

Curriculum Vitae
Dr. Pawel O. Mazur
Professor of Theoretical Physics

Department of Physics and Astronomy
University of South Carolina, Columbia, SC 29208

Telephone: 803-777-7289 (office), 803-777-3065 (fax).

E-mail: mazur@mail.psc.sc.edu, mazur@physics.sc.edu

EDUCATION :

M.S. (Honors), 1978, *Physics*, Jagellonian University, Kraków, Poland

Ph. D. (Honors), 1982, *Theoretical Physics*, Jagellonian University, Kraków, Poland

APPOINTMENTS :

Professor: **(2001 - present)** Department of Physics and Astronomy, University of South Carolina, Columbia,

Associate Professor: **(1994 - 2001)** Department of Physics and Astronomy, University of South Carolina, Columbia,

Assistant Professor: **(1991 - 1994)** Department of Physics and Astronomy, University of South Carolina, Columbia,

Assistant Professor: **(1983 - 1989)** Institute of Physics, Jagellonian University, Kraków, Poland, Department of Theoretical Physics (Gravitation and Astrophysics),

RESEARCH POSITIONS :

(1989 - 1991) Department of Physics, University of California, Los Angeles (UCLA), Senior Research Associate,

(1988 - 1989) University of Florida, Institute for Fundamental Theory, Gainesville, Research Associate,

(1985 - 1988) Department of Physics, Syracuse University, Syracuse, Research Associate,

(1984 - 1985, 1986) Institute for Theoretical Physics (presently KITP), Santa Barbara, Member,

(1982 - 1983) Jagellonian University, Kraków, Poland , Institute of Physics, Department of Theoretical Physics (Gravitation, Astrophysics),

AWARDS :

Directeur Associe de Recherche, C.N.R.S (France), Ecole Polytechnique, March-July 2000,
Second Award, Gravity Research Foundation, Boston, with V. P. Nair, 1988,
Third Award, Gravity Research Foundation, Boston, 1987,
Third Award, Gravity Research Foundation, Boston, 1983.

RESEARCH FUNDING FROM 1984 :

Post-doctoral Research Funded :

ITP, UCSB, Santa Barbara (NSF, NASA)

Syracuse University (NSF)

University of Florida, Gainesville (DOE, NSF)

UCLA, Los Angeles (DOE)

Faculty Research Funded at USC, Columbia, SC: NSF (From 1992)

**SELECTED INVITED TALKS, PLENARY LECTURES, COLLOQUIA,
AND LECTURES AT SCHOOLS ON THEORETICAL PHYSICS :**

Lectures at the Szczyrk School on Theoretical Physics, Poland, 1983,

Lectures at the Stefan Banach Mathematical Center Trimester, Warsaw, Poland, Fall 1983,

Lectures at Universit Catholique de Louvain (UCL), May-June 1984,

Lectures at Institute of Theoretical Physics, Bern University, Switzerland, July-August 1984; Lecture in 2000,

Pacific Coast Relativity Conference, invited talk, California Institute of Technology, 1985,

1st Conference on Classical and Quantum Gravity, invited talk, Syracuse, 1985,

University of Texas, Austin, seminars (April 1985, 1994),

Plenary Session Lecture, Fourth Marcel Grossmann Meeting, Rome, Italy, 1985,

University of Chicago, seminars (April 1985, 1987, 1988, February 1989, 1991)

University of Maryland, September 1985, January 1988,

University of Georgia, Athens, Colloquium, March 1986,

Plenary Session Lecture, GR 11 Conference, Stockholm, Sweden, 1986,

Lectures at Max Planck Institute for Physics and Astrophysics, Munich/Garching, July-August, 1986,

Yale University, Colloquia, December 1987, January 1988, seminars (1985, 1986),

Brown University, seminar, August 1988,

University of Wisconsin, Milwaukee, Colloquium, September 1988,

14th Texas Symposium on Relativistic Astrophysics, invited talk, Dallas, December 1988,

