Equations and Applications*, University of Graz (Austria), July 1984. (Also, *Proceedings of CDC Conference*, held in Las Vegas, December 1984.)
- (34) Finite rank, relatively bounded perturbations of C_0 -semigroups, Part II: Spectrum allocation and Riesz basis in parabolic and hyperbolic feedback systems (with I. Lasiecka), *Annali Matem. Pura Appl.* (IV) CXLIII (1986), 47–100.
- (35) Riccati equations for hyperbolic partial differential equations with $L_2(\Sigma)$ -Dirichlet boundary terms (with I. Lasiecka), *SIAM J. Control Optimiz.* 24 (1986), 884–926.
- (36) Non homogeneous boundary value problems for second order hyperbolic operators (with I. Lasiecka and J. L. Lions), *J. Math. Pures Appl.* 65 (1986), 149–192.
- (37) A direct study of Riccati equations arising in boundary control problems for hyperbolic equations (with G. Da Prato and I. Lasiecka), *J. Diff. Eqns.* 64 (1986), 26–47.
- (38) Exponential uniform energy decay rates of the wave equation in a bounded region with $L_2(0, T; L_2(\Gamma))$ -boundary feedback in the Dirichlet B.C. (with I. Lasiecka), *J. Diff. Eqns.* 66 (1987), 340–390.
- (39) The regulator problem for parabolic equations with Dirichlet boundary control, Part I: Riccati’s feedback synthesis, and regularity of optimal solutions (with I. Lasiecka), *Appl. Math. Optimiz.* 16 (1987), 147–168.
- (40) The regulator problem for parabolic equations with Dirichlet boundary control, Part II: Galerkin approximation (with I. Lasiecka), *Appl. Math. Optimiz.* 16 (1987), 187–216.
- (41) Exact boundary controllability of $L_2(\Omega) \times H^{-1}(\Omega)$ of the wave equation with Dirichlet boundary control acting on a portion of the boundary and related problems, *Appl. Math. Optimiz.* 18 (1988), 241–277. (Also, preliminary version in *Springer-Verlag Lecture Notes* 102 (1987), 291–332; *Proceedings of Workshop on Control for Distributed Parameter Systems*, University of Graz, Austria (July 1986)).
- (42) Proof of two conjectures of G. Chen and D. L. Russell on structural damping for elastic systems: The case $\alpha = 1/2$ (with S. Chen), *Springer-Verlag Lecture Notes in Mathematics* 1354 (1988), 234–256. *Proceedings of Seminar on Approximation and Optimization*, University of Havana, Cuba (January 1987).

- (43) A lifting theorem for the time regularity of solutions to abstract equations with unbounded operators and applications to hyperbolic equations (with I. Lasiecka), *Proceedings American Mathematical Society* 103 (1988), 745–755.
- (44) Algebraic Riccati Equations with non-smoothing observation arising in hyperbolic and Euler-Bernoulli boundary control problems (with F. Flandoli and I. Lasiecka), *Annali Matem. Pura Appl.* (IV) CLM (1988), 307–382. (Preliminary version in *Infinite Horizon Quadratic Cost Boundary Control Problems* (with I. Lasiecka), Proceedings, CDC Conference, Los Angeles, CA, December 1987).
- (45) Exact controllability of the Euler-Bernoulli equation with $L_2(\Sigma)$ -control only in the Dirichlet boundary condition (with I. Lasiecka), *Rendiconti Accademia Nazionale dei Lincei*, Rome, Italy, *Classe Sci. Fis. Matem.* LXXXI (1988).
- (46) Wave equation on a bounded domain with boundary dissipation: An operator approach, *J. Math. Anal. Appl.* 137 (1989) 438–461. (Also, preliminary versions in *Operator Methods for Optimal Control Problems*, Sung J. Lee (editor), Marcel Dekker (1988), pp. 283; *Lecture Notes Pure Appl. Math.* 108, 283–310; *Proceedings of Special Session of the Annual Meeting of the American Mathematical Society*, New Orleans, LA (1986)).
- (47) Exact boundary controllability for the wave equation with Neumann boundary control (with I. Lasiecka), *Appl. Math. Optimiz.* 19 (1989), 243–290. (Also, preliminary version in *Springer-Verlag Lecture Notes* 100 (1987), 316–371.)
- (48) Trace regularity of the solutions of the wave equation with homogeneous Neumann boundary conditions and compactly supported data (with I. Lasiecka), *J. Math. Anal. Appl.* 141 (1989), 49–71.
- (49) Proof of extensions of two conjectures on structural damping for elastic systems: The case $1/2 \leq \alpha \leq 1$ (with S. Chen), *Pacific J. Math.* 136 (1989), 15–55.
- (50) Exact controllability of the Euler-Bernoulli equation with controls in the Dirichlet and Neumann boundary conditions: A non-conservative case (with I. Lasiecka), *SIAM J. Control Optimiz.* 27 (1989), 330–373. (Also, preliminary version in *Semigroups and Applications*, Marcel Dekker Lecture Notes 116 (1988), 241–261.)
- (51) Regularity theory for a class of nonhomogeneous Euler-Bernoulli equations: A cosine operator approach (with I. Lasiecka), *Bollettino Unione Matem. Ital.* (7)3-B (1989), 199–228. (Also, invited paper for special volume, *Topics in Mathematical Analysis*, volume dedicated to A. L. Cauchy, T. M. Rassias (editor), World Scientific (1989), 623–657).
- (52) Lack of uniform stabilization for non-contractive semigroups under compact perturbation, *Proceedings Amer. Math. Soc.* 105 (1989), 375–383.
- (53) Exact controllability for wave and Euler-Bernoulli equations in the presence of damping, 30 Years of Modern Optimal Control, *Lecture Notes Pure Appl. Math.* 119 (1989) 377–387, Marcel Dekker. (Also, *Diff. Eqns. Appl.* III (1989), 454–463, Ohio University Press.)
- (54) Exact controllability of the Euler-Bernoulli equation with boundary controls for displacement and moment (with I. Lasiecka), *J. Math. Anal. Appl.* 146 (1990), 1–33. (Also, invited paper for special volume, *Topics in Mathematical Analysis*, volume dedicated to A. L. Cauchy, T. M. Rassias (editor), World Scientific (1989), 576–622).

