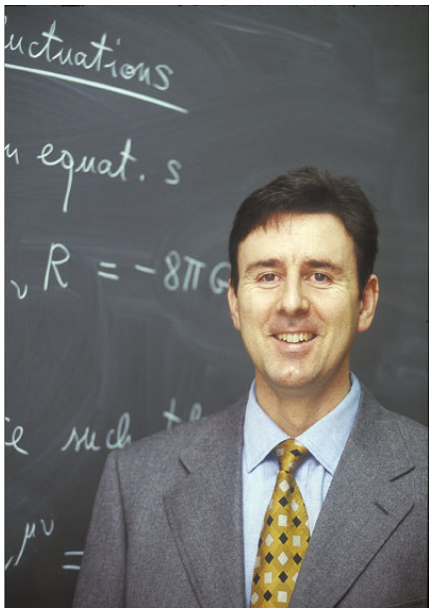
Curriculum vitae et studiorum of Dr. Giovanni Modanese



I am an Italian citizen, born in Bolzano (Italy) in 1964, married, with two children. I earned my Ph.D. title in theoretical physics at the university of Pisa in 1992. I live in Lana, near Bolzano.

Education

I graduated in physics "cum laude" at the University of Trento in 1988 presenting a thesis in General Relativity. My supervisor was Prof. M. Toller. The main results of that work were published in Ref. 28. In short, we proposed a new gauge condition, called "radial gauge", for the gravitational field in the Vierbein formalism, studying its properties. (This gauge condition was used one year later by Menotti and Seminara to find the most general class of solutions of classical (2+1) Einstein gravity known up to now.)

In 1989 I did my military service in the Italian army.

From 1990 to 1992 I attended the PhD courses at the University of Pisa. There my supervisor was prof. P. Menotti. In the PhD thesis, some observables in quantum gravity were studied, both gauge-dependent and gauge-independent. The results have been published in Ref.s 22-26 and later summarized in an invited review paper (Ref. 20). They concern especially the gravitational propagator in radial gauge and perturbative computations of the analogues of the Wilson loops.

Post-doctoral research

In January 1993, after an invitation of Prof. R. Jackiw I went to the Massachusetts Institute of Technology (Boston), where I stayed until the end of the same year. In that time I worked mainly at a quantum formula for the gravitational static potential (Ref. 19) and at the physical interpretation of the Wilson loops (Ref. 21). I could discuss these ideas in detail with many people, including R. Jackiw, D. Freedman, C. Lucchesi.

In 1994-1995 I was in Munich, at the Max-Planck Institut for theoretical physics "Werner Heisenberg", guest of Prof. D. Maison. During that time I mainly refined the quantum formula for the gravitational potential, which in the meantime had been implemented on a Regge lattice by Hamber and Williams with remarkable results.

In 1997-98 I have been post-doc fellow at the "European Centre for theoretical investigations in nuclear physics and related areas" (ECT*) in Trento.

In 2000 I have been research fellow at the California Institute for Physics and Astrophysics in Palo Alto.

Therefore I acquired in these years a considerable research experience in environments of the highest international level, producing several scientific publications. My work was several times examined and evaluated positively by Italian and international commissions. My specific competence regards the theoretical and applied physics, besides including several fields of applied mathematics, in particular the tensor analysis and the linear algebra.

Professional experience

In 1998-99 I have been consultant in the field of gravitation for the "Association for the scientific and technological development of Piemonte" (ASP) in Torino.

In the academic year 1999-2000 I have been assistant professor for Mathematics I and II at the Industrial Engineering Course of the Free University of Bolzano, Italy. Since 2000-2001, I have been regularly appointed professor for Mathematics I and assistant for Mathematics II. I have produced a substantial amount of original didactic material, available for the students in printed version and in the online "reserve collections".

Since 2000 I hold a fixed position as physics and math teacher in the high school "Liceo Carducci", Merano.

In 2002-2003 I have been consultant for Pirelli Labs, Milano, in the field of gravitation and superconductivity.

Since 2004 I am consultant for the Institut fuer Gravitationsforschung, Aschaffenburg (D). A confidentiality agreement implies that my latest work for this institute can not yet be published.

Scientific publications

I am the author of 24 peer-reviewed articles published in international research journals and 4 peer-reviewed articles published in international conference proceedings. Of these, 21 are single-author papers, 6 are papers with two authors and 1 is a paper with three authors.

My Hirsch impact index is h=11, my g-index is g=15. These are usually regarded as typical values for advancement to tenure (also in consideration of the fact that for some years my research activity has not been full-time).