FERMILAB, Batavia, seminars (1987, 1988, 1989, 1991),

University of North Carolina, Chapel Hill, Colloquium, January 1989,

Pacific Coast Relativity Conference, invited talk, California Institute of Technology, 1989,

University of California, UCSB, Santa Barbara, seminars (1984, 1985, 1990, 1991),

PASCOS 1990, Northeastern University, Boston,

Northeastern University, Boston, seminar, 1990,

Princeton University, seminar, April 1990,

Institute for Advanced Studies (IAS), Princeton, seminar, April 1990,

Santa Fe (LANL) Meeting on "Baryon and Lepton Non-conservation at High Energies", invited talk, Santa Fe, 1991,

Lectures at the Spanish Summer Summer School, the 23rd GIFT Seminar on Theoretical Physics, San Feliu Guixols, Spain, 1991,

Warsaw University, Warsaw, Poland, Colloquia (1982,1983), seminars (1991,1993,1994,1996),

Plenary Session Lecture, Conference on Fundamental Aspects of Quantum Theory, USC, Columbia, 1992, (Professor Yakir Aharonov's Festschrift, 60th Birthday),

Lectures at the Nordic Meeting on High-Energy Particle Physics, Spatind, Norway, 1994,

Lectures at the 34th Cracow Summer School on Theoretical Physics, Zakopane, Poland, 1994,

Tufts University, Medford, MA, seminars (1994,1997, 1998,1999, 2001, 2004),
 Ecole Polytechnique, Paris, seminars (1992, 1994, 1996, 1998, 2000),
 Lecture at L'Observatoire de Paris, Meudon, 1996,
 S. Chandrasekhar Memorial Conference, University of Chicago, December 1996,
 California Institute of Technology, seminars, Pasadena, 1991, 1996, 2004,
 Beyond the Standard Model V, invited talk, Balholm, Norway, 1997,
 Quantum Black Hole, Spinoza Meeting, Utrecht, Netherlands, 1998,
 19th Texas Symposium on Relativistic Astrophysics, Paris, France, 1998,
 Conference 25eme Anniversaire du LPT-ENS, Paris, France, 2000,
 Nuclear Physics Institute, Bronowice, Poland, Colloquium (July 2000),
 Lecture at the World Space Congress 2002: 34th COSPAR Scientific Assembly, Houston, October 2002,
 CMD19CMMP, 19th Condensed Matter Division Conference of the European Physical Society, invited talk, Brighton, England, April 2002,
 ESO, Colloquium, Garching, Germany, April 2002,
 CERN, seminar, Geneva, Switzerland, April 2002,
 Lecture at COSLAB Workshop, Bilbao, Spain, July 2003,
 Syracuse University, seminar(s), April 2004, (many seminars, 1985 - 1988, and in 1990),
 JPL (NASA), Colloquia, Pasadena, 2004, 2006,
 Stanford University (SLAC), seminar, October 2004,
 UCLA, Los Angeles, seminars, February 1989, 1990 (three), 1991 (three), February 1996, March 2006,
 KITP (UCSB), 22nd Pacific Coast Gravity Meeting, invited talk, Santa Barbara, March 2006,
 MIT, 9th Eastern Gravity Meeting, invited talk, Cambridge, March 2006,
 Santa Fe Meeting on Supermassive Black Holes, invited talk, Santa Fe, July 2006,
 Los Alamos National Laboratory, Los Alamos, New Mexico, many seminars over the years between 1987 and now (at least 10), with the most recent one in June 2006,
 Jagellonian University, Krakow, Poland, many Colloquia and seminars over the years, with the most recent one in December 2006,
 University of South Carolina, Columbia, many Colloquia over the years (at least 10), with the most recent one on April 26th, 2007,
Lecture at 11th Marcel Grossmann Meeting, Chair and Organizer of a Conference Session
 "Alternative Models of Black Holes", Berlin, July 2006,
Invited co-organizer of the first International Workshop "Condensed Matter Meets Gravity" on emergent gravitation in the Lorentz Center, Leiden University, Leiden, Netherlands, August 2007.