- (55) Finite rank, relatively bounded perturbations of semi-group generators, Part III: A sharp result on the lack of uniform stabilization, *Diff. Int. Eqns.* 3 (1990), 503–522. (Also, preliminary version in *Proceedings INRIA Conference*, Paris, France (June 1988), Springer-Verlag Lecture Notes.)
- (56) Sharp regularity for mixed second order hyperbolic equations of Neumann type Part I: The L_2 -boundary case (with I. Lasiecka), *Annali Matem. Pura Appl.* (IV) CLVII (1990) 285–367. (Announcements in *Accad. Lincei*, LXXXIII (1989), 109–113, Classe di Scienze Matematiche, Rome, Italy, and *Springer-Verlag Lecture Notes*, 114.)
- (57) Gevrey class semigroups arising from elastic systems with gentle perturbation (with S. Chen), *Proceedings Amer. Math. Soc.* 110 (1990), 401–415.
- (58) Characterization of domains of fractional powers of certain operators arising in elastic systems, and applications (with S. Chen), *J. Diff. Eqns.* 88 (1990), 279–293.
- (59) Further results on exact controllability of the Euler-Bernoulli equation with control in the Dirichlet/Neumann boundary conditions (with I. Lasiecka), *Springer-Verlag Lecture Notes, LNCIS* 147 (1990), 226–235, J. P. Zolesio (editor).
- (60) Exact controllability of semi-linear abstract systems with application to wave and plate problems (with I. Lasiecka), *Appl. Math. Optimiz.*, 23 (1991), 109–154.
- (61) Uniform energy decay rates for Euler-Bernoulli equations with feedback operators in the Dirichlet/Neumann B.C. (with J. Bartolomeo), *SIAM J. Math. Anal.* 22 (1991), 46–71. (Announcement in *Rendiconti Accademia Nazionale dei Lincei*, Rome, Italy, *Classe Sci. Fis. Matem.* (8) LXXXIII (1989), 121–128.)
- (62) Regularity theory of hyperbolic equations with non-homogeneous Neumann boundary conditions, Part II: General boundary data (with I. Lasiecka), *J. Diff. Eqns.* 94 (1991), 112–164.
- (63) Uniform stabilization of the Euler-Bernoulli equation with feedback only in the Neumann boundary conditions (with N. Ourada), *Diff. Int. Eqns.* 4 (1991), 277–292.
- (64) Regularity of structurally damped systems with point/boundary control, *J. Math. Anal. Appl.* 161(2) (1991), 299–331.
- (65) Numerical approximations of algebraic Riccati equations for abstract systems modelled by analytic semigroups, and applications (with I. Lasiecka), *Math. Computation* 57(196) (1991), 639–662 and Supplement 513–537.
- (66) Exact controllability and uniform stabilization of Euler-Bernoulli equations with only one active control in $\Delta w|_{\Sigma}$, (with I. Lasiecka), *Bollettino Unione Matem. Ital.* (7)5-B (1991), 665–702. (Also, invited paper for special volume dedicated to C. Caratheodory, T. M. Rassias (editor), World Scientific.)
- (67) Differential Riccati equations with unbounded coefficients: applications to boundary control/boundary observation hyperbolic problem (with I. Lasiecka), *J. Nonlinear Anal.* 17(7) (1991), 655–682. (Also, invited paper for special volume dedicated to E. F. Gauss, T. M. Rassias (editor), World Scientific 9.)
- (68) Exact controllability and uniform stabilization of Kirchhoff plates with boundary controls only in $\Delta w|_{\Sigma}$ (with I. Lasiecka), *J. Diff. Eqns.* 93 (1991), 62–101. (Preliminary version in “Semigroup and Evolution Equations,” *Marcel Dekker Lectures Notes Pure Appl. Math.* 135, 267–295.)

- (69) Lack of exact controllability for wave and plate equations with finitely many boundary controls, *Diff. Int. Eqns.* 4 (1991) 683–705.
- (70) Riccati differential equations with unbounded coefficients and non-smoothing terminal condition: The case of analytic semigroup (with I. Lasiecka), *SIAM J. Math. Anal.* 25 (1992), 449–481.
- (71) Uniform stabilization of the wave equation with Dirichlet or Neumann-feedback control without geometrical conditions (with I. Lasiecka), *Appl. Math. Optimiz.* 25 (1992), 189–224. (Preliminary version in *Springer-Verlag Lecture Notes LNCIS* 147, 62–108, J. P. Zolesio (editor).)
- (72) Optimal regularity, exact controllability and uniform stabilization of the Schrödinger equation (with I. Lasiecka), *Diff. Int. Eqns.* 5 (1992), 521–535.
- (73) Constructive steering control functions for linear systems and abstract rank conditions, *J. Optimiz. Theory Appl.* 74(2) (August 1992), 347–367.
- (74) Counterexamples to some stability questions for dissipative generators, *J. Math. Anal. Appl.* 170 (1992), 49–64.
- (75) Regularity with point control. Part III: Schrodinger equations, *J. Math. Anal. Appl.* 171 (1992), 567–577.
- (76) Uniform Convergence of Solutions to Riccati equations arising in boundary/point control problems (with I. Lasiecka), *Springer Verlag Lecture Notes LNCIS* 184 (1992), 285–305.
- (77) Interior and boundary regularity of the wave equations with point control, *Diff. Int. Eqns.* 6 (1993), 111–129. (Announcement in *Accademia Nazionale dei Lincei*, Rome, Italy, *Matem. Appl.* II(4) (1991), 307–315.)
- (78) Interior regularity with point control: Euler-Bernoulli equations, *Springer Verlag Lecture Notes LNCIS* 79, 321–355, J. P. Zolesio (editor).
- (79) Regularity with point control. Part II: Kirchhoff equations, *J. Diff. Eqns.* 103 (1993), 394–420.
- (80) Algebraic Riccati Equations arising from systems with unbounded input solution operator: Applications to boundary control problems for wave and plate problems (with I. Lasiecka), *J. Nonlinear Anal.* 20 (1993), 659–695. (Preliminary version in *Springer-Verlag Lecture Notes LNCIS* 180, 530–538. *Proceedings of EFIP Conference*, held in Zurich, Sept. 2–5, 1991.)
- (81) Sharp trace estimates of solutions to Kirchhoff and Euler-Bernoulli equations (with I. Lasiecka), *Appl. Math. Optimiz.* 28, (1993), 277–306. (Preliminary version in *Marcel Dekker Lectures Notes Pure Appl. Math.* 148. *Proceedings of International Conference of Evolution Equations in Banach Space*, held at University of Bologna, Italy (July 1991), 141–180.)
- (82) Analytic and Gevrey class semigroups generated by $-A + iB$, and applications (with A. Favini) *Marcel Dekker Lectures Notes Pure Appl. Math.* 148 (1993). *Proceedings of International Conference on Evolution Equations in Banach Space*, held at University of Bologna, Italy, July 1991, 148 (August 1993), 93–114. (Announcement appeared in *Accademia Nazionale dei Lincei*, Rome, Italy, *Sezione Matematica*, 1992).