My core expertise includes several high-level mathematical topics. In particular, research work in General Relativity notoriously involves tensor algebra and differential geometry of curved spaces. Several of my research papers feature new solutions of partial and ordinary differential equations typical of gravitation, field theory or condensed matter theory.

All my recent publications (see complete list below) can be accessed online at the address http://arxiv.org/find.

I have been invited several times for talks at Italian universities and I have presented contributions in various conferences in Italy and abroad (see list below). I am a regular referee of two of the world leading journals in theoretical physics: *Physical Review D* and *Nuclear Physics B*.

Languages spoken

Italian: mother tongue

German: good ("A" bilingual certificate of Bolzano province. Spouse and children speak

German as mother tongue.)

English: good

Meeting Participations

Spring 1991: participant to the Spring School in String Theory and Quantum Gravity, ICTP, Trieste

Autumn 1991: invited seminar at Trento University on *The Radial Gauge Propagator*

Spring 1991: Italian "Cortona" Theory Meeting, Isola d'Elba; presented a communication on *The Radial Gauge Propagator*

Spring 1992: Italian "Cortona" Theory Meeting, Isola d'Elba; presented a communication on *Geodesic Round Trips in Quantum Gravity*

Summer 1992: General Relativity 14, National Meeting, Bardonecchia; presented a communication on *Vacuum Correlations in Quantum Gravity*

Autumn 1992: invited seminar at Pavia University on *Properties of Lattice Quantum Gravity and Wilson Loops*

Spring 1993: internal seminar at MIT, Boston, on *Properties of Wilson Loops to Leading Order in Quantum Gravity*

Summer 1993: Meeting "The Form of Space" at Trento University; presented a communication on *The Quantum Formula for the Static Gravitational Potential*

Spring 1994: Italian "Cortona" Theory Meeting, Cortona; presented a communication on *The Absence of Localized Curvature in Euclidean Quantum Gravity to Leading Order*

Autumn 1994: invited seminar at Trento University on *Radial Gauge and Vacuum Correlations*

Autumn 1994: "Rindberg Castle" Meeting (Germany); presented a communication on *Information Loss in Black Holes and Ergodic Theorem*

Spring 1995: invited seminar at Parma University on *The Quantum Formula for the Static Gravitational Potential*

Summer 1995: Meeting "Constrained Systems and Quantum Gravity", Dubna (Russia); presented a communication on *The Decay Amplitudes for Massless Particles*

Summer 1996: internal seminar at MIT, Boston, on *Anomalous Coupling of Gravity to a Bose Condensate*

Spring 1997: seminar at ECT*, Trento, on *General Properties of the Decay Amplitudes for Massless Particles*

Autumn 1997: invited seminar at the World Congress of the International Astronautical Federation in Torino, on *Anomalous Coupling of Gravity to a Bose Condensate*

Autumn 1997: invited seminar at Milano University, on *Anomalous Coupling of Gravity to a Bose Condensate*

Winter 1997: invited seminar at the Politecnico, Torino, on *Anomalous Coupling of Gravity to a Bose Condensate*

Winter 1997: internal seminar at ECT*, Trento, on *The Static Potential in Euclidean Quantum Gravity*

Summer 1998: partecipant to the world meeting "Path Integrals from peV to TeV", Firenze;

presented a communication on *Tunneling of a Massless Field through a 3D Gaussian Barrier*

July 2000: invited seminar at Starlab, Brussels, on *Large Dipolar Fluctuations in Quantum Gravity.*

August 2000: participant to the meeting "Gravitation and Cosmology: from the Hubble Radius to the Planck Scale" in Berkeley, USA; presented a communication on *Large Dipolar Fluctuations in Quantum Gravity.*

Publications of Dr. G. Modanese

1. *The vacuum state of quantum gravity contains large virtual masses,* Giovanni Modanese (U. of Bolzano, Logistics and Production Engineering), Class. Quantum Grav. 24 (2007) 1899-1909.

2. *Effect of the Vacuum Energy Density on Graviton Propagation,* Giovanni Modanese (U. of Bolzano, Logistics and Production Engineering), Giorgio Fontana (U. of Trento), Space Technol. and Applic.s Internat. Forum STAIF 2004. AIP Conference Proceedings, February 4, 2004, Volume 699, pp. 1198-1205.

3. *Investigation of High Voltage Discharges in Low Pressure Gases Through Large Ceramic Superconducting Electrodes*, E. Podkletnov (Moscow Chemical Scientific Research Center), G. Modanese (University of Bolzano, Logistics and Production Engineering), Journal of Low Temperature Physics 132, pp. 239-259, August 2003.

4. *Evaluation of an Impulse Gravity Generator Based Beamed Propulsion Concept*, Giovanni Modanese (University of Bolzano, Logistics and Production Engineering), Chris Y. Taylor (Jupiter Research Corp., Houston). Paper AIAA-2002-4095, 38th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit, Indianapolis, Indiana, 2002.