PUBLICATIONS :

In the list below I did not include most of the contributed abstracts to conferences where I gave lectures

"Gravitating Macroscopic Quantum Objects and Their Thermal Properties", to be published in the Proceedings of the *10th Marcel Grossmann Meeting On Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories, July 23-29, 2006, Berlin, Germany*, ed. H. Kleinert, R. Ruffini, and R. Jantzen, (World Scientific, 2007), 20pp. .

“Cosmological Dark Energy and Gravitational Condensate Stars”, to be published in the Proceedings of the *10th Marcel Grossmann Meeting On Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories, July 23-29, 2006, Berlin, Germany*, ed. H. Kleinert, R. Ruffini, and R. Jantzen, (World Scientific, 2007), 8pp., (with E. Mottola).

“Quantum Theory and the Nature of Gravitation”, published in **Quantum Leap**, *Fall 2004 issue, Department of Physics and Astronomy, University of South Carolina*, [astro-ph/0701270].

“Cosmological Dark Energy: Prospects for a Dynamical Theory”, *New J. Phys.* **9**, 11 (2007), published in *Focus Issue of New Journal of Physics on Dark Energy*, [gr-qc/0612068], (with I. Antoniadis and E. Mottola).

“Information Storage in a Quantum Critical Layer”, to appear (2007), (with G. Chapline and S. Rowley).

”Dark Energy and Condensate Stars: A Quantum Alternative to Classical Black Holes”, in Proceedings of *10th Marcel Grossmann Meeting On Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories, July 20-26, 2003, Rio de Janeiro, Brazil*, ed. M. Novello, S. P. Bergliaffa, R. Ruffini, (Hackensack, World Scientific, 2005), vol. 2, pp. 1041-1047 (2006).

“Tommy Gold Revisited: Why Does not the Universe Rotate?”, *AIP Conf. Proc.* **822**, 160-165 (2006); in *Moncao 2005, “Crisis in Cosmology Conference”*, [astro-ph/0509230], (with G. Chapline).

“Gravitational Vacuum Condensate Stars”, *Proc. Nat. Acad. Sci.* **101**, 9545-9550 (2004) (with E. Mottola).

“Superfluid Picture for Rotating Space-Times”, [gr-qc/0407033], (with G. Chapline).

“Dark Energy and Condensate Stars: Casimir Energy in the Large”, published in ‘*Norman 2003*’, *6th Workshop on Quantum Field Theory under the Influence of External Conditions*, pp. 350-357, [gr-qc/0405111], *Proceedings of QFEXT03, ed. K. A. Milton, Rinton Press, Princeton, 2004*, (with E. Mottola).

“De Sitter Invariant Vacuum States, Vertex Operators, and Conformal Field Theory Correlators, [hep-th/0301023] (with A. Casher and A. J. Staruszkiewicz).

“Weyl Cohomology and the Effective Action for Conformal Anomalies”, *Phys. Rev.* **D64**, 104022 (2001) (with E. Mottola).

“Gravitational Condensate Stars: An Alternative to Black Holes”, preprint LA-UR-01-5067, [gr-qc/0109035], (with E. Mottola), submitted to *Physical Review Letters*, unpublished.

“Black Hole Uniqueness Theorems”, an online Review Article, [hep-th/0101012].

“On the Theta Term in Electrodynamics”, [hep-th/9809205], unpublished, (with A. Staruszkiewicz).

“Fractal Geometry of Quantum Space-Time at Large Scales”, *Phys. Lett.* **B444**, 284-292 (1998), (with I. Antoniadis and E. Mottola).

BOOK REVIEW: “Black Hole Uniqueness Theorems”, by Markus Heusler, *General Relativity and Gravitation*, Volume 30, Number 4, April 1998, pp. 675-677(3).

“Comment on ‘Non-gaussian isocurvature perturbations from inflation’.”, [astro-ph/9705200], (with I. Antoniadis and E. Mottola), unpublished.