- (83) Min-Max game theory and algebraic Riccati equations for boundary control problems with continuous input-solution map. Part I: The stable case (with C. McMillan), *Marcel Dekker Lectures Notes Pure Appl. Math.* 155 (1994). *Proceedings of International Conference/Workshop in Evolution Equations in Banach Space*, held in Han-sur-Lesse, Belgium, October 1991, Ph. Clement and G. Lumer (editors), 372–405.
- (84) Min-Max game theory and algebraic Riccati equations for boundary control problems with continuous input-solution map, Part II: The general case (with C. McMillan), *Appl. Math. Optimiz.* 29 (1994), 1–64. (Announcement appeared in *Differential Equations with Applications to Mathematical Physics*, Academic Press (1992), 239–49 and in *Springer-Verlag LNICS*).
- (85) Min-Max game theory and algebraic Riccati equations for boundary control problems with analytic semigroups, Part I: The stable case (with C. McMillan), *Marcel Dekker Lecture Notes Pure Appl. Math.* 152 (1994), 757–780, invited paper for special volume (Festschrift), in honor of L. Markus on the occasion of his 70th birthday.
- (86) Min-Max game theory and algebraic Riccati equations for boundary control problems with analytic semigroups. Part II: The general case (with C. McMillan), *J. Nonlinear Anal.* 22 (1994) 431–465.
- (87) An optimal quadratic boundary control problem for wave and plate-like equations with high internal damping: An abstract approach, *Marcel Dekker Lecture Notes Pure Appl. Math.* 165 (1994), 215–271. International Conference on Optimal Control for Partial Differential Equations, University of Trento, January 1993.
- (88) Lack of generation of strongly continuous semigroups by the damped wave operator on $H \times H$ (with A. V. Balakrishnan), *Appl. Math. Letters* 6 (1993), 33–37.
- (89) Optimal boundary control and new Riccati equations for highly damped second order equations, *Diff Int. Eqns.* 7 (1994), 1109–1144. Invited paper for special volume in memory of Peter Hess.
- (90) Further regularity properties of the optimal pair in quadratic cost problems for parabolic equations with boundary control and non-smoothing final state penalization (with I. Lasiecka), *Marcel Dekker Lectures Notes Pure Appl. Math.* 160 (1994), 173–190. International Conference on Optimal Control of Differential Equations and Calculus of Variations, Ohio University, March 1993.
- (91) On the relationship between the optimal control quadratic problem on an infinite horizon and on a finite horizon with final state penalization: The abstract hyperbolic case, *Marcel Dekker Lectures Notes Pure Appl. Math.* 160 (1994), 301–325. International Conference on Optimal Control of Differential Equations and Calculus of Variations, Ohio University, March 1993.
- (92) A sharp result on the exponential operator-norm decay of a family of s.c. semigroups, *Semigroup Forum* 49 (1994), 387–395.
- (93) Abstract model and semigroup well-posedness of spherical shells with boundary dissipation (with I. Lasiecka), invited paper in *Dynamical Sys. Appl.* 4 (1995), 453–471, World Scientific Series in Applicable Analysis.
- (94) Uniform stabilization of spherical shells by boundary dissipation (with I. Lasiecka and V. Valente), *Advances Diff. Eqns.* 1 (1996) 635–674. (Also, preliminary version in *Marcel Dekker Lectures Notes Pure Appl. Math.* 176 (1996), 171–181.

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- (95) Carleman estimates and uniqueness for the system of strongly coupled PDE's of spherical shells (with I. Lasiecka), special volume of *Zeits. Angewandte Math. Mech. (ZAMM)*, Akademie Verlag, Berlin, ICIAM 1995, 76(4) (1996), 277–280.
- (96) Regularity theory, exact controllability and optimal quadratic cost problem for spherical shells with physical boundary controls, invited paper in special issue of *Control and Cybernetics*, Polish Academy of Sciences, *Control Problems Part. Diff. Eqns.* 259(3) (1996), 553–569.
- (97) A singular control approach to highly damped second order abstract equations and applications (with I. Lasiecka and L. Pandolfi), *Appl. Math. Optimiz.* 36 (1997), 67–107. (Also, preliminary version in *Marcel Dekker Lectures Notes Pure Appl. Math.* 176 (1996), 157–170. Proceeding of Conference on Control of Partial Differential Equations, Laredo, Spain, September 1994.)
- (98) An optimal control problem with unbounded control operator and unbounded observation operator where the Algebraic Riccati Equation is satisfied as a Lyapunov equation, *Appl. Math. Letters* 10 (1997), 95–102.
- (99) Carleman estimates and exact boundary controllability for a system of coupled, nonconservative second order hyperbolic equations (with I. Lasiecka), *Marcel Dekker Lectures Notes Pure Appl. Math.* 188 (1997), 215–245, invited paper for the special volume *Partial Differential Equations Methods in Control and Shape Analysis*.
- (100) Carleman estimates and exact boundary controllability for a system of coupled non-conservative Schrödinger equations, invited paper for special volume of *Rendiconti dell' Istituto di Matematica dell' Universita di Trieste XXVIII* (1996), 453–504. Supplemento, invited paper for special volume in memory of Pierre Grisvard.
- (101) An abstract setting for differential Riccati equations in optimal control problems for hyperbolic/Petrovski-type PDE's with boundary control and slightly smoothing observation, *Abstract Appl. Anal.* 1 (1996), 435–484.
- (102) Exact controllability for second-order hyperbolic equations with variable coefficients-principal part and first-order terms (with I. Lasiecka and P. F. Yao), *Non-Linear Anal. Theory Meth. Appl.* 30 (1997), 111–122.
- (103) Analyticity, and lack thereof, of semigroups arising from thermo-elastic plates, special volume *Computational Science for the 21st Century*, John Wiley (1997), invited paper for a conference in honor of R. Glowinski, May 1997.
- (104) Analyticity, and lack thereof, of thermo-elastic semigroups (with I. Lasiecka), *European Soc. Appl. Math. (ESAIM)* 4 (1999), 199–222.
- (105) The Algebraic Riccati equation with unbounded control operator: The abstract hyperbolic case revisited, American Mathematical Society, Contemporary Mathematics, special volume *Optimization Methods in Partial Differential Equations* 209 (1997), 315–338.
- (106) Control problems in noise reduction: the case of two hyperbolic equations, *Math. Contr. Smart Structures*, SPIE 3039 (1997), 382–392.
- (107) Two direct proofs on the analyticity of the s.c. semigroup arising in abstract thermo-elastic equations (with I. Lasiecka), *Advances Diff. Eqns.* 3(3) (May 1998), 387–416.

- (108) Spectral analysis of thermo-elastic plates with rotational forces (with S. K. Chang), in *Optimal Control: Theory, Algorithms, and Applications*, Kluwer (1998), 84–115.
- (109) Exact null controllability of structurally damped and thermo-elastic parabolic models, (with I. Lasiecka), invited paper (Memoria), *Accademia Nazionale dei Lincei*, Mathematics Section, Rome, Italy, IX(1) (1998), 43–69.
- (110) Analyticity of thermo-elastic semigroups with coupled hinged/ Neumann B.C. (with I. Lasiecka), *Abstract Appl. Anal.* 3(1-2) (1998), 153–169.
- (111) Analyticity of thermo-elastic semigroups with free B.C. (with I. Lasiecka), *Annali Scuola Normale Superiore*, Pisa, Cl. Sci. (4), XXVII (1998), 457–482.
- (112) Sharp regularity of a coupled system of a wave and a Kirchoff equation with point control arising in noise reduction (with M. Camurdan), *Diff. Int. Eqns.* 12(1) (January 1999), 101–118.
- (113) High level interior and boundary regularity results of the Euler-Bernoulli equation with application to Differential Riccati Equations in optimal control, *Numer. Funct. Anal. Optimiz.* 20(3&4) (1999), 367–386.
- (114) Sharp regularity theory for thermo-elastic mixed problems, *Applicable Analysis* 77(3–4) (2001), 419–433. [Reprint of an electronically faulty version in 73(3-4) (1999), 557–572.]
- (115) A sharp trace result on a thermo-elastic plate equation with coupled hinged/Neumann boundary conditions (with I. Lasiecka), *Discrete Cont. Dynam. Sys.* 5 (July 1999), 585–598.
- (116) Finite element compensators for thermo-elastic systems with boundary control and point observation (with S. K. Chang and I. Lasiecka), *Num. Funct. Anal. Optimiz.* 20(5&6) (1999), 419–435.
- (117) Uniform stability of non-linear thermo-elastic plates with free boundary conditions (with G. Avalos and I. Lasiecka), *International Series of Numerical Mathematics*, Birkhäuser 133 (1999), 13–32.
- (118) An observability estimate in $L_2(\Omega) \times H^{-1}(\Omega)$ for second order hyperbolic equations with variable coefficients (with I. Lasiecka and P. F. Yao), *Control of Distributed Parameter and Stochastic Systems*, Kluwer (1999), 71–79, S. Chen, X. Li, J. Yong, and X. Zhou (editors).
- (119) Inverse observability estimates for second order hyperbolic equations with variable coefficients (with I. Lasiecka and P. F. Yao), *J. Math. Anal. Appl.* 235 (July 1999), 13–57.
- (120) Inverse/observability estimates for Schrödinger equations with variable coefficients (with P. F. Yao), invited paper, special volume on *Control of Partial Differential Equations*, Polish Academy of Sciences 28(3) (1999), 627–664.
- (121) Exact boundary controllability of a first order non-linear hyperbolic equation with non-local integral term arising in epidemic modeling (with I. Lasiecka), *Direct and Inverse Problems of Mathematical Physics*, R. P. Gilbert, J. Kajiwara, Y. Xu (editors), Kluwer (2000), 363–398. ISAAC'97, The First International Congress of the International Society for Analysis, its Applications and Computations.
- (122) Structural decomposition of thermo-elastic semigroups with rotational forces (with I. Lasiecka), *Semigroup Forum* 60 (2000), 16–66.