5. *Local contribution of a quantum condensate to the vacuum energy density*, G. Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys. - Palo Alto), Mod. Phys. Lett. A, Vol. 18 pp. 683-690, 2003.

6. *Inertial Mass and Vacuum Fluctuations in Quantum Field Theory*, Giovanni Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys., Palo Alto), Found. Phys. Lett., 16 (2003) 135-141.

7. *Possible quantum gravity effects in a charged Bose condensate under variable e.m. field*, G. Modanese (INFN, Trento), J. Schnurer (Physics Engin. Inc., Yellow Springs, OH) Phys. Essays 14 (2001) 93-105

8. *The paradox of virtual dipoles in the Einstein action.* G. Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys.), Phys. Rev. D 62 (2000) 087502.

9. *Large "dipolar" fluctuations in quantum gravity.* G. Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys.), Nucl. Phys. B 588 (2000) 419-435.

10. *Zero-point field induced mass vs. QED mass renormalization.* G. Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys.), in Proceedings of the 18th Advanced ICFA Beam Dynamics Workshop on "Quantum Aspects of Beam Physics", Capri, Italy (DOI 10.2172/813018), P. Chen editor, World Scientific Press, 2002

11. *The dipolar zero-modes of Einstein action: An informal summary with some new issues.* G. Modanese (Univ. of Bolzano and California Inst. F. Physics and Astrophys.), in "Gravitation and Cosmology: from the Hubble Radius to the Planck Scale", edited by R.L. Amoroso, G. Hunter, M. Kafatos, J.-P. Vigier, p. 259-266 (Kluwer Academic Publishers, Dordrecht, 2002)

12. *Virtual dipoles and large fluctuations in quantum gravity.* G. Modanese (ECT*, Trento), Phys. Lett. B 460 (1999) 276.

13. *Tunneling of a massless scalar field through a 3D gaussian barrier.* G. Modanese (ECT*, Trento), J. Math. Phys. 40 (1999) 3300.

14. *Stability issues in Euclidean quantum gravity.* G. Modanese (ECT*, Trento), Phys. Rev. D 59 (1998) 24004

15. *Role of a "local" cosmological constant in euclidean quantum gravity.* G. Modanese (INFN, Trento), Phys. Rev. D 54 (1996) 5002.

16. *General properties of the decay amplitudes for massless particles.* G. Fiore and G. Modanese (Munich, Max Planck Inst.), Nucl. Phys. B 477 (1996) 623.

17. *Theoretical analysis of a reported weak gravitational shielding effect.* G. Modanese (Munich, Max Planck Inst.), Europhys. Lett. 35 (1996) 413-418

18. *General estimate for the graviton lifetime.* G. Modanese (Munich, Max Planck Inst.), Phys. Lett. B 348 (1995) 51-54

19. *Potential energy in quantum gravity.* G. Modanese (Munich, Max Planck Inst.), Nucl. Phys. B 434 (1995) 697-708

20. *Vacuum correlations at geodesic distance in quantum gravity.* G. Modanese (INFN, Trento), Riv. Nuovo Cimento. 17, 8 (1994) 1-62

21. *On the absence of localized curvature in the weak coupling phase of quantum gravity.* G. Modanese (MIT, LNS), Phys. Lett. B 325 (1994) 354-358

22. *Wilson loops in four-dimensional quantum gravity.* G. Modanese (MIT, LNS), Phys. Rev. D 49 (1994) 6534-6542

23. *On the motion of test particles in a fluctuating gravitational field.* G. Modanese (Pisa U. & INFN, Pisa), J. Math. Phys. 33 (1992) 4217-4219

24. *The radial gauge propagators in quantum gravity.* P. Menotti, G. Modanese (Pisa U. & INFN, Pisa), D. Seminara (Pisa, Scuola Normale Superiore & INFN, Pisa), Ann. Phys. 224 (1993) 110-138

25. *Vacuum correlations in quantum gravity.* G. Modanese (Pisa U. & INFN, Pisa), Phys. Lett. B 288 (1992) 69-71

26. *Geodesic round trips by parallel transport in quantum gravity.* G. Modanese (Pisa U. & INFN, Pisa), Phys. Rev. D 47 (1993) 502-509

27. *The propagator in the radial gauge.* G. Modanese (Pisa U. & INFN, Pisa), J. Math. Phys. 33 (1992) 1523-1528

28. *Radial gauge in Poincare' gauge field theories.* G. Modanese, M. Toller (Trento U. & INFN, Trento), J. Math. Phys. 31 (1990) 452.