

# **CURRICULUM VITAE OF JUAN PABLO PAZ**

## **PERSONAL DATA**

- **Name:** Juan Pablo Paz
- **Postal address:** Departamento de Física, Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Pabellón 1, Ciudad Universitaria, 1428 Buenos Aires, Argentina.
- **Place and date of birth:** Buenos Aires, april 5th,1959.
- **Citizenship:** Argentina.

## **CURRENT POSITIONS**

- Full Professor (full time) Department of Physics, FCEyN--UBA, Argentina
- Fellow of CONICET (Argentina). Level: Investigador Principal
- Chairman of the Physics Department of the University of Buenos Aires
- Director of the Institute of Physics of Buenos Aires (IFIBA-CONICET)

## **GENERAL SCIENTIFIC BACKGROUND**

### **Degrees**

- 100PhD in Physics, 1988, University of Buenos Aires.
- Licenciado en Ciencias Físicas, 1984, University of Buenos Aires.

### **Previous Research Positions**

- Technical Staff Member, Theoretical Division, Los Alamos National Laboratory (2003-2004)
- Postdoctoral Fellow. Theory División. Los Alamos National Laboratory (1991-1994).
- Research Associate, Department of Physics, University of Maryland (1991).
- Visiting Research Associate, Department of Physics, University of Maryland (1989-1991).
- External Fellow of Fundación Antorchas. University of Maryland. (1989-1991).
- External Fellow of CONICET (1989-1992).
- Doctoral fellowship from CONICET (1986-1989).

### **Previous Pos itions**

- Chairman of the Departamento de Física de la FCEyN-UBA (1997-2002).
- Associate Professor (full time). Departamento de Física de la FCEyN-UBA (1999- ). Assistant Professor (full time). Departamento de Física de la FCEyN-UBA (1994-1999). As a teacher I lectured on the following courses: Physics I (elementary mechanics), Mechanics (advanced mechanics), Theoretical Physics 2 (quantum mechanics), Foundations of quantum mechanics (advanced class). Dissipative quantum systems (advanced class), etc.
- Invited Lecture r at the 72nd Les Houches Summer School (Les Houches, France, July August 1999) "Coherent matter waves". Invited Lecturer at the 47th Winter School on Theoretical Physics, Schladming, Austria (February 2004). Invited Lecturer at the PASI School on Quantum Information, Buzios, Brazil (November

- 2003). Invited Lecturer at the Fourth Canadian School on Quantum Information, Waterloo, Canada (June 2004).
- Invited Lecturer in the Department of Physics of the University of Maryland (1990). (in charge of the course Advanced Topics on General Relativity, PHY0879)
- Teaching assistant. Departamento de Física de la FCEN (1984-1988).

#### **Awards, grants, etc .**

- W. Bessel Award, 2006. Alexander von Humboldt Foundation.
- Guggenheim Fellow, 2004.
- International Fellow, Santa Fe Institute, 2001-2003.
- Prize Ernesto Galloni 1994. Argentinian Academy of Sciences.
- Principal Investigator. LDRD Grant: "Cold Atoms quantum simulators", LANL 2004.
- Principal Investigator. Grant ANPCyT "Computación cuántica", PICT-01014 (1999-2000). PICT 0309000 2001-2004. PICT 29856 (2006-2009). Principal Investigator Grant CONICET PIP 2008-2011. Principal Investigator. Grant UBACyT, PID EX-122, 1994/97. PID TW-23, 1998/2001, X722 (2000/2002).. Principal Investigator. Grant Antorchas for young researchers, 1994, 1995, 1996, 1998.
- Member of the Organizing Committee (main local organizer) of the first Pan American Advanced Study Institute ("Chaos, decoherence and quantum entanglement", Ushuaia, Octubre 2000). Financed with grants from NSF, Claf and Anpcyt. Member of the Organizing Committee of the Fourth Drexel Symposium on Quantum Nonintegrability and Quantum to Classical Correspondence. Univ. of Drexel, Philadelphia, September 1994. Member of the Organizing Committee of the second PASI on Quantum Information (Buzios, Brazil, 2003). Member of the Organizing Committee of Quantum Optics II (Cozumel, México, 2004)
- Member of the organizing committee of the XI Escuela Juan José Giambiagi (2009). Member of the organizing committee of the annual meetings of AFA organized in Buenos Aires in 2000 and 2008. .
- Referee of international scientific journals: Nature, Science, Physical Review Letters, Physical Review, etc.
- Member of the Directive Council of the Asociación Física Argentina (1994-1986, 1996--1998).

