CURRICULUM VITAE

Personal Data

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Position: Postdoctoral Research Associate at FERMILAB, Batavia, Illinois (USA).

Education

- B.S. Degree in Theoretical Physics (1998), with marks 3.87/4.00 at the University of Granada.

- Ph. D. Thesis "Fermion Mixing from Extra Dimensions", submitted on May 15, 2002.

Research Experience

- Summer Student at CERN under the supervision of Dr. Pascuale Migliozzi, CHORUS collaboration, (July-August, 1998).

- Introduction to Research grant at Instituto de Estructura de la Materia (Madrid), under the supervision of Prof. Mariano Quirós (September-December, 1998).

- Ph.D. scholarship Formación de Profesorado Universitario (FPU) of Ministerio de Educación y Cultura under the supervision of Prof. F. del Aguila (1999- 2002)

- Postdoctoral Research Associate in the Institute for Particle Physics Phenomenology, Durham, (October 2002-September 2004)

- Postdoctoral Research Associate in FERMILAB, Batavia IL, USA (October 2004-currently)

Teaching Experience

- Quantum Mechanics (II) problems class, one year, 2000-2001 (25 hours).

- Quantum Field Theory problems class, one year, 2001-2002 (25 hours).

- Special and General Relativity problems class, two years, 2000-2002 (15 hours each year).

- International Undergraduate Summer School, Durham, June-July 2003. Project supervisor.

- Mathematical Methods in Physics, example classes. Durham, 2003-2004 (44 hours).

- International Undergraduate Summer School, Durham, July 2004. Project supervisor.

Other experience

- Co-organiser of the Exotic Signals at Hadron Colliders 03 workshop, Durham, March 26-28, 2003.

- Co-organiser of the Particle Physics 2003 conference (Institute of Physics), Durham, April 14-16, 2003.

- Co-organiser of the String Phenomenology 03 conference, Durham, July 29-August 4, 2003.

- Co-organiser of the Cosmo 03 conference, Ambleside, Lake District, August 25-29, 2003.

- Editor of the String Phenomenology 03 conference proceedings, published by World Scientific, Singapure, ISBN: 981-256-035-1.

- Co-organiser of the Exotic Signals at Hadron Colliders 04 workshop, Durham, March 31-April 2, 2004.

- Co-organiser of the SUSY 2005 conference, Durham, July 18-23, 2005.

- Co-organiser of Monte Carlo for Beyond the Standard Model Physcis, Fermilab, March 20-21, 2006.

- Referee activities. Journals: Journal of High Energy Physics, Journal of Physics G: Nuclear and Particle Physics and Classical and Quantum Gravity.

Publications

An up-to-date list of publications, including citations, can be found in the Spires data base under the command `find ea santiago, jose`. According to Spires, the total number of citations as of May 15, 2006 is 612.

Research articles

1. "Calculation of Electroproduction to NNLO and Precision Determination of α_s", J. Santiago and F.J. Ynduráin, Nucl. Phys **B563** (1999) 45-62 [hep-ph/9904344].

2. "A Three Three-brane Universe: New Phenomenology for the New Millennium?", I.I.Kogan, S. Mouslopoulos, A.Papazoglou, G.G.Ross and J. Santiago, Nucl. Phys. **B584** (2000) 313-328 [hep-ph/9912552].

3. "Effective Description of Quark Mixing", F. del Aguila, M. Pérez-Victoria and J. Santiago, Phys. Lett. **B492** (2000) 98 [hep-ph/0007160].

4. "Observable Contributions of New Exotic Quarks to Quark Mixing", F. del Aguila, M. Pérez-Victoria and J. Santiago, JHEP **09** (2000) 011 [hep-ph/0007316)].

5. "Universality Limits on Bulk Fermions", F. del Aguila and J. Santiago, Phys. Lett. **B493** (2000) 175 [hep-ph/0008143].

6. "Improved Calculation of F_2 in Electroproduction and xF_3 in Neutrino Scattering to NNLO and Determination of α_s", J. Santiago and F.J. Ynduráin, Nucl. Phys. **B611** (2001) 447-466 [hep-ph/0102247].