“Toward the New Gravitational Noncommutative Mechanics and Statistical Mechanics of Quantum Black Holes”, [hep-th/9801068], *Published in *Jerusalem 1997, Recent Developments in Theoretical and Experimental General Relativity, Gravitation, and Relativistic Field Theories, Pt.B**, pp. 989-991, ed. T. Piran, (World Scientific, 1999).

“On Gravitation and Quanta”, [hep-th/9712208], *Slightly extended version presented at the 8th Marcel Grossmann Meeting of Recent Developments in Theoretical and Experimental General Relativity, Gravitation and Relativistic Field Theories (MG 8), Jerusalem, Israel, 22-27 Jun 1997.*

“Gravitation as a Many Body Problem”, in *Balholm 1997, Beyond the Standard Model 5*, ed. G. Eigen, P. Osland and B. Stugu, AIP Proceedings **415**, 299-305 (1997), [hep-th/9708133].

“The Quantum Black Hole Specific Heat Is Positive”, [hep-th/9704179], (with A. Z. Górski), unpublished.

“Conformal Invariance and Cosmic Background Radiation”, Phys. Rev. Lett. **79**, 14-17, (1997), (with I. Antoniadis and E. Mottola).

“Criticality and Scaling in 4D Quantum Gravity”, Phys. Lett. **B394**, 49-56 (1997), (with I. Antoniadis and E. Mottola).

“Gravitation, the Quantum, and Cosmological Constant”, Acta Phys. Polon. **B27**, 1849-1858 (1996).

“On the Quantum Theory of Gravitating Particles”, Acta Phys. Polon. **B26** 1685 (1995).

“Physical States of the Quantum Conformal Factor”, Phys. Rev. **D55**, 4770-4784 (1997), (with I. Antoniadis and E. Mottola).

“Quantum Diffeomorphisms and Conformal Symmetry”, Phys. Rev. **D55**, 4756-4769 (1997), (with I. Antoniadis and E. Mottola).

“Scaling Behavior of Quantum Four - Geometries”, Phys. Lett. **B323**, 284 (1994), [arXiv:hep-th/9301002], (with I. Antoniadis and E. Mottola).

“Geometric Phase for the Relativistic Klein-Gordon Equation”, Phys. Lett. **A173**, 116 (1993), (with J. Anandan).

“Conformal Symmetry and Central Charges in Four-Dimensions”, Nucl. Phys. **B388**, 627-647 (1992), (with I. Antoniadis and E. Mottola).

“Generating a Hot Big Bang as a Quantum Fluctuation”, Int. J. Mod. Phys. **A6**, 4041 (1991), (with H. E. Kandrup).

“Quantum Gravitational Measure for Three Geometries”, Phys. Lett. **B262**, 405 (1991), [arXiv:hep-th/9701033].

“Gravitational Scattering on a Global Monopole”, Phys. Rev. **D44**, 1317 (1991), (with J. Papavassiliou).

“Quantum Gravitational Measure for Three Geometries”, Phys. Lett. **B262**, 405-410 (1991).

“Effects of Fermion Back Reaction on Instantons”, Nucl. Phys. **B352**, 507-527 (1991), (with K-I. Aoki).

“The Gravitational Measure, Solution of the Conformal Factor Problem and Stability of the Ground State of Quantum Gravity”, Nucl. Phys. **B341**, 187-212 (1990), (with E. Mottola).

“Generating a Hot Big Bang”, Mod. Phys. Lett. **A5**, 1471 (1990), also preprints UCLA-90-TEP-27, UFIFT-AST-89-6, May 1990, 10pp., Presented at 14th Texas Symposium on Relativistic Astrophysics, Dallas, Texas, 11-16 Dec 1988, (with H. E. Kandrup).

“Back Reaction in Fermion Number Violating Processes,” preprint UCLA-90-TEP-26, (April 1990), 11pp., *Presented at Santa Fe Workshop, “Baryon Number Violation at the SSC?”, Santa Fe, NM, April 27-30, 1990*, published in the proceedings, ed. Michael Mattis and Emil Mottola, (World Scientific 1990), (with K. Aoki).