#### **Advisor of PhD and Master Students.**

- Dr Augusto Roncaglia, PhD Thesis presented in FCEyN UBA, May 2009. Title: "Dynamics of correlations created in the course of decoherence".
- Dr Cecilia Cormick, PhD Thesis defended in FCEyN UBA, December 2009. Title: "Quantum simulators".
- Dr. Cesar Miquel. PhD Thesis presented in FCEyN UBA, December 2002. Title: "Quantum computation".
- f5 Dr. Diana Monteoliva, PhD Thesis presented in FCEyN UBA, December 2003. Title: "Decoherence for classically chaotic systems".
- Lic. Luciana Dávila Romero. Master Thesis defended in FCEyN UBA, June 1996. Title: "Decoherencia y correlaciones iniciales en el movimiento Browniano cuántico".
- Lic. Cesar Miquel. Master Thesis defended in FCEyN UBA, August 1996. Title: "Factorización cuántica con iones fríos" (co-directed with R Perazzo).
- Lic. Hernn Pringe. Master Thesis defended in FCEyN UBA, June 1997. Title: "Códigos cuánticos de corrección de errores".
- Lic. Verónica Cerletti. Master Thesis defended in FCEyN UBA, October 2000. Title: "Como buscar una aguja en un pajar usando la mecánica cuántica".

- Lic. Federico Botessi, Master Thesis defended in FCEyN UBA, August 2000. Title: "Dinámica de un sistema de varios espines interactuando con el mismo entorno".
- Lic. Pablo Bianucci, Master Thesis defended in FCEyN UBA, March 2001. Title: "Decoherence for chaotic quantum maps" (co-directed with M Saraceno).
- Lic. Alejandro Villanueva, Master Thesis defended in FCEyN UBA, September 2002. Title: "Decoherence from vacuum fluctuations" (co-directed with D Mazzitelli).
- Lic. Graciana Puentes, Master Thesis defended in FCEyN UBA, October 2002. Title: "Optical simulations of quantum maps" (co-directed with M. Saraceno).
- Lic. Augusto Roncaglia, Master Thesis defended in FCEyN UBA, March 2003. Title: "Quantum algorithms for phase space tomography".
- Lic. Cecilia Lopez, Master Thesis defended in FCEyN UBA, March 2003. Title: "Decoherence in quantum walks".
- Lic. Cecilia Cormick, Master Thesis defended in FCEyN UBA, July 2005. Title: "Discrete Wigner functions for stabilizer states".
- Lic. Ariel Bendersky, Master Thesis defended in FCEyN UBA, March 2007. Title: "Mutually unbiased basis: theory and applications".
- Lic. Fernando Pastawski, Master Thesis defended in FAMAF, UNC, March 2008. Title: "Efficient algorithms for quantum process tomography"..

## **SCIENTIFIC INTERESTS**

- ◆ The physics of quantum information and quantum computation (use of quantum computers for physics simulations, study of quantum algorithms as dynamical systems, study of potential physical realizations of quantum computers, quantum error correction, etc).
- ◆ Decoherence and the physics of the quantum to classical boundary (decoherence for classically chaotic systems, decoherence and quantum measurement, controlled decoherence experiments, etc).
- ◆ The dynamics of phase transitions (nonequilibrium and quantum effects in phase transitions, defect formation, etc).

## **RESEARCH PAPERS**

**Papers authored by Juan Pablo Paz have more than 3400 citations registered in the Science Citation Index (as of 2010). H-factor = 28.**

### **a) Papers published in international journals.**

1. "Selective and efficient quantum process tomography with single photons", C. Schmiegelow, M. Larrotonda and J.P. Paz, Phys. Rev. Lett. 104, 123601 (2010).
2. "Towards scalable tomography of quantum maps using twirling—based methods and information hierarchies", C. Lopez, A. Bendersky, J.P. Paz and D. Cory, Phys. Rev. A (2010) submitted.
3. "Studying the different phases for the dynamics of entanglement in an ion trap", C. Cormick and J.P. Paz, Phys. Rev. A 81, 022306 (2010).
4. "Selective and efficient quantum process tomography", A. Bendersky, F. Pastawski, J.P. Paz, Phys. Rev. A 80, 032116 (2009) .
5. "General theory of measurement with two copies of a quantum state", A. Bendersky, J.P. Paz and M. Terra Cunha, Phys. Rev. Lett. 103, 040403 (2009).
6. "Redundancy of total and quantum correlations in the course of decoherence", J.P. Paz and A. Roncaglia, Phys. Rev. A 80, 042111 (2009).