7. "Signals from Extra Dimensions Decoupled from the Compactification Scale", F. del Aguila and J. Santiago, JHEP **03** (2002) 010 [hep-ph/0111047].

8. "Extra Dimensions, Isosinglet Charged Leptons and Neutrino Factories", G.C. Branco, D. Delepine, B. Nobre, J. Santiago, Nucl. Phys. **B657** (2003) 355-377, [hep-ph/0209263].

9. “Bulk Fields with General Brane Kinetic Terms”, F. del Aguila, M. Pérez-Victoria, J. Santiago, JHEP **0302** (2003) 051 [hep-th/0302023].

10. “Flavour Changing Neutral Currents in Intersecting Brane Models”, S.A. Abel, M. Masip, J. Santiago, JHEP **0304** (2003) 057 [hep-ph/0303087].

11. “Einstein Gravity on the Co-dimension 2 Brane?”, P. Bostock, R. Gregory, I. Navarro, J. Santiago, Phys Rev Lett **92** (2004) 221601 [hep-th/0311074].

12. “Flavour in Intersecting Brane Models and Bounds on the String Scale”, S. Abel, O. Lebedev, J. Santiago, Nucl. Phys. **B696** (2004) 141 [hep-ph/0312157].

13. “Higher codimension brane worlds from intersecting branes”, I. Navarro, J. Santiago, JHEP **0404** (2004) 062 [hep-th/0402204].

14. “Flux Compactifications: Stability and Implications for Cosmology”, I. Navarro, J. Santiago, JCAP **09** (2004) 005 [hep-th/0405173].

15. “Gravity on Codimension 2 Brane Worlds”, I. Navarro, J. Santiago, JHEP **0502** (2005) 007 [hep-th/0411250].

16. “Unconventional cosmology on the (thick) brane”, I. Navarro, J. Santiago, JCAP **03** (2006) 015 [hep-th/0505156].

17. “Constraining Inverse Curvature Gravity with Supernovae”, O. Mena, J. Santiago, J. Weller, Phys Rev Lett **96** (2006) 041103 [astro-ph/0510453]. Featured in Issue Four of The Gravitational Lens, CGWP, `http://cgwp.gravity.psu.edu/gravlens/GravLens2005_4.shtml`, Physicsweb (Feb. 7, 2006), `http://www.physicsweb.org/articles/news/10/2/4/1` and in the news section of Science (Feb. 13, 2006), `http://sciencenow.sciencemag.org/cgi/content/full/2006/213/2` .

18. “Revamped Braneworld Gravity”, R. Bao, M. Carena, J. Lykken, M. Park, J. Santiago, Phys Rev **D73** (2006) 064026 [hep-th/0511266].

19. “Effective Description of Brane Terms in Extra Dimensions”, F. del Aguila, M. Pérez-Victoria, J. Santiago, hep-ph/0601222.

Invited Reviews

1. “Constraining the String Scale: from Planck to Weak and Back Again”, S. Abel, J. Santiago, Topical review, J.Phys.G: Nucl.Part. Phys. **30** (2004) R83-R111 [hep-ph/0404237].

2. “New Bounds on the String Scale from Flavour Physics”, J. Santiago, Mod. Phys. Lett. A19 (2004) 497 [hep-ph/0406239].

Conference Proceedings

1. “NNLO Calculation of DIS; Precision Determination of the Strong Coupling Constant, Extraction of the Gluon Density, and Comments on “Hidden” Gluinos”, J. Santiago and F.J. Ynduráin, Nucl. Phys. Proc. Suppl. **86** (2000) 69-73 [hep-ph/9907387].

2. “Top Mixing in Effective Theories”, F. del Aguila and J. Santiago, Nucl. Phys. **B** (Proc. Suppl.) **89** (2000) 43 [hep-ph/0011142].

3. “Large Top Mixing from Extra Dimensions”, F. del Aguila and J. Santiago, in G. C. Branco *et. al* (eds.), Recent Developments in Particle Physics and Cosmology, 497-506, Kluwer Academic Publisher [hep-ph/0011143].