- (123) Feedback noise control in an acoustic chamber: Mathematical theory (with I. Lasiecka), *Nonlinear Problems in Aviation and Aerospace*, Gordon and Breach Science Publishers (2000), 89–111. S. Siva (editor), Vol. 11, *Stability and Control: Theory Methods and Applications*, 1999.
- (124) Extended algebraic Riccati equations in the abstract hyperbolic case (with V. Barbu and I. Lasiecka), *Nonlinear Anal.* 40(1–8) (2000), 105–130, Elsevier, invited paper for special issue in honor of Lakshmikantham.
- (125) Nonconservative wave equations with unobserved Neumann B.C.: Global uniqueness and observability (with I. Lasiecka and X. Zhang), *AMS Contemp. Math.*, Vol. 268 (2000), 227–326.
- (126) Simultaneous exact/approximate boundary controllability of thermoelastic plates with variable thermal coefficient and moment control (with M. Eller and I. Lasiecka), *J. Math. Anal. Appl.* 251 (2000), 452–478.
- (127) A sharp trace regularity result of Kirchoff and thermo-elastic plate equations with free boundary conditions (with I. Lasiecka), *Rocky Mount. J. Math.* 30(3) (2000), 981–1023.
- (128) Factor spaces and implications on Kirchoff elastic and thermoelastic systems with clamped boundary conditions (with I. Lasiecka), *Abstract & Appl. Analysis*, Vol. 6(8) (2001), 1–48. Preliminary announcement in Oberwolfach Proceedings ‘Control of Complex Systems, Kluwer.
- (129) Sharp regularity of the second time derivative w_{tt} of solutions to Kirchhoff elastic equations with clamped boundary conditions (with I. Lasiecka), *Int. J. Appl. Math.* 11(44) (2001), 753–773.
- (130) Simultaneous exact/approximate boundary controllability of thermoelastic plates with variable coefficient (with M. Eller and I. Lasiecka), Marcel Dekker Lecture Notes Pure and Applied Mathematics 216 (February 2001), 109–230, invited paper for the special volume entitled *Shape Optimization and Optimal Designs*, J. P. Zolesio (Editor). [Preliminary version, is in invited paper in *Semigroup of Operators and Applications*, Birkhäuser (2000), 335–351, A. V. Balakrishnan (editor).]
- (131) Backward uniqueness for thermoelastic plates (with I. Lasiecka and M. Renardy), *Semigroup Forum* 62 (2001), 217–242.
- (132) Simultaneous exact/approximate boundary controllability of thermoelastic plates with variable thermal coefficient and clamped controls (with M. Eller and I. Lasiecka), *Discrete Cont. Dynam. Sys.* 7(2) (2001), 283–301.
- (133) Unique continuation for over-determined Kirchoff plate equations and related thermoelastic systems (with M. Eller and I. Lasiecka), *J. Inv. Ill-Posed Prob.* 9(2) (2001), 1–46.
- (134) Optimal control and algebraic Riccati equations under singular estimates for $e^{At}B$ in the absence of analyticity. Part I: The stable case (with I. Lasiecka), Marcel Dekker, *Lecture Notes in Pure and Applied Mathematics*, Vol. 225 (2002), 193–219, S. Aizicovici & N. Pavel (Editors).
- (135) Min-max game theory and optimal control with indefinite cost under a singular estimate for $e^{At}B$ in the absence of analyticity, invited paper in memory of B. Terreni, *Evolution Equations, Semigroups and Functional Analysis*, Birkhäuser (2002), 353–380, A. Lorenzi & B. Ruf (Editors).
- (136) Singular estimates and uniform stability of systems of coupled hyperbolic/parabolic PDEs (with F. Bucci, I. Lasiecka), *Abstract and Applied Analysis*, Vol. 7(4) (2002), 169–237.

- (137) Uniform stabilization of a shallow shell model with nonlinear boundary feedback (with I. Lasiecka), *J. Anal. & Appl.*, Vol. 269(2) (2002), 642–688.
- (138) Carleman estimates with no lower order terms for general Riemannian wave equations. Global uniqueness and observability in one shot (with P. F. Yao), *Appl. Math. & Optimiz.* 46(2–3) (2002), 331–375.
- (139) Carleman estimates for a plate equation on a Riemannian manifold with energy level terms (with I. Lasiecka and P. F. Yao), *Analysis and Applications*, Kluwer (2003), 199–236. H. Begehr, R. Gilbert, and M. W. Wang (Editors).
- (140) Optimal estimates of norms of fast controls in exact null controllability of two non-classical abstract parabolic systems, *Advances in Diff. Eqns.*, Vol. 8(2) (2003), 189–229.
- (141) The coupled PDE system of a composite (sandwich) beam, *Discr. & Contin. Dynam. Systems B*, Vol. 3(2) (2003), 285–298.
- (142) The case for differential geometry in the control of single and coupled PDEs: The structural acoustic chamber (with R. Gulliver, I. Lasiecka, and W. Littman). IMA Volumes in Mathematics and its Applications, volume 137: Geometric Methods in Inverse Problems and PDE Control, Springer Verlag (2003), 73–181.
- (143) $L_2(\Sigma)$ -regularity of the boundary \rightarrow boundary operator B^*L for hyperbolic and Petrowski PDEs (with I. Lasiecka), *Abstract & Applied Analysis*, Vol. 19 (2003), 1061–1139.
- (144) Global uniqueness, observability and stabilization of non-conservative Schrödinger equations via pointwise Carleman estimates. Part I: $H^1(\Omega)$ -estimates (with I. Lasiecka and X. Zhang), *J. Inverse & Ill-Posed Problems*, Vol. 12(1) (2004), 1–81.
- (145) Global uniqueness, observability and stabilization of non-conservative Schrödinger equations via pointwise Carleman estimates. Part II: $L_2(\Omega)$ -estimates (with I. Lasiecka and X. Zhang), *J. Inverse & Ill-Posed Problems*, Vol. 12(2) (2004), 182–231. Preliminary announcement in *Analysis and Optimization of Differential Systems*, Kluwer (2003), 235–246.
- (146) Backward uniqueness of semigroups arising in coupled PDE systems of structural acoustics, *Advances in Diff. Eqns.*, Vol. 8(1–2) (Jan.–Feb. 2004), 53–84. Preliminary announcement in *Semigroups of Operators: Theory and Applications* (2002), 285–300. C. Kubrusly, N. Levan, M. da Silveira (editors).
- (147) Optimal control and differential Riccati equations under singular estimates for $e^{At}B$ in the absence of analyticity (with I. Lasiecka). Invited paper in honor of A. V. Balakrishnan, *Advances in Dynamics and Control*, Chapman and Hall/CRC (2004), Chapter 19, 271–307.
- (148) Internal stabilization of Navier-Stokes equations with finitely many controllers (with V. Barbu), *Indiana Univ. Math. J.* 53(5) (2004), 1443–1494.
- (149) The operator B^*L for the wave equation with Dirichlet control (with I. Lasiecka), *Abstract and Applied Analysis*, Vol. 2004, Issue 7, 625–634.
- (150) The dual algebraic Riccati equations: Additional results under isomorphism of the Riccati operator, *Appl. Math. Letters* 18 (2005), 1001–1008.