7. "Entanglement dynamics during decoherence", J.P. Paz and A. Roncaglia, *Quant. Info. Comp* 8, 535 (2009),.
8. "Dynamical phases for the evolution of the entanglement between two oscillators coupled with the same environment", J.P. Paz and A.J. Roncaglia, *Phys. Rev. A* 79, 032102 (2009).
9. "Dynamics of the entanglement between two oscillators in the same environment", J.P. Paz and A. Roncaglia, *Phys. Rev. Lett* 100, 220401 (2008).
10. "Selective Efficient Estimation of the Parameters of a Quantum Process", A. Bendersky, F. Pastawski and J.P. Paz, *Phys. Rev. Lett.* 100, 19040 3 (2008).
11. "Phase space origin of purity and fidelity decay", D. Monteoliva and J.P. Paz; *Phys. Rev. A* (2008), submitted (AQ10398).
12. "Decoherence of Bell states by local interactions with a dynamic spin environment", C. Cormick and J.P. Paz, *Phys. Rev. A* 78, 012357 (2008).
13. "Decoherence induced by a dynamic spin environment: the universal regime", C. Cormick and J.P. Paz, *Phys. Rev. A* 77, 022317 (2008) .
14. "Universal decoherence induced by an environmental quantum phase transition", F.M. Cucchietti, J.P. Paz and S. Fernández-Vidal, *Phys. Rev. A* 75, 032337 (2007).
15. "Signatures of non-locality in the first-order coherence of the scattered light", P. Cañizares, T. Görler, J.P. Paz, G. Morigi and W. Schleich, *Laser Physics* 17, 903-907 (2007).
16. "Gaussian decoherence and Gaussian echoes from spin environments", W.H. Zurek, F. Cucchietti and J.P. Paz, *Acta Physica Polonica B* 38, 1685 (2007).
17. "Interference in the discrete Winger function", C. Cormick and J.P. Paz, *Phys. Rev. A* 74 062315 (2006).
18. "Simulating a quantum walk with classical optics", D. Francisco, C. Lemmi, J.P. Paz and S. Ledesma, *Phys. Rev. A* 74, 052327 (2006).
19. "Optical simulation of the quantum Hadamard operator", D. Francisco, C. Lemmi, J.P. Paz and S. Ledesma, *Optics Communications* 268, pp 340-345 (2006).
20. "Classicality in the discrete Winger function", C. Cormick, E. Galvao, D. Gottesmann, J.P. Paz and A. Pittenger, *Phys. Rev. A* 73, 012301 (2006).
21. "Decoherence from spin environments", F. Cucchietti, J.P. Paz and W.H. Zurek, *Phys. Rev. A* 72, 052113 (2005).
22. "Decoherence induced by a chaotic environment: a quantum walker with a complex coin", L. Ermann, J.P. Paz and M. Sarraceno, *Phys. Rev. A* 73, 012302 (2006).
23. "Qubits in phase space: Wigner function approach to quantum error correction and the mean king paradox", J. P. Paz, A. Roncaglia and M. Sarraceno, *Phys. Rev. A* 72, 012309 (2005).
24. "Quantum algorithms for phase space tomography", J. P. Paz, A. J. Roncaglia and M. Saraceno, *Phys. Rev. A* 69, 032312 (2004).
25. "Decoherence and recoherence from vacuum fluctuations near a conducting plate", F. D. Mazzitelli, J. P. Paz and A. Villanueva, *Phys. Rev. A* 68, 062106 (2004).
26. "Optical simulation of quantum algorithms using programmable liquid crystal displays", G. Puentes, C. La Mela, S. Ledesma, C. Lemmi, J. P. Paz and M. Saraceno, *Phys. Rev. A* 69, 042319 (2004).
27. "Randomness in quantum computation", J. P. Paz, *Science* 302, 2076-2077 (2003).
28. "Phase-space approach to the study of decoherence in quantum walks", C. C. Lopez and J. P. Paz, *Phys. Rev. A* 68, 052305 (2003).
29. "Decoherence and the Loschmidt echo", F. M. Cucchietti, D. A. R. Dalvit, J. P. Paz and W. H. Zurek, *Phys. Rev. Lett.* 91, 210403 (2003).
30. "A Method for Modeling Decoherence on a Quantum Information Processor", G. Teklemariam, E. M. Fortunato, C. C. Lopez, J. Emers on, J. P. Paz, T. F. Havel and D. G. Cory, *Phys. Rev. A* 67, 062316 (2003).
31. "Testing integrability with a single bit of quantum information", D. Poulin, R. Laflamme, G.J. Milburn and J. P. Paz, *Phys. Rev. A* 68, 022302 (2003).
32. "A quantum gate array can be programmed to evaluate the expectation value of any operator", J. P. Paz and A. Roncaglia, *Phys. Rev. A* 68, 052316 (2003).