4. “Low Energy Constraints on Orbifold Models”, F. del Aguila and J. Santiago, Nucl. Phys. **B** (Proc. Suppl.) **116** (2003) 326-330 [hep-ph/0212205].

5. “Some Consequences of Brane Kinetic Terms for Bulk Fermions”, F. del Aguila, M. Pérez-Victoria and J. Santiago, hep-ph/0305119.

6. “Bulk Fields with Brane Terms”, F. del Aguila, M. Pérez-Victoria, J. Santiago, hep-ph/0310352, invited review presented at HEP03 Europhysics conference, parallel session “Physics beyond the Standard Model”, 17-23 July 2003, Aachen, Germany.

7. “Flavour Structure of Intersecting Brane Models”, S. Abel, O. Lebedev, J. Santiago, presented at String Phenomenology 03.

8. “Physics of Brane Kinetic Terms”, F. del Aguila, M. Pérez-Victoria, J. Santiago, Acta Phys. Polon. **B34** (2003) 5511 [hep-ph/0310353], presented at XXVII International Conference of Theoretical Physics, Ustron 15-21 September 2003, Poland.

9. “Discrete Regularisation of Localised Kinetic Terms”, F. del Aguila, M. Pérez-Victoria, J. Santiago, Nucl. Phys. Proc. Suppl.**135** (2004) 295 [hep-ph/0410082], presented at the 7th DESY Workshop on Elementary Particle Theory “Loops and Legs in Quantum Field Theory”, Zinnowitz, April 25-30, 2004.

Visits to other institutions

- July-August 1998, CERN (Geneva).
- September-December 1998, Instituto de Estructura de la Materia, CSIC (Madrid).
- November-December 1999, Department of Theoretical Physics, Oxford University.
- June-July 2000, Dipartimento di Fisica “Galileo Galilei”, Padova University.
- November-December 2001, Department of Theoretical Physics, Oxford University.
- November 2003, Johns Hopkins University.

Schools and Workshops attended

- VI Escuela de Otoño de Física Teórica de Santiago de Compostela. (September 10-23, 1998).
- International Workshop on Low x Physics, Tel Aviv (Israel) June 15-18, 1999.
- NATO ASI Summer School “Particle Physics: Ideas and Recent Developments”, Cargese (Corsica), 26 July - 7 August, 1999.
- VII Escuela de Otoño de Física Teórica de Santiago de Compostela, September 6-17, 1999.
- XXVIII International Meeting on Fundamental Physics, Sanlúcar de Barrameda, February 14-18, 2000.
- Conference on Physics Beyond Four Dimensions, ictp, Trieste, July 3-6, 2000.

- Lisbon School on Superstrings “Modern Trends in String Theory”, Lisbon, July 13-17, 2001.
- Corfu Summer Institute on Elementary Particle Physics, Corfu, September 2001.
- Annual Theory Meeting, Durham, December 17-19, 2001.
- 1st Workshop on Flavour Physics, CP violation and Extra Dimensions, Covilhã, Portugal, May, 2002.
- Annual Theory Meeting, Durham, December 15-18, 2002.
- XXXVIIIth Rencontres de Moriond, Electroweak Interactions and Unified Theories session, March 15-22, 2003.
- Workshop on Exotic Signals at Hadron Colliders 2003, Durham, March 26-28, 2003.
- Planck 2003, Madrid, May 26-31, 2003.
- The World According to WMAP, Abingdon, U.K., June 7-8, 2003.
- String Phenomenology 2003, Durham, July 29 - August 4, 2003.
- Cosmo 2003, Ambleside, U.K., August 25-29, 2003.
- 3rd Meeting of the EuroGDR “Supersymmetry”, Dec 11-13, 2003. LAL, Orsay, France.
- Annual Theory Meeting, Durham, December 18-20, 2003.
- Exotic Signals and Hadron Colliders 2004, Durham, March 31- April2, 2004.
- X Christmas Workshop, IFT-UAM, Madrid, December 15-17, 2004.
- ANL Theory Institute 05: SUSY, Extra Dimensions and Higgs Bosons, Argonne, May 9-13, 2005.
- SUSY 2005 Conference, 18th-24th July 2005. Durham, UK
- New Views of the Universe, KAVLI Institute Inaugural Symposium in Honor of D. Schramm, Chicago, December 8-13, 2005.
- Aspen Winter Conference 2006, “Particle Physics at the Verge of Discovery”, Aspen, Feb. 12-18, 2006.
- Monte Carlo Tools for Beyond the Standard Model Physics workshop, Fermilab, March 20-21, 2006.
- Argonne & University of Chicago Workshop on Collider Physics, Argonne, May 8-12, 2006.