- (151) Global exact controllability on $H_{\Gamma_0}^1(\Omega) \times L_2(\Omega)$ of semilinear wave equations with Neumann $L_2(0, T; L_2(\Gamma_1))$ -boundary control, *Control Theory for Partial Differential Equations, CRC Lecture Notes in Pure & Applied Mathematics*, Vol. 242, Chapter 19, 271–334, May 2005.
- (152) Global exact controllability of semilinear wave equations by a double compactness/uniqueness argument (with I. Lasiecka), *Discrete & Continuous Dynamical Systems*, Supplement Volume (June 2005), 556–565.
- (153) Boundary stabilization of Navier-Stokes equations (with V. Barbu and I. Lasiecka), *Memoirs AMS*, 128 pp., Vol. 181, N. 852, May (2006).
- (154) Abstract settings for tangential boundary stabilization of Navier-Stokes equations by high- and low-gain feedback controllers (with V. Barbu and I. Lasiecka), *Nonlinear Analysis* 64(12) (June 2006), 2705–2746.
- (155) Well-posedness and uniform decay rates at the $L_2(\Omega)$ -level of Schrödinger equations with nonlinear boundary dissipation (with I. Lasiecka), *J. Evol. Eqns.* 6 (2006), 485–537.
- (156) Stability enhancement of a 2-D linearized Navier-Stokes channel flow by finite-dimensional, wall-normal boundary controllers, with arbitrarily small support, 39 pp., *Discrete & Continuous Dynamical Systems B*, 8(2) (2007), 279–314.
- (157) Pointwise Carleman estimates, global uniqueness, observability and stabilization for non-conservative Schrödinger equations on Riemannian manifolds at the $H^1(\Omega)$ -level (with X. Xu), *AMS Contemporary Math.* 426 (March 2007), 339–404.
- (158) Sharp regularity of hyperbolic-dominated thermoelastic systems with point control: The hinged case, *J. Math. Anal. & Appl.*, 333 (2007), 530–542.
- (159) The coupled PDE-system arising in fluid-structure interaction. Part I: Explicit semigroup generator and its spectral properties (with G. Avalos), *AMS Contemporary Mathematics, Fluids and Waves* 440 (2007), 15–55.
- (160) Sharp regularity of hyperbolic-dominated thermoelastic systems with point control: The clamped case, *Discr. & Cont. Dynam. Systems* 2007(special) (September 2007), 993–1004.
- (161) Local exponential stabilization strategies of the Navier-Stokes equations, $d = 2, 3$, via feedback stabilization of its linearization (with V. Barbu and I. Lasiecka), *Optimal Control of Coupled Systems of Partial Differential Equations*, Oberwolfach, Birkhauser ISNM 155 (2007), 13–46.
- (162) Exact controllability in $L_2(\Omega)$ of the Schrödinger equation in a Riemannian manifold with $L_2(\Sigma_1)$ -Neumann boundary control (invited paper) in: *Functional Analysis and Evolution Equations* (2007), 613–636. Special volume dedicated to the memory of Günter Lumer; H. Amann, W. Arendt, J. von Below, M. Hieber, F. Neubrander, and S. Nicaise, editors, Birkhäuser Verlag.
- (163) The role of an $L_2(\Omega)$ -energy level estimate in the theories of uniform stabilization and exact controllability for Schrödinger equations with Neumann boundary control, *Bol. Soc. Paran. Math.* 25(1–2) (2007), 109–138. Invited paper, Inter. Conference on PDEs, State University of Maringa, Brazil, September 2007.
- (164) Mathematical analysis of PDE systems which govern fluid-structure interaction (with G. Avalos), *Bol. Soc. Paran. Math.* 25(1–2) (2007), 109–138. Invited paper, Inter. Conference on PDEs, State University of Maringa, Brazil, September 2007.

- (165) The critical case of clamped thermoelastic systems with interior point control: Optimal interior and boundary regularity results, *J. Diff. Eqns.* 245(12) (2008), 3764–3805.
- (166) Uniform stabilization of a coupled PDE system arising in fluid-structure interaction with boundary dissipation at the interface (with G. Avalos), *Discr. & Cont. Dynam. Systems*, 22(4) (2008), 817–833 (invited paper).
- (167) Backward uniqueness of the s.c. semigroup arising in parabolic-hyperbolic fluid-structure interaction (with G. Avalos), *J. Diff. Eqns.* 245(3) (2008), 737–761.
- (168) Backward uniqueness of the C_0 -semigroup associated with a parabolic-hyperbolic coupled Stokes-Lamé PDE system (with G. Avalos), *AMS Transactions*, 29 pages, to appear.
- (169) Higher regularity of a coupled parabolic-hyperbolic fluid-structure interactive system (with G. Avalos and I. Lasiecka), invited paper, special issue of *Georgian Mathematical Journal* 15(3) (2008), 403–437; dedicated to the memory of J. L. Lions; J. Mawhin, editor.
- (170) Linear hyperbolic and Petrowski-type PDEs with continuous boundary control \rightarrow boundary observation open loop map: Implications on nonlinear boundary stabilization with optimal decay rates (with I. Lasiecka), 187–276. Invited paper in *Sobolev Spaces in Mathematics: Applications of Functional Analysis in Mathematical Physics*, International Mathematical Series, Vol. 8, Springer Verlag (2008), dedicated to the centenary of Sergey Sobolev.
- (171) A hidden gain of regularity on the strongly damped abstract wave equation: Implications on the nonlinear model, invited paper in *Advances in Theory, Methods and Applications in Dynamics and Control*, a felicitation volume in honor of A. V. Balakrishnan, Cambridge, to appear in 2009.
- (172) Uniform energy decay rates of hyperbolic equations with nonlinear boundary and interior dissipation (with I. Lasiecka), invited paper for special issue C&C, *Control Journal of Polish Academy of Sciences* in honor of J. P. Zolesio, 37(4) (2008), 932–966.
- (173) Linear independence of boundary traces of eigenfunctions of elliptic and Stokes Operators and applications, invited paper for special issue, *Applicationes Mathematicae* 35(4) (2008), 481–512, Institute of Mathematics, Polish Academy of Sciences.
- (174) Semigroup well-posedness in the energy space of a parabolic-hyperbolic coupled Stokes-Lamé PDE system (with G. Avalos), *Discr. & Cont. Dynam. Systems DCDS-S* 2(3) (2009), 417–448.
- (175) Boundary feedback stabilization of a coupled parabolic-hyperbolic Stokes-Lamé PDE system (with G. Avalos), *J. Evol. Eqns.* 9 (2009), 341–370.
- (176) Unique continuation from an arbitrary interior subdomain of the variable-coefficient Oseen equation, *Nonlinear Analysis, Theory, Meth. & Appl.* 17 (2009), 4967–4976.
- (177) Beyond lack of compactness and lack of stability of a coupled parabolic-hyperbolic fluid-structure system (with G. Avalos and I. Lasiecka), *International Series of Numerical Mathematics*, Vol. 158, Birkhäuser Verlag, Basel, Switzerland (2009), pp. 1–33 (Oberwolfach Conference).
- (178) Unique continuation of boundary over-determined Stokes and Oseen eigenproblems, *Discr. & Cont. Dynam. Systems, DCDS-S* (invited paper) 2(3) (2009), 645–678.