33. "Interpretation of tomography and spectroscopy as dual forms of quantum computation", C. Miquel, J. P. Paz, M. Saraceno, R. Laflamme, E. Knill and C. Negrevergne, *Nature* 418, 59-62 (2002).
34. "Quantum computers in phase space", C. Miquel, J. P. Paz and M. Saraceno, *Phys. Rev. A* 65, 062309 (2002).
35. "Decoherence for classically chaotic quantum maps", P. Bianucci, J. P. Paz and M. Saraceno, *Phys. Rev. E* 65, 046226 (2002).
36. "Phase-space representation of quantum teleportation", J. P. Paz, *Phys. Rev. A* 65, 062311 (2002).
37. "Discrete Wigner functions and the phase space representation of quantum computers", P. Bianucci, C. Miquel, J. P. Paz and M. Saraceno, *Phys. Lett. A* 299, 353-358 (2002).
38. "Decoherence for classically chaotic quantum systems: rate of entropy production and quantum-classical correspondence", D. Monteoliva and J. P. Paz, *Phys. Rev. E* 64, 05238 (2001).
39. "Environment engineering: protecting the quantum world", J P Paz, *Nature* 412, 869-870 (2001).
40. "Decoherence and the rate of entropy production for chaotic quantum systems", D. Monteoliva and J. P. Paz, *Phys. Rev. Lett.* 85 3373, (2000).
41. "Quantum limit of decoherence: Environment induced superselection of energy eigenstates", J. P. Paz and W. H. Zurek, *Phys. Rev. Lett.* 82, 5181 (1999).
42. "Continuous error correction", J. P. Paz and W. Zurek, *Proc. Roy. Soc. London A* 454, 355 (1998).
43. "Quantum computation with phase drift errors", C. Miquel, J.P. Paz and W. H. Zurek, *Phys. Rev. Lett.* 78, 3971 (1997).
44. "Deconstructing decoherence", J. Anglin, J. P. Paz and W. H. Zurek, *Phys. Rev. A* 55, 4041 (1997).
45. "Decoherence and initial correlations in quantum Brownian motion", L. Davila Romero and J. P. Paz, *Phys. Rev. A* 55, 4070 (1997).
46. "Perfect quantum error correction code", R. Laflamme, C. Miquel, J. P. Paz and W. H. Zurek, *Phys. Rev. Lett.* 77, 198 (1996).
47. "Dissipation and decoherence in mean field theory", S. Habib, Y. Kluger, E. Motolla and J. P. Paz, *Phys. Rev. Lett.* 76, 4660 (1996).
48. "Factoring in a dissipative quantum computer", C. Miquel, J. P. Paz and R. Perazzo, *Phys. Rev. A* 54, 2605 (1996).
49. "Quantum evolution of disoriented chiral condensates", Y. Kluger, F. Cooper, E. Motolla, J. P. Paz and A. Kovner, *Nucl. Phys. A* 590, 581 (1995).
50. "Decoherence, recoherence and the black hole information paradox", J. Anglin, R. Laflamme, W. Zurek and J. P. Paz, *Phys. Rev. D* 52, 2221 (1995).
51. "Quantum chaos, a decoherent definition", W. H. Zurek and J. P. Paz, *Physica D* 83, 300 (1995).
52. "Non-equilibrium dynamics of disoriented chiral condensates", Y. Kluger, J. P. Paz, F. Cooper and E. Mottolla, *Phys. Rev. D* 51, 2377 (1995).
53. "Non-equilibrium quantum fields in the large N expansion", F. Cooper, S. Habib, Y. Kluger, E. Motolla, J. P. Paz and P. Anderson. *Phys. Rev. D* 50, 2848 (1994).
54. "Decoherence, chaos and the second law", W. H. Zurek and J. P. Paz, *Phys. Rev. Lett.* 72, 2508 (1994). See also the reply to comments by B. Chirikov and G. Casati in W.H. Zurek and J. P. Paz, *Phys. Rev. Lett.* 75, 351 (1995).
55. "Proposed test for temporal Bell inequalities", J. P. Paz and G. Mahler, *Phys. Rev. Lett.* 71, 3235 (1993).
56. "Environment-induced decoherence, classicality and the consistency of quantum histories", J. P. Paz and W. H. Zurek, *Phys. Rev. D* 48, 2728 (1993).
57. "Coherent states via decoherence", W H Zurek, S Habib and J P Paz, *Phys Rev Lett* 70, 1187 (1993).
58. "Reduction of the wave packet: Preferred observable and decoherence time scale", J P Paz, S Habib and W H Zurek, *Phys Rev D* 47, 488 (1993).