Talks

- “Calculation of e-p at NNLO and Precision Determination of α_s”, Universidad Autónoma de Madrid, April 15, 1999.
- “DIS at NNLO”, Tel Aviv University, June 15, 1999.
- “The Hierarchy Problem and Extra Dimensions”, Granada, January 14, 2000.
- “Effective Lagrangian Description of Quark Mixing”, Padova, July 17, 2000.
- “Large Top Mixing from Extra Dimensions”, Universidad Autónoma de Madrid, January 30, 2001.

- “Improved Calculation of Electroproduction and Neutrino Scattering at NNLO”, II Jornadas de Física Teórica, Sevilla, September 24, 2001.
- “Flavour Physics from Extra Dimensions”, II Jornadas de Física Teórica, Sevilla, September 26, 2001.
- “Signals from Extra Dimensions Decoupled from the Compactification Scale”, Oxford, December 6, 2001.
- “Fermion Masses and Mixing Angles from Extra Dimensions”, 1st Workshop on Flavour physics, CP violation and Extra Dimensions, Covilhã, May 17, 2002.
- “Fermion Localization in Extra Dimensions”, Durham, October 31, 2002.
- “Bulk Fields with Brane Kinetic Terms”, Rencontres de Moriond, March, 2003.
- “Flavour Changing Neutral Currents in Intersecting Brane Models”, Exotic Signals at Hadron Colliders 03, Durham, March 27, 2003; Granada, April 10, 2003; Oxford, May 1, 2003; Planck03, Madrid, May 26-31, 2003.
- “Adding Flavour to Models with Intersecting D-branes”, String Pheno03, Durham, July-August, 2003 and EuroGDR meeting, Orsay, December 2003.
- “Einstein Gravity on the Codimension 2 Brane?”, Johns Hopkins University, Baltimore (US) and New York University, New York (US), November 2003.
- “New Bounds on the String Scale from Flavour Physics”, DAMTP, Cambridge Univ., February 2003
- “Higher Codimension Braneworlds from Brane Intersections”, UAM (Madrid), April 20 and Granada University, April 22, 2004.
- “Gravity on Codimension 2 Braneworlds”, X Christmas workshop, IFT-UAM, December 17, 2004.
- “Gravity on Codimension 2 Braneworlds”, FNAL, January 27, 2005 and ANL, February 7, 2005.
- “Constraining Inverse Curvature Gravity with Supernovae”, New Views of the Universe Symposium, Chicago, December 12, 2005.
- “Braneworld Gravity”, Aspen Winter Conference 2006, Aspen, February 17, 2006.
- “Dark energy or . . . better?”, Syracuse Univ., February 27, 2006; Cornell Univ., March 1, 2006 and Argonne Nat. Lab., March 6, 2006.
- “Revamped brane world gravity”, UAB, Barcelona, April 28, 2006.
- “FNAL theory Beyond the Standard Model”, Theory breakout session of the DOE Annual Program Review, Fermilab, May 17, 2007.