- (179) Optimal regularity and optimal control of thermoelastic structural acoustic model with point control and clamped boundary conditions (with C. Lebiedzik), 41 pages, invited paper, special issue C&C, Control Journal of Polish Academy of Sciences entitled, “50 Years of Optimal Control Theory,” to appear.
- (180) Min-max game theory and non-standard differential Riccati equations under singular estimates for $e^{At}B$ and $e^{At}G$ in the absence of analyticity (with J. Zhang), *Set-Valued and Variational Analysis*, Springer-Verlag, Vol. 17 (2009), 245–283.
- (181) A coupled parabolic-hyperbolic Stokes-Lamé PDE system: Limit behavior of the resolvent operator on the imaginary axis (with G. Avalos), *Applicable Analysis*, to appear, 45 pages.
- (182) Uniform stabilization with arbitrary decay rates of the Oseen equation by finite-dimensional tangential localized interior and boundary controls (with I. Lasiecka), preprint 2009.

V INVITED TALKS SINCE 1992

1. Invited speaker at specialized session, “Nonlinear Hyperbolic Equations and Control Systems in Physics and Engineering,” annual AMS meeting, San Francisco, January 13–16, 2010.
2. Main one-hour speaker at international conference, “Recent Advances in Mathematical Sciences and Applications RAMSA09,” Visakhapatnam, India, December 19–22, 2009.
3. Invited speaker at specialized session, “SIAM Conference on Analysis of Partial Differential Equations,” Miami, Florida, December 7–10, 2009.
4. Main lecturer of a one-week mini-course at the Winter Semester in Nonlinear Analysis, Mathematics Institute of the Federal University of Rio de Janeiro, Brazil, Aug. 3–8, 2009.
5. Invited speaker at specialized session IFIP Conference on Systems Modelling and Optimization, Buenos Aires, Argentina, July 27–31, 2009.
6. Invited speaker at specialized session at ISAAC (International Society of Applied Analysis and Computation), Imperial College, London, July 13–16, 2009.
7. Invited speaker at International Conference on Nonlinear Parabolic Problems, in honor of H. Amann, May 10–16, 2009, Banach Center, Bedlewo, Poland.
8. Invited speaker, Special Session on Nonlinear Partial Differential Equations, AMS meeting, San Francisco State University, April 25–26, 2009.
9. Invited speaker, Workshop in honor of Professor A. V. Balakrishnan, University of California, Los Angeles, Jan. 30–31, 2009.
10. Invited speaker at Specialized Session, AMS Meeting, Western Michigan University, Kalamazoo, October 17–19, 2008.
11. Invited speaker, International Workshop, “Direct, Inverse and Control Problems for PDEs,” Cortona, Italy, September 22–27, 2008.
12. Invited speaker at International Conference, “50 Years of Optimal Control,” Banach Center, Poznan, Poland, September 15–22, 2008.

13. Invited speaker at International Workshop on Partial Differential Equations, Institute of Mathematics, Federal University of Rio de Janeiro, Brazil, August 26–29, 2008.
14. Invited speaker, Special Session “Control, Stabilization, and Long-Time Behavior of Nonlinear Evolutionary PDE Systems,” at 5th World Congress in Nonlinear Analysis, July 2–9, 2008.
15. Invited speaker, Special Session “Control and Optimization in PDEs,” International Conference “Differential Equations and Topology,” in commemoration of the 100th anniversary of L. S. Pontryagin (1908–1988), Moscow, Russia, June 17–22, 2008.
16. Invited speaker (and organizer) at AIMS International Conference on “Dynamical Systems, Differential Equations and Applications, University of Texas, Arlington, May 18–21, 2008.
17. Invited speaker, International Workshop Optimal Control of Coupled Systems of PDEs, Oberwolfach, Germany, March 2–8, 2008.
18. Seminar, Scuola Normale Superiore, Pisa, Italy, March 10, 2008.
19. Colloquium talk, SUNY at Binghamton, November 15, 2007.
20. Colloquium talk, Wichita State University, November 2, 2007.
21. Invited speaker, International Conference on Partial Differential Equations, State University of Maringó, Brazil, Sept. 3–7, 2007.
22. Invited speaker, VI Workshop on Partial Differential Equations, Rio de Janeiro, August 28–31, 2007.
23. Invited speaker, International Conference on Theoretical and Numerical Fluid Mechanics, Vancouver, Canada, August 13–17, 2007.
24. Invited speaker, First AMS-PTM Joint Meeting, Special Session on “Control and Optimization of Nonlinear PDE Systems,” Warsaw, Poland, July 31–August 3, 2007.
25. Invited speaker, Specialized Session on “Control and Optimization of Nonlinear Evolutionary PDE Systems,” 23rd IFIP TC7 Conference, Cracow, Poland, July 23–27, 2007.
26. Invited speaker, International Workshop on “Direct, Inverse and Control Problems for PDEs,” Naticonal Institute of Higher Mathematics (INDAM), University of Rome, Italy, June 25–28, 2007.
27. Invited talk, Seminar in Partial Differential Equations, U. of Nebraska, Lincoln, March 2007.
28. Invited main speaker, First World Congress in Applied Mathematics, Lima, Peru, Jan. 7–14, 2007.
29. Invited main speaker at conference, Advances in Control of Partial Differential Equations, Univ. of Maryland, Baltimore County, Oct. 28–29, 2006.
30. Invited speaker, International Conference on Applied Analysis and Differential Equations, U. of Iasi, Romania, September 2006.
31. Invited speaker, International Conference on Inverse and Direct Problems, U. of Bologna, Italy, September 2006.
32. Invited speaker at two specialized sessions, International Conference on Differential Equations and Dynamical Systems, Poitiers, France, July 2006.