“Nonperturbative Instability of Black Holes in Quantum Gravity”, Mod. Phys. Lett. **A4**, 1497 (1989), [arXiv:gr-qc/9709079].

“An Interacting Geometry Model and Induced Gravity”, Gen. Rel. Grav. **21**, 651 (1989), [arXiv:hep-th/9612135], (with V. P. Nair), Gravity Research Foundation Essay for 1988, 2nd Prize.

“ A Topological Hawking Effect”, Mod. Phys. Lett. **A4**, 1189 (1989), (with H. E. Kandrup).

“Are There Topological Black Hole Solitons in String Theory?”, Gen. Rel. Grav. **19**, 1173 (1988), [arXiv:hep-th/9612197], Gravity Research Foundation Essay for 1987, 3rd Prize.

- “Cobordisms and Semiclassical Instability of Toroidal Compactifications”, Nucl. Phys. **B294**, 525 (1987).
- “BRST Structure of General Relativity in Terms of New Variables”, Phys. Rev. **D36**, 2955 (1987), (with A. Ashtekar and C. G. Torre).
- “Mazur Replies to ‘Comment on ‘Spinning Cosmic Strings and Quantization of Energy’.’”, Phys. Rev. Lett. **59**, 2380 (1987).
- “Stationary Axisymmetric Kaluza-Klein Black Hole”, J. Math. Phys. **28**, 406 (1987), (with L. Bombelli).
- “Strings in QCD and Theta Vacua”, Nucl. Phys. **B284**, 146 (1987), (with V. P. Nair).
- “Black Hole Uniqueness Theorems”, in *STOCKHOLM 1986, PROCEEDINGS OF GR11, GENERAL RELATIVITY AND GRAVITATION*, pp. 130-157.
- “Spinning Cosmic Strings and Quantization of Energy”, Phys. Rev. Lett. **57**, 929-932 (1986).
- “Induced Angular Momentum on Superconducting Cosmic Strings”, Phys. Rev. **D34**, 1925 (1986).
- “Spontaneous Breaking of De Sitter Symmetry by Radiative Effects”, Nucl. Phys. **B278**, 694 (1986), (with E. Mottola).
- “Static Solutions in D=3 Einstein-Maxwell Theory”, Class. Q. Grav. **2**, L51-L56 (1985), (with Stanley Deser).
- “Harmonic Maps and Uniqueness of Axisymmetric Monopole Solutions”, Phys. Lett. **A109**, 429 (1985), (with E. Richter).
- “SU(3) Extension of the Skyrme Model”, Phys. Lett. **B147**, 137-140 (1984) (with M. A. Nowak, M. Przaszłowicz).
- “A Global Identity for Nonlinear Sigma Models”, Phys. Lett. **A100**, 341 (1984).
- “A Relationship Between the Electro-vacuum Ernst Equations and Nonlinear Sigma Model”, Acta Phys. Polon. **B14**, 219 (1983).
- “Black Hole Uniqueness From a Hidden Symmetry of Einstein’s Gravity,” Gen. Rel. Grav. **16**, 211 (1984), Gravity Research Foundation Essay for 1983, 3rd Prize.
- “Proof of Uniqueness of the Kerr-Newman Black Hole Solution”, J. Phys. **A15**, 3173-3180 (1982).
- “Second Order Phase Transitions in Black Hole Thermodynamics”, J. Phys. **A13**, 1113-1120 (1980), (with L. M. Sokolowski).

UNPUBLISHED REPORTS/PREPRINTS :

- “Gravitational condensate stars: An alternative to black holes”, LA-UR-01-5067, Sep. 2001. 4pp., (with Emil Mottola, Los Alamos).
- “On the Theta term in electrodynamics”, Sep. 1998. 6pp.,(with Andrzej Staruszkiewicz, Jagiellonian U.).
- “Comment on ‘NonGaussian isocurvature perturbations from inflation’,” USC-TH-97-03, May 1997, 10pp., (with Ignatios Antoniadis, Ecole Polytechnique, and Emil Mottola, Los Alamos).
- “The Quantum black hole specific heat is positive”, USC-TH-97-02, Apr. 1997, 4pp., (with Andrzej Z. Gorski, South Carolina U. and Cracow, INP).
- “Topology change and non-perturbative instability of black holes in quantum gravity”, Dec. 1996, 17pp. e-Print Archive: hep-th/9612136.
- “Geometric Phase for the Relativistic Klein-Gordon Equation”, preprint USC-92-0493 (SOUTH-CAROLINA), October 1992, 10pp., (with J. Anandan).
- “Quantum gravitational measure for three geometries”, UCLA-90-TEP-72, Dec. 1990, 17pp. .