59. "Quantum Brownian motion in a general environment: II nonlinear coupling and perturbative approach", B L Hu, J P Paz and Y Zhang, Phys Rev D 47, 1576 (1993).
60. "Quantum Brownian motion in a general environment: exact master equation with non-local dissipation and colored noise", B L Hu, J P Paz and Y Zhang, Phys Rev D 45, 2843 (1992).
- 61.
62. "Decoherence and backreaction in quantum cosmology: multidimensional minisuperspace examples", J P Paz and S Sinha, Phys Rev D 45, 2823 (1992).
63. "Decoherence and backreaction: the origin of the semiclassical Einstein equations", J P Paz and S Sinha, Phys Rev D 44, 1038 (1991).
64. "Anisotropy dissipation in the early universe: finite temperature effects reexamined", J P Paz, Phys Rev D 41, 1054 (1990).
65. "Dissipation during the oscillations around a true vacuum", J P Paz, Phys Rev D 42, 529 (1990).
66. "Reheating of the Universe and evolution of the inflaton", F Mazzitelli, J P Paz and C El Hasi, Phys Rev D 40, 955 (1989).
67. "Gaussian and  $1/N$  approximations in semiclassical cosmology", F Mazzitelli and J P Paz, Phys Rev D 39, 2234 (1989).
68. "Quantum effects near multidimensional black holes", V P Frolov, F Mazzitelli and J P Paz, Phys Rev D 40, 948 (1989).
69. "Renormalized evolution equations for the backreaction problem with a self interacting scalar field", J P Paz and F D Mazzitelli, Phys Rev D 37, 2170 (1988).
70. "A simple form for the Gaussian equations in curved space time", F D Mazzitelli and J P Paz, Phys Rev D 37, 3525 (1988).
71. "On the Dirac equation in anisotropic backgrounds", M A Castagnino, C El Hasi, F Mazzitelli and J P Paz, Phys Lett A 128, 125 (1988).
72. "Cauchy data and Hadamard singularities in time dependent backgrounds", F D Mazzitelli, J P Paz and M A Castagnino, Phys Rev D 36, 2994 (1987).
73. "Graviton and topology contributions to selfconsistent cosmology", M A Castagnino, J P Paz and N Sanchez, Phys Lett B 193, 13 (1987) (CERN preprint, TH-4691/87).
74. "Fermions between moving boundaries", M A Castagnino, F D Mazzitelli and J P Paz, Phys Lett B 189, 132 (1987).
75. "Hadamard and minimal renormalizations", M A Castagnino, E Gunzig, P Nardone and J P Paz, Phys Rev D 34, 3698 (1986).
76. "De Sitter self consistent cosmologies for Weinberg-type fields", M A Castagnino, D Harari and J P Paz, Class Quantum Grav 3, 569 (1986).
77. "On the instability of the Minkowski space", M A Castagnino and J P Paz, Phys Lett B 164, 274 (1985).

#### **c) Papers published as chapters of books**

1. "Environment induced superselection and the transition from quantum to classical", J. P. Paz and W. H. Zurek, (2000). In "Coherent matter waves, Les Houches Session LXXII", edited by R Kaiser, C Westbrook and F David, EDP Sciences, Springer Verlag (Berlin) (2001) 533-614.
2. "Using qubits to learn about it", J. P. Paz (2002) in "Science and ultimate reality", a book edited to honor J.A. Wheeler. Cambridge University Press (2004). Authors of the chapters of this book were selected by an international committee and awarded with a prize of ten thousand dollars by the Templeton Foundation and the Metanexus Institute.
3. "Environment-induced decoherence and the transition from quantum to classical", J. P. Paz and W. H. Zurek, LECTURE NOTES IN PHYSICS; 2002; v.587, p.77-148

#### **d) Papers of general interest and scientific popularization**

0. "Del átomo a la bomba (una breve historia para entender mejor la obra Copenhague)", J. P. Paz (2002). Publicado en la revista del Teatro General San Martín (Buenos Aires, Mayo 2002).
1. "Einstein contra la mecánica cuántica: el azar y la ignorancia", J.P. Paz (2007); publicado en "El Universo de Einstein" editado por A. Gangui (EUDEBA).

