Lattanzi Massimiliano

Position: Postdoctoral fellow (Oxford University, UK)

I Scientific Work

His main research interest are in the areas of Cosmology and Astroparticle Physics. He has been studying the role of neutrinos in cosmological evolution, and the possibility of measuring neutrino-related quantities through cosmological observation.

Together with R. Ruffini and G. Vereschagin, he has obtained a robust upper limit on the cosmological lepton asymmetry from analysis of the cosmic microwave background data (see ML, Ruffini, Vereshchagin, PRD 72, 063003, 2005).

He has also studied, together with J.W.F. Valle, the possibility of relating the problem of dark matter to the issue of the origin of neutrino masses, proposing a new dark matter candidate, the majoron (ML, Valle, PRL 99, 121301, 2007) and studying the perspectives for its indirect detection (Bazzocchi, ML, Riemer-Sørensen, Valle, JCAP 0808:013, 2008).

He is also interested in primordial gravitational waves. The issue of their interaction with neutrinos has been studied in ML & Montani (Mod. Phys. Lett. A 20, 2607, 2005), while at the moment he is working on their interaction with spinning particles (Milillo, ML, Montani, IJMP A23, 1278, 2008).

In the last two years he has been working with J. Silk on the topic of indirect detection dark matter, focusing mainly on the signal produced by the annihilation of supersymmetric particles. In Cumberbatch, ML, Silk (submitted to MNRAS) they have studied the 21cm signal generated by neutralino and light dark matter annihilations.

II Conferences and educational activities

Conferences and Other External Scientific Work

2008

- UniverseNet: the 2nd Network School and Meeting, “Seeking links between fundamental physics and cosmology”, Oxford (UK).
- Neutrino Oscillation Workshop 2008, Otranto (LE), Italy.
- 3rd Stueckelberg Workshop on Relativistic Field Theories, Pescara, Italy

2007

- Royal Astronomical Society Specialist Discussion Meeting: “Statistical challenges in particle astrophysics and cosmology”, London, UK
- Institute of Physics **“**Theta13 half day meeting”, Oxford, UK
- 2nd Meeting of the “Red Nacional Temática de Astroparticulas” (RENATA), Valencia, Spain
- Workshop “The Path to Neutrino Mass”, Aarhus, Denmark.
- 4rd Italian-Sino Workshop on Relativistic Astrophysics: “Astrophysics at z>6”, Pescara, Italy.
- 10th Italian-Korean Symposium on Relativistic Astrophysics, Pescara, Italy.
- XIXèmes Rencontres de Blois: “Matter and Energy in the Universe: from nucleosynthesis to cosmology”, Blois, France.

2006

- 1st Meeting of the “Red Nacional Temática de Astroparticulas” (RENATA), Valencia, Spain
- 11th Marcel Grossmann Meeting on General Relativity, Berlin, Germany
- 3rd Italian-Sino Workshop on Relativistic Astrophysics: “Supernovae, GRBs and Cosmology”, Pescara, Italy.
- International School on Astro-Particle Physics: “Neutrinos in Physics, Astrophysics and Cosmology”, Munich, Germany.

2005

- IRAP Ph.D. School in Pescara, Italy.
- “Albert Einstein Century” International Conference, Paris, France
- 2nd Italian-Sino Workshop on Relativistic Astrophysics: “Probing the Dark Universe”, Pescara, Italy

2004

- “Testing the equivalence principle in space and on ground” meeting, Pescara, Italy.
- 1st Sino-Italian Workshop on Cosmology and Relativistic Astrophysics, Pescara, Italy

2003

- “VIII Italian-Korean Symposium on Relativistic Astrophysics”, Pescara, Italy
- “X Marcel Grossman Meeting on General Relativity”, Rio de Janeiro, Brazil.

2002

- “X Brazilian School of Cosmology and Gravitation”, Rio de Janeiro, Brazil.
- X ICRA Network Workshop on ‘Black Holes, Gravitational Waves and Cosmology’, Roma and Pescara, Italy.
- “Science and Ultimate Reality Symposium” in honour of J. A. Wheeler, Princeton N.J.