33. Invited speaker, International Conference on Nonlinear Problems in Mathematical Physics, Ankara (Turkey), end of April 2006.
34. Invited speaker, AMS meeting, Specialized Session on Harmonic Analysis and PDEs, Miami, FL, April 2006.
35. Invited speaker at International Conference on Inverse and Control Problems for PDEs, March 13–17, 2006, Rome, Italy.
36. Math Colloquium, U. of Nebraska, Lincoln, March 3, 2006.
37. Invited main speaker (50 min) at International Conference on Evolution Equations with Applications, in memory of G. Lumer; Luminy (near Marseille), France, October 24–28, 2005.
38. Invited main speaker (50 min) at International Conference in Differential Equations, Florida Technological Institute, Melbourne, FL, August 4–8, 2005.
39. Main speaker (50 min), AMS-IMS-SIAM Summer Research Conference, Snowbird Resort, Utah, July 2–7, 2005.
40. Invited speaker at Workshop on Inverse Problems, U. of North Carolina, Charlotte, June 3–6, 2005.
41. Main invited speaker (50 min) at IFIP Conference in “Free and Moving Boundaries,” Math Department, University of Houston, Dec. 2–6, 2005.
42. Invited speaker (2 specialized sessions) International Conference in Differential Equations and Dynamical Systems, Pomona College, California, June 2004.
43. Invited speaker, AMS Conference, Specialized Session on Evolution Equations, Bowling Green, Kentucky, March 2004.
44. Invited speaker at International Workshop, Scuola Normale Superiore, Pisa, Italy, Feb. 26–28, 2004.
45. Twelve-hour lectures delivered at Winter School on Transport Equation and Control Theory for PDEs, Bressanone, Italy, Jan. 12–17, 2004.
46. Main speaker at International Conference on PDEs, Iguassu Falls, Brazil, Dec. 16–19, 2003.
47. Main plenary speaker and invited speaker at specialized session 21st IFIP Conference on Systems Analysis and Optimization, Sophia Antipolis, France, July 21–25, 2003.
48. Invited speaker at specialized session, 5th Romannian Congress of Mathematicians, University of Pitesti, Romania, June 2003.
49. Main speaker at Conference Control Theory for Partial Differential Equations, Georgetown University, on the occasion of the retirement of J. Lagnese, May 30–June 1, 2003.
50. Invited speaker at Mittag-Leffler Institute, Semester on Mathematical Control and System Theory, February 2003.
51. Main speaker, University of Minnesota, September 21–22, 2002.
52. Main speaker at International Conference in Analysis and Optimization of Differential Systems, Ovidius University, Constanta, Romania, September 9–14, 2002.

53. Invited speaker at specialized session, SIAM Conference, Philadelphia, Pennsylvania, July 8–12, 2002.
54. Invited speaker at two specialized sessions of the First American Math Society–Italian Math Society Meeting, Pisa, Italy, June 11–16, 2002.
55. Colloquium, Math. Department, University of Brescia, Italy, May 2002.
56. Main speaker at conference, Evolution Equations and Applications, held at Cortona, Italy, April 15–19, 2002.
57. A few lectures on geometric methods in control of PDEs, Scuola Normale Superiore, Pisa, Italy, April–May 2002.
58. Main invited address, Amer. Math. Soc. meeting, Chattanooga, TN; October 5–6, 2001.
59. Main speaker at SOTA2 (Semigroup of Operators, Theory and Applications), Rio de Janeiro, Brazil, September 8–14, 2001.
60. ISAAC Conference, invited speaker at specialized session, Berlin, Germany, August 20–25, 2001.
61. Main speaker, Institute of Mathematics and its Applications, University of Minnesota, July 2001.
62. Invited speaker, International Conference on Inverse and Direct Problems, Gargnano, Italy, April 1–6, 2001.
63. Invited speaker, Workshop on Control Theory of Partial Differential Equations, University of Nebraska, Lincoln, NE, April 2001.
64. Invited speaker, specialized session at American Mathematical Society meeting, University of Kansas, April 2001.
65. Conference on Differential Equations (main speaker) in memory of Brunello Terreni, University of Milano, Italy, September 28–29, 2000.
66. IMACS, Lausanne, Switzerland, August 2000.
67. Control of Partial Differential Equations, Oberwolfach, Germany, June 2000.
68. IFIP Conference on Control of Distributed Systems (main speaker), Ekaterinburg, Russia, June 2000.
69. International Workshop on Differential Equations and Optimal Control (main speaker), Ohio University, May 2000.
70. AMS Annual Meeting, Specialized Session on Geometric Methods in Control of PDE's, Washington, DC, January 2000.
71. Control of Nonlinear Distributed Parameter Systems (main speaker), Texas A&M, October 22–24, 1999.
72. AMS Meeting at U. of North Carolina at Charlotte (invited speaker at specialized session), October 16–17, 1999.
73. Invited speaker at NSF-CBM Conference, University of Nebraska, Lincoln, August 4–9, 1999.

74. IFIP Conference, Cambridge University, England (invited speaker at specialized session), July 12–16, 1999.
75. ICIAM 1999, Edinburgh, Scotland (invited speaker at specialized session), July 5–9, 1999.
76. Differential Geometric Methods in the Control of PDE, University of Colorado, Boulder (main speaker), June 27–July 2, 1999.
77. AMS Meeting at University of Nevada, Las Vegas (invited speaker at specialized session), April 10–11, 1999.
78. First International Conference on Semigroups of Operators: Theory and Applications (main speaker), Los Angeles, December 14–18, 1998.
79. Third International Symposium on Methods and Models in Control Theory, Miedzyzdroje, Poland, August 1998.
80. Seminar lectures at Scuola Normale Superiore, Pisa, Italy, July 1998.
81. IFIP Conference, Zhejiang University, Hangzhou, China, June 1998.
82. Nonlinear Problems in Avionics, Embrie-Riddle, May 1998, Daytona Beach, Florida.
83. IFIP Conference, Chemnitz, Germany, April 1998.
84. CIMAT International Conference on Dynamics and Control of PDE, Mexico, November 29–30, 1997.
85. Fourth International Symposium on Methods and Models in Control Theory, Miedzyzdroje, Poland, August 1997.
86. ERP Conference (Session: Modeling, Analysis and Control of Partial Differential Equations), Detroit, July 1997.
87. The International Society for Analysis, its Applications and Computations (ISAAC), University of Delaware, June 1997.
88. Series of lectures on A-priori Inequalities for Hyperbolic and Petrowski-type Partial Differential Equations, Scuola Normale Superiore, Pisa, Italy, June 1997.
89. Conference in INRIA, Paris, France, May 1997, in honor of R. Glowinski.
90. Mathematics, Modeling and Control for Smart Materials and Structures, San Diego, California, March 1997.
91. IFIP Conference Optimal Control Theory: Theory, Algorithms, and Applications, Mathematics Department, University of Florida, Gainesville, FL, February 1997.
92. Fifth International Conference on Evolution Equations, Hiroshima, Japan, October 27–31, 1996.
93. International Workshop on Boundary Control and Inverse Problems, Euler Institute of Mathematics, St. Petersburg, Russia, July 1996 (declined).
94. International Workshop on Control and Estimation of Partial Differential Equations, Vorau, Austria, July 1996 (declined).

95. Second World Contress in Non-Linear Analysis, (Two 1-hour invited talks), Athens, Greece, July 1996.
96. International Conference in Applied Analysis, University of the Aegean, Mathematics Department, Samos Island, Greece, July 1996.
97. Mathematical Theory of Systems, St. Louis, Missouri, June 1996.
98. AMS Summer Research Conference on Optimization Methods for Partial Differential Equations, Mount Holyoke College, Massachusetts, June 1996.
99. First International Conference on Nonlinear Problems in Avionics and Aerospace, Embry-Riddle Aeronautical University, Daytona Beach, FL, May 9–11, 1996.
100. Colloquium, Mathematics Department, George Mason University, Fairfax, VA, March 1996.
101. Colloquium, Mathematics Department, Virginia Polytechnic Institute and State University, Blacksburg, VA, March 1996.
102. 1995 SIAM Annual Conference, Charlotte, NC, October 1995.
103. Third European Control Conference, Rome, Italy, September 1995.
104. IMP Workshop on Modeling and Optimization for Partial Differential Equations, Warsaw, Poland, July 1995.
105. IFIP Conference, Prague, Czech Republic, July 1995.
106. ICIAM (International Conference of Industrial and Applied Mathematics), Hamburg, Germany, July 1995.
107. Colloquium, University of Minnesota, Minneapolis, March 1995.
108. 4th International Conference on Evolution Equations, Scuola Normale Superiore, Pisa, Italy, September 1994.
109. IFIP Conference on Control Theory of Partial Differential Equations, Laredo, Spain, September 1994.
110. Institute of Applied Analysis, Picone, Rome, June–July 1994.
111. 4th International Colloquium on Differential Equations, Bulgaria, August 1994.
112. Conference on Control Theory for Partial Differential Equations and Applications, Virginia Polytechnic Institute, April 1994.
113. IFIP Conference, Boundary Control and Boundary Variation, Rabot, Morocco, December 1993 (declined).
114. Third International Colloquium on Differential Equations, Bulgaria, August 1993.
115. Plenary Speaker, IFIP Conference, Control of Partial Differential Equations, Compiègne, France, July 1993.
116. Colloquium, Mathematics Department, Polytechnic of Torino, Italy, July 1993.