#### e) Papers published in refereed conference proceedings

2. "Quantum Golems", J.P. Paz, Published in "Interdisciplinary aspects of human-machine coexistence and cooperation", V. Malik et al editors, Czech Tech Univ Press ISBN 80-01-03275-2, (Prague, 2005).
3. "La decoherencia y el principio de correspondencia para sistemas clásicamente caóticos", J. P. Paz, in Anales de la Academia Nacional de Ciencias Exactas Físicas y Naturales, Buenos Aires, V47, (1995).
4. "Why we don't need 'Quantum Planetary Dynamics'?", W. H. Zurek and J. P. Paz, in Proceedings of the Fourth Drexel Meeting on Quantum Nonintegrability, ed. by D.H.Feng et al., Plenum, (1995).
5. "Decoherence, chaos, the quantum and the classical", W. H. Zurek and J. P. Paz, in Il Nuovo Cimento B110 (1995), 611; also in Proceedings of the FMP93 Symposium, Cologne, October 1993. ed. By P. Busch, World Sc. (Singapore, 1994).
6. "Quantum coherence, classical limit and temporal Bell inequalities", J P Paz, in "Perspectives in neutrinos, atomic physics and gravitation", Proceedings del 28th Rencontre de Moriond, ed. By C.T Van Tran and O. Fackler, Editions Frontieres (1993).
7. "Minisuperspace as a quantum open system", B.L. Hu, S. Sinha and J. P. Paz, in "Directions in General Relativity", ed. by B.L. Hu et al., Cambridge Univ Press (1993), 145--165.
8. "Decoherence in Brownian motion", J P Paz in "Physical Origins of Time Asymmetry", ed. by J J Halliwell et al., Cambridge Univ. Press (1993).
9. "Quantum origin of noise and fluctuations in cosmology", B L Hu, J P Paz and Y Zhang, in The Origin of Structure in the Universe, ed. by E. Gunzig and P. Nardone, NATO ASI Series, Kluwer Acad. Pub. (1993), 227--252.
10. "Decoherence and backreaction in quantum cosmology", J P Paz and S Sinha, in Proceedings of the VII Simposio Latino Americano de Relatividad y Gravitación, (SILARG VII), ed. by M Rosebaum et al., World Sc., Singapur, (1991).
11. "Causality in finite temperature quantum field theory", J P Paz, in "Thermal Field Theories and Applications", ed. by Ezawa et al, (1991) North Holland, Proceedings of the Second Workshop on Thermal Field Theories, Tsukuba, Japan, (1990).
12. "Non-equilibrium quantum fields in cosmology", J P Paz, in "Thermal Field Theories and Applications", ed. por Ezawa et al, (1991) North Holland, Proceedings of the Second Workshop on Thermal Field Theories, Tsukuba, Japan, (1990).
13. "The back-reaction problem for self interacting scalar fields: one loop and gaussian approximations", J P Paz and F D Mazzitelli, in Proceedings of the VI Simposio Latino Americano de Relatividad y Gravitación, (SILARG VI), ed. by M. Novello, World Sc. Pub, Singapur, (1988).
14. "Some quantum effects in cosmological models", M A Castagnino and J P Paz, in "Quantum Mechanics of Fundamental Systems", ed. by C Teitelboim, Plenum New York, (1988), chap 11.
15. "Semiclassical cosmological models", M A Castagnino, D Harari and J P Paz, in Proceedings of the Fourth Marcel Grossmann Meeting on General Relativity, ed. by R Ruffini, Elsevier Sc Pub, (1986), 1095.
16. "De Sitter self consistent cosmology with adiabatic regularization", J P Paz, D Harari and M A Castagnino en Proceedings of the V Simposio Latino Americano de Relatividad y Gravitación (SILARG V), ed. by O. Bressan et al., World Sc., Singapur, (1985).