Statement of research interests

We are currently facing one of the most exciting times for phenomenology of particle physics, astrophysics and cosmology. The Large Hadron Collider (LHC) will turn on soon, uncovering the dynamics of spontaneous symmetry breaking and most likely discovering physics beyond the Standard Model (SM) of particle physics. There is nowadays a large number of alternative models beyond the SM with potential for discovery at LHC and a great deal of work and ingenuity will have to be devoted to disentangle the signals from the SM backgrounds and decide which one is the right (class of) model(s). I have always been very interested in the phenomenology of models beyond the SM, in particular in models with extra dimensions that are a well motivated completion of the SM with great possibilities of discovery at LHC.

Extra dimensional models can range from Universal Extra Dimensions in flat space, with a built in discrete symmetry that allows only pair production and loop effects of new particles, thus with masses compatible with present experimental constraints well below the TeV scale, to highly curved extra dimensions with a strong warping explaining in a natural way the tantalizing hierarchy between the Planck and the electroweak scales or the one present in the flavour sector of the Standard Model. In all these models, the presence of lower-dimensional spaces (branes) and operators localized on them can crucially change their phenomenology and a serious study of their effects is essential when facing LHC data. In my research, I have studied flavour phenomenology of models with extra dimensions and their most natural ultraviolet completion, String Theory. I have found extremely powerful the complementarity of quantum field theory calculations in extra dimensions and purely stringy calculations. The different points of view of the same phenomenon gives a much deeper understanding and sometimes a unique way of obtaining physical results that could never be grasped without both of them. I plan to continue using string theory calculations as a natural and powerful completion of models with extra dimensions. I have also started a project of systematic study, in an effective field theory framework, of phenomenological implications of brane-localized operators. I have started with brane kinetic terms and the way of systematically including them (in particular the most singular ones) in an effective Lagrangian with zero width branes. In the future I plan to include other brane localized terms and perform a detailed analysis of their collider implications. Another very exciting aspect of extra dimensions, that I am currently investigating, is the possibility of gauge-Higgs unification in which the Higgs boson is the component along the extra dimensions of higher dimensional gauge fields. Locality and gauge invariance then protects the Higgs mass from quantum divergences in a very predictive model. We are currently studying its challenging flavour sector and the possibility of phenomenological implications at the LHC. In the future, I plan to continue the study of models with extra dimensions, with special emphasis on their collider phenomenology, together with more formal aspects of these models. Of course it will ultimately be the experiment that will tell us which kind of new physics lurkes beyond the electroweak scale and I will definitely devote my efforts to the study of the phenomenology of such physics beyond the SM.

Astrophysics and Cosmology are also experiencing a golden moment of their history, finally becoming precision sciences, with a plethora of new very precise experimental data. The Concordance Model has emerged as a very successful explanation of almost all experimental data although its inability to explain some of the most excruciating questions in physics such as those related to dark matter and dark energy has fueled efforts to look for alternative theories of gravity in which these problems may have natural solutions. I have studied over the last few years modified theories of gravity based on extra dimensions and braneworlds of diferent codimensions. Even though the search for a self-tuning model where the cosmological constant is automatically zero to first approximation has not been successful *yet*, much progress has been made in that direction and it is not unlikely that a satisfactory explanation will soon be found. I am currently working on a very general model of braneworld gravity, that parametrizes a large number of models, with their different features. This allows us to study, once and for all, the phenomenological implications of all these models that range from DGP-like models that attempt to explain the current acceleration of the Universe due to brane-localized curvature terms, to RS-like models that explain the gauge hierarchy and can have important collider implications with the possibility of direct graviton production at LHC. Another alternative to standard gravity with interesting implications for the cosmological constant problem is inverse curvature modifications of gravity. I have recently shown that these modifications of gravity are as good a description of the current acceleration of the Universe as the Concordance Model and I am currently investigating their implications for the growth of perturbations. This will allow us to put the model to non-geometric tests, like the growth of large scale structure and cosmic microwave background radiation, that are thought to be the ultimate test to distinguish the Concordance Model from modified gravity. These modifications of gravity are intimately connected to models of particle physics beyond the SM, and their study in a broader context, relating experimental tests and theories relevant to particle physics, cosmology and astrophysics will undoubtedly help unveil some of the most interesting mysteries of Nature. I plan to continue my research in these fields to understand the physics beyond the standard models.