117. Colloquium, Mathematics Department, University of Bologna, Italy, July 1993.
118. Colloquium, Scuola Normale Superiore, Pisa, Italy, July 1993.
119. International Conference on Partial Differential Equations, Oberwolfach, Germany, May 1993.
120. School of Mathematics, University of Minnesota, Spring 1993.
121. International Conference on Optimal Control of Differential Equations and Variational Inequalities, Ohio University, March 1993.
122. Special Session at American Mathematical Society Annual Meeting in San Antonio, Texas, January 1993 (declined, being in Europe).
123. International Conference on Partial Differential Equations, Oberwolfach Germany, January 1993 (declined).
124. International Conference on Control Theory for Partial Differential Equations, University of Trento, Italy, January 1993.
125. Series of Lectures, Mathematics Department, University of Trento, October–December 1992.
126. Colloquium, Mathematics Department, University of Pavia, Italy, December 1992.
127. Colloquium, Mathematics Department, University of L'Aquila, Italy, December 1992.
128. Workshop on Control Theory for Partial Differential Equations, Institute of Mathematics and Its Applications, University of Minnesota, November 1992.
129. Special Session at American Mathematical Society Annual Meeting in Dayton, Ohio, October 1992 (declined, being in Europe).
130. SIAM Conference on Control Theory for Differential Equation, Minneapolis, Minnesota, September 1992.
131. First World Congress in Non Linear Analysis, Tampa, Florida, August 1992 (declined, being in Europe).
132. Colloquium, Mathematics Department, University of Torino, Italy, July 1992.
133. Colloquium, Mathematics Department, University of Bologna, Italy, July 1992.
134. Colloquium, Mathematics Department, Scuola Normale Superiore Pisa, Italy, July 1992.
135. International Conference on State Space and Frequency Domain Techniques for Infinite Dimensional Systems, INRIA, France, June 1992.
136. International Workshop in Boundary Control and Boundary Variation, Sophie-Antipolis, France, June 1992.
137. International Conference on Partial Differential Eqts., Oberwolfach Germany, May 1992 (declined).

VI Ph.D. STUDENTS (first employment noted in parenthesis)

Jerry Bartolomeo, Mathematics Department, University of Florida, December 1988; Assistant Professor, Mathematics Department, Nova University, Florida

Norman Ourada, Applied Mathematics Department, University of Virginia, July 1990; NRC Post-Doctoral Fellowship at NASA Langley, Virginia

Daniel Tataru, Applied Mathematics Department, University of Virginia (with I. Lasiecka), May 1991; Assistant Professor, Mathematics Department, Northwestern University

Christine McMillan, Applied Mathematics Department, University of Virginia, May 1993; Instructor, Mathematics Department, MIT

Mehmet Camurdan, Applied Mathematics Department, University of Virginia, May 1999 (Tattersall Advisory Group, First Union)

VII HONORS, AWARDS, AND GRANTS

Grants:

(A) Principal Investigator:

Air Force Office of Scientific Research (AFOSR), Directorate of Mathematical and Information Sciences: AFOSR Grant: 1976–77; 1977–78; 1978–81.

(B) Co-Principal Investigator (with I. Lasiecka):

- (1) National Science Foundation; Division of Mathematical Sciences; Program: Applied Mathematics: NSF Grant: 1981–84; 1984–87; Award: 1985 (partial support for organization of International Conference in “Control Theory for Partial Differential Equations,” held at the University of Florida, February 1986); 1987–89 (Creativity Extension Award); 1987 (Computer Equipment); 1989–92; 1989–92 (Support for Ph.D. Students); 1992–95; 1993–98 (International Exchange Program within U.S.-France Program); 1995–98; 1998–2001; 2001–2006, 2006–2011.
- (2) Air Force Office of Scientific Research (AFOSR), Directorate of Mathematical and Information Sciences: 1984–85; 1985–86; Award 1986 (partial support for organization of International Conference on “Control Theory for Partial Differential Equations,” held at the University of Florida, February 1986); 1986–87; 1987–88; 1988–89; 1989–90; 1990–91; 1991–92; AFOSR Award 1989–93 (University Research Initiative Award); 2009–2012.
- (3) NATO Collaborative Research Grant (with Prof L. Pandolfi, Mathematics Department, Politecnico di Torino, Italy), Mathematics Program: 1994–1997.
- (4) U. S. Army Research Office, Mathematical Sciences: ARO Grant: 1996–1999; 2000–2006.

Awards:

National Science Foundation Creativity Extension Award, Division of Mathematical Sciences, 1987–1989.

University Research Initiative Award, AFOSR, Mathematical Sciences, 1989–93.

Joint AMS-IMS-SIAM Summer Research Conference, “Differential Geometric Methods in the Control of Partial Differential Equations,” University of Colorado, Boulder, July 1999.

Joint AMS-IMS-SIAM Summer Research Conference, “Control Methods in PDE-Dynamical Systems,” Snowbird Resort, Utah, July 2–7, 2005.

ISI's Highly Cited Researcher (one of the 250 most cited mathematicians worldwide for the period 1981–1999).

VIII NATIONAL ACTIVITIES

Special Service to the National Science Foundation:

Colloquium presentation on present status of control theory for partial differential equations before Director and Program Managers of the Mathematical Division of the National Science Foundation, April 1987

Chair of National Panel (Mathematics) for the EPSCOR Project (evaluation of proposals in a national competition among 20 states), April 1987

Special Service to the National Research Council:

Panel member for selection of Doctoral Fellowships, Ford Foundation Program, March 1993, 1994, 1995

Present Associate Editorship:

Associate Editor, *Boundary Value Problems*

Associate Editor, *Journal of Mathematical Analysis and Applications*

Member, Editorial Board, *Applied Mathematics and Optimization*, Springer-Verlag

Member, Editorial Board, *System and Control Letters*

Member, Editor-in-Chief, *Abstract and Applied Analysis*

Member, Editorial Board, *Discrete and Continuous Dynamical Systems, B*

Member, Editorial Board, *Nonlinear Science*

Member of the Editorial Board of other foreign mathematics journals, such as *Bolletim de Sociedade Paranaense de Matematica* (Brazil)

Co-editor (along with G. Kallianpur) of special issue of *Appl. Math. & Optimiz.*, December 2002, in memory of J. L. Lions.

Extensive refereeing of research papers in main international journals in the field of interest; of NSF Proposals (Applied Mathematics and Classical Analysis); of AFOSR Proposals; of NRC of Canada.

IX POST-DOCTORAL FELLOWS

S. Chen, China (1987–88)

S. K. Chang, S. Korea (1996–97)

P. F. Yao, China (1996–97 and 2000–01)

J. Cagnol, France (1999–2000)

F. Bucci, Italy (2000)