“Gravitational scattering on a global monopole”, UCLA-90-TEP-49, Jul. 1990, 9pp., (with Joannis Papavassiliou, UCLA).

“Generating A Hot Big Bang”, UCLA-90-TEP-27, UFIFT-AST-89-6, May 1990. 10pp., (with Henry E. Kandrup, Florida U. and Oakland U.).

“Back reaction in fermion number violating processes”, UCLA-90-TEP-26, Apr. 1990, 11pp., (with Kenichiro Aoki, UCLA).

“Effects Of Fermion Back Reaction On Instantons”, UCLA-89-TEP-67, Jan, 1990, 26pp., (with Kenichiro Aoki, UCLA).

“Absence of Phase in the Sum Over Spheres”, preprint LA-UR-89-2118, (June 1989), 10pp., unpublished, (with E. Mottola).

“The Gravitational Measure, Solution Of The Conformal Factor Problem And Stability Of The Ground State Of Quantum Gravity”, UFIFT-AST-89-3, LA-UR-89-340, Jan. 1989, 37pp., (with Emil Mottola, Los Alamos).

“Nonperturbative Instability Of Black Holes In Quantum Gravity”, UFTP-89-01, Jan. 1989, 17pp. .

“A Topological Hawking Effect”, UFTP-88-14, Oct. 1988. 14pp., (with Henry E. Kandrup, Florida U.).

“Particle Creation and Topology Change in Quantum Cosmology,” preprint UFTP-88-10, April 1988, 40pp., (with H. E. Kandrup).

“Stationary axisymmetric Kaluza-Klein black hole”, P.O. Mazur (Santa Barbara, KITP and Syracuse U.), NSF-ITP-86-73, Oct 1986, 10pp. .

“STRINGS IN QCD AND theta VACUA” P.O. Mazur (Santa Barbara, KITP, and Syracuse U.) , V.P. Nair (Santa Barbara, KITP), NSF-ITP-86-91, Aug. 1986, 10pp. .

“Induced Angular Momentum On Superconducting Cosmic Strings”, Pawel O. Mazur (Santa Barbara, KITP, and Syracuse U.), NSF-ITP-86-56, Jun. 1986, 7pp. .

“Static Solutions In $D = 3$ Einstein-Maxwell Theory”, S. Deser (Brandeis U. and Santa Barbara, KITP) , P.O. Mazur (Santa Barbara, KITP), NSF-ITP-85-13, May 1985, 10pp. .

“Harmonic Maps And Uniqueness of Axisymmetric Monopole Solutions”, P.O. Mazur (Santa Barbara, KITP) , E. Richter (Jagiellonian U.), NSF-ITP-85-14, May 1985, 7pp. .

“A GLOBAL IDENTITY FOR NONLINEAR sigma MODELS”, P.O. Mazur (Jagiellonian U.), TPJU-22/83, Oct. 1984, 10pp. .

“Anomalous Sigma Model and Quantum Mechanics on the Coset Space”, preprint TPJU-5/84, Mar. 1984, 11pp. .

“ $SU(3)$ Extension of the Skyrme Model”, Pawel O. Mazur, Maciej A. Nowak, Michal Przaszłowicz (Jagiellonian U.), TPJU-4/84, Jan. 1984, 10pp. .

“Black Hole Uniqueness From A Hidden Symmetry Of Einstein’s Gravity”, P.O. Mazur (Jagiellonian U.), TPJU-13-83, Jun. 1983, 10pp. .