2001

- XI ICRA Network Workshop on 'Fermi and Astrophysics', Pescara, Italy.
- **VII Italian-Korean Meeting on Relativistic Astrophysics, Inje University, South Korea.**
- VI ICRA Network Workshop on 'Time Structures in Relativistic Astrophysics', Pescara, Italy.

Work With Students

Teaching Experiences:

2005 *Lecturer*: IRAP Doctorate School, Pescara, Italy

Delivered a lecture on the thermodynamics in the expanding Universe.

2002 *Postgraduate Teaching Assistant*: University of Rome 'La Sapienza'

Physics Laboratory. Supervised lab sessions, graded papers and exams.

2001 – 2005 *Substitute Lecturer*: University of Rome 'La Sapienza'

Delivered several lectures to the advanced general relativity class on the evolution of metric perturbations in a Friedmann Universe.

Work with graduate students

He has been working with graduate students from different institutions, including D. Cumberbatch (Oxford), U. França (Valencia), I. Milillo (Rome and Portsmouth), S. Riemer-Sørensen (Aarhus).

Diploma thesis supervision

He followed as an adjoint supervisor Roberto Guida, now an IRAP PhD graduate, during its diploma thesis work, titled "Fractality and cosmological initial conditions: the role of the velocity field" (graduation date 30/9/04).

III Service activities

Within ICRANet

2005 Research Assistant, ICRANET

Outside ICRANet

2007 – Present Postdoctoral Fellow, Physics Department, Oxford University (UK)

2006 Postdoctoral Fellow, Institute For Particle Physics, Valencia (ES)

IV 2007-2008 List of Publications

Submitted papers

- D. Cumberbatch, M. Lattanzi, J. Silk, submitted to *Mon. Not. Roy. Astron. Soc.* [arxiv:0808.0881] [astro-ph]
Signatures of clumpy dark matter in the global 21 cm background signal

Published papers

- M. Lattanzi, to appear in "Proceedings of the XIX Rencontres de Blois". In press.
Constraints on the cosmological lepton asymmetry: a reappraisal using WMAP third-year data

- M. Lattanzi, to appear in "Proceedings of the 10th Italian-Korean Symposium on Relativistic Astrophysics". In press.
The majoron: a new dark matter candidate

- M. Lattanzi, R. Ruffini, G.V. Vereshchagin, in "Proceedings of the Eleventh Marcel Grossmann Meeting on General Relativity", Eds. H. Kleinert, R.T. Jantzen and R. Ruffini, World Scientific, Singapore (2008).
Constraining the cosmological lepton asymmetry through cosmic microwave background observations

- F. Bazzocchi, M. Lattanzi, S. Riemer-Sorensen, J.W.F. Valle, *J. Cosmol. Astropart. Phys.* **08** (2008) 013 [arxiv:0805.2372] [astro-ph]
X-ray photons from late-decaying majoron dark matter

- I. Milillo, M. Lattanzi, G. Montani, in "Proceedings of the Second Stueckelberg Workshop on Relativistic Field Theories", Eds. F. Cianfrani, G. Montani, R. Ruffini, *Int. J. Mod. Phys. A.* **23** 1278 (2008) [arxiv:0804.0572] [astro-ph]
On the coupling between spinning particles and cosmological gravitational waves

- M. Lattanzi, in "Relativistic Astrophysics: 4th Italian-Sino Workshop", Eds. C.L. Bianco and S.-S. Xue, *AIP Conf. Proc.* **966**, 163 (2007) [arxiv:0802.3155] [astro-ph]
Decaying majoron dark matter and neutrino masses

- M. Lattanzi, J.W.F. Valle, *Phys. Rev. Lett.* **99**, 121301 (2007) [arxiv:0705.2406] [astro-ph]
Decaying warm dark matter and neutrino masses