## **INVITED TALKS IN SCIENTIFIC CONFERENCES (selected list)**

- National Univ of Singapore, Center for Quantum Technologies, Colloquium, Jan. 2008..
- ITAMP, Univ of Harvard, Invited Talk, November 2008.
- Perimeter Institute, Waterloo, Canada, Agosto 2008.
- Topical School on Quantum Open Systems, Nancy, Francia, Julio 2008.
- College de France, Paris, France, Febrero 2006 (Conferencia invitada)
- Institute Henry Poincare, Paris, France, February 2006 (Dos charlas invitadas)
- ELAF 2007 (Escuela Latinoamericana de Física), Información Cuántica, México DF, México, Agosto 2007 (Curso de cuatro clases)
- Escuela B rasilera de Información Cuántica, Parati, Brazil, Agosto 2007 (Curso de cuatro clases)
- Quantum Optics III, Pucon, Chile, Noviembre 2006 (Charla invitada)
- Santa Fe Institute, International Fellows Meeting, Santa Fe, NM (EEUU), Septiembre 2006 (Charla invitada)
- Scala Euro-Workshop, Benasque, España, Junio 2006 (Charla invitada)
- Scala Euro-School, Benasque, España, Julio 2006 (Curso de cuatro clases)
- ICTP Workshop on Noise in Quantum Information, Octubre 2005 (Charla invitada a)
- ICSSUR Workshop, Besancon, Francia, Mayo 2005 (Charla invitada)
- Canadian School on Quantum Information. Agosto 2004, Waterloo, Canada (Curso de cuatro clases)
- Quantum Optics II, Cozumel, México, Diciembre 2004 (Charla invitada)
- PASI School on Quantum Information, Buzios, Brazil, Noviembre 2003 (Curso de cuatro clases)
- Squeezed states and uncertainty relations, Puebla, México, Junio 2003 (Charla invitada)
- Workshop on Control of decoherence in quantum computers. Univ of Michigan, Agosto 2002 (Charla invitada)
- MIT, Quantum Information Group, Abril 2002 (Coloquio)
- Science and ultimate reality (J.A.Wheeler Fest), Princeton Univ, Marzo 2002 (Charla invitada)
- Workshop on Quantum Information, ITP (UCSB). Agosto 2001 (Charla invitada)
- Sociedad Venezolana de Física, Caracas, Venezuela, Diciembre 2001 (Charla invitada)
- Sociedad Uruguaya de Física, Montevideo, Uruguay, Octubre 2001 (Conferencia invitada)
- Workshop on Transport on mesoscopic systems, Choroní, Venezuela, Diciembre 2001 (Charla invitada)
- Max Planck Institute (PKS), Dresden, Germany, Mayo 2001 (Charla invitada)
- Universitat Autònoma de Barcelona, Barcelona, España, Julio 2006 (Coloquio)
- UFMG, Mina Gerais, Brazil, Marzo 2006 (Coloquio)
- University of Maryland, Department of Physics, Octubre 2003 (Coloquio)
- Laboratory for Physical Sciences, Maryland, Octubre 2003 (Coloquio)
- University of Texas (Brownsville). Physics Department, Mayo 2003 (Coloquio)
- UFRJ, Rio de Janeiro, Brazil, Diciembre 2000 (Coloquio)
- Instituto Balseiro, Bariloche, Argentina, Setiembre 2006 (Coloquio); Mayo 2006 (Coloquio)
- INQUIMAE, Buenos Aires, Argentina, Marzo 2006 (Coloquio)
- Instituto Leloir, Buenos Aires, Argentina, Mayo 2006 (Coloquio)
- FAMAF, UNC, Córdoba, Argentina, Noviembre 2005 (Charla invitada por el año de la física)
- University of New México, Center for Advanced Studies, Albuquerque, NM, Mayo 2004 (Coloquio)
- Workshop on Quantum Computation and the Physics of Information, Isaac Newton Institute, Cambridge, July 1999. Invited talk..
- Les Houches 72<sup>nd</sup> Summer School. July August 1999. Invited Lecturer.

- Anual Meeting of the SUF (Uruguayan Physical Society). Minas, October 1999. Invited plenary talk.
- Meeting on Quantum Computation and NMR. ITAMP, Univ. de Harvard (EEUU). Invited plenary talk. February 1999.
- Invited speaker in the Meeting on quantum coherence and decoherence, ITP (UCSB), december 1996.
- Quantum gravity in the southern cone. Invited speaker. Punta del Este (Uruguay). April 1996.
- Fourth Drexel Symposium on Quantum Nonintegrability and Quantum Classical Correspondence. Setiembre de 1994. Plenary speaker.
- Simposio Nacional de Geometría y Relatividad (Vaquerías 5), Córdoba, August 1994. Invited Lecturer.
- XXVIII Rencontre de Moriond, "Perspectives in neutrinos, atomic physics and gravitation", Villars sur Ollon, Switzerland, Jan. 30-Feb 6, 1993.
- GR-13. Huerta Grande, Córdoba, June 1992.
- "The Physical Origins of Time Asymmetry", NATO. Mazagn, Spain. October 1991.
- VII Simposio Latinoamericano de Relatividad y Gravitación (SILARG VII), México, December 1990.
- Workshop on "Cosmological Phase Transitions", Aspen Center for Physics, August 1990.
- International meeting on Thermal Field Theories and Applications, Tsukuba, Japan, July 1990.

### **TALKS FOR GENERAL AUDIENCE (selected list)**

- "Física Cuántica", Centro Cultural Borges, Buenos Aires, Mayo 2006 (Cuatro conferencias para todo público)
- "¿Qué sabemos sobre la computación cuántica y la teleportación a fines de 2006?", Centro Cultural Borges, Buenos Aires, Conferencia de Navidad, Diciembre 2006
- "Quantum computers", US Library of Congress, Washington DC, Enero 2005 (Charla emitida por CSPAN)
- "Einstein contra la mecánica cuántica", Centro Cultural Borges, Buenos Aires, Mayo 2005.
- "La física de Copenhague", (alrededor de diez conferencias en diversos colegios secundarios e instituciones culturales en 2002, 2003 y 2004)
- "Computación Cuántica", (varias conferencias en colegios y universidades, CndeBA, UNER, etc; en 2003, 2004, 2005, 2006)
- "Quantum Computers", AISTI Conference, Santa Fe, NM, Septiembre 2003.
- "Giróscopos y bicicletas", Semana de la Física, FCEyN UBA, Septiembre 2000, 2001.
- "La historia de la bomba atómica", Semana de la Física, FCEyN UBA, Mayo 2002.
- "La mecánica cuántica", Semana de la Física, FCEyN UBA, Abril 2006
- "Teleportación", Semana de la Física, FCEyN UBA, Abril 2007

### **VISITS TO OTHER SCIENTIFIC INSTITUTIONS (selected list)**

- } CQT, National University of Singapore, Febrero 2008, January 2009.
- } UAB, Barcelona, July 2009.
- } Universität Ulm, Ulm Germany, July 2008, January 2009.
- } Universität Stuttgart, July 2008.
- } University de Nancy, July 2008.
- } University of Harvard, November 2008.
- } Institute Henry Poincaré, Paris, France (Febrero 2006).
- } Collège de France, Paris, (Febrero 2006)

- } Universitat Autònoma de Barcelona, España (Agosto 2006)
- } Institute for Quantum Computation, University of Waterloo, Julio 2004.
- } Benasque Center for Physics, Junio 2007, Julio 2006, Julio 2005, Julio 2003, Junio 2000, Junio/Julio 1998..
- } Physics Department, University of Michigan, Agosto 2002.
- } Perimeter Institute & IQC, University of Waterloo, Canada,
  - o Julio 2004
  - o Agosto 2002.
- } MIT, Department of Nuclear Engineering.
  - o Abril 2002,
  - o Octubre 2002,
  - o Junio 2001
- } Santa Fe Institute. Enero-Febrero 2002.
- } Institute for Theoretical Physics, University of California at Santa Barbara
  - o Program on Quantum Information. Agosto--Septiembre 2001.
  - o Program on Quantum computers and quantum coherence. Julio--Noviembre 1996.
- } Max Planck Institute (PKS), Dresden Germany, Mayo 2001.
- } Los Alamos National Laboratory,
  - o Febrero 2008
  - o Enero and Febrero 2001.
  - o Enero and Febrero 1998.
  - o Julio 1997.
  - o Enero and Febrero 1996.
  - o Enero and Febrero 1995.
- } Department of Physics, UFRJ, Rio de Janeiro, Brazil, Diciembre 2000., Marzo 2008
- } Isaac Newton Institute, Cambridge (England).
  - o Junio and Julio 1999. Invited participant in the Programme on Computation, Complexity and the Physics of Information.
  - o Mayo and Junio 1994. Invited participant in the Programme on Quantum Cosmology.
- } Les Houches Summer School. Lecturer (four lectures) in the LXXII Edition of the Summer School ("Coherent matter waves"). Julio 1999
- } Institute for Advanced Studies (Princeton, NJ, USA). September 1994.
- } Institute for Scientific Interchange, Torino (Italy). Program on Quantum Computation. July 1993
- } Aspen Center for Physics, June 1992 (Workshop on Decoherence and Physics of Information). August 1990 (Workshop on Cosmological Phase Transitions)
- } Université Libre de Bruxelles, October and November 1990
- } Fermilab, Theoretical Astrophysics Group, Febrero 1--28, 1990
- } DARC, Observatoire de Meudon, France, Diciembre 1987--March 1988.

## **TEACHING IN SPECIALIZED INTERNATIONAL SCHOOLS**

- LXXII sesión de Les Houches Summer School on Theoretical Physics. Julio 1999, Agosto), Les Houches, Francia. Dictado de un curso (cuatro clases sobre "Decoherence, the quantum to classical transition and the physics of information" en el marco de la escuela sobre "Coherent matter waves"
- 84th Schladming Winter School on Theoretical Physics. (2004, Enero), Schladming, Austria. Dictado de un curso de cuatro clases sobre "Decoherence, the quantum to classical transition and the physics of information"

- 2nd Scala: (Scalable quantum computers) European Summer School on Quantum Information. 2006 (Julio) Benasque, España. Dictado de un curso de cuatro clases sobre "Decoherence and quantum information"
- 4th Canadian School on Quantum Information. 2004 (Julio) Waterloo, Canada. Dictado de un curso de cuatro clases sobre "Decoherence and quantum information"
- Escuela de Ciencias Informáticas (ECI). 2000 (Julio) Buenos Aires. Dictado de un curso de cinco clases sobre "Computación cuántica"
- Escuela Latinoamericana de Física (E LAF). 2007 (Agosto) México DF, México. Dictado de un curso de cuatro clases sobre "Decoherencia e información cuántica"
- Escola Brasileira de Informacao Cuantica. 2007 (Julio) Parati, Brazil. Dictado de un curso de cuatro clases sobre "Decoherencia e información cuántica"
- Topical School on Quantum Open Systems. 2008 (Julio) Nancy, Francia. Dictado de un curso de cuatro clases sobre "Decoherencia e información cuántica"