

Dr. Carlo Giovanni Maccaferri

Dipartimento di Fisica
Università degli Studi di Torino,
Via Pietro Giuria 1, Torino
E-mail : maccafer@to.infn.it

CURRICULUM VITAE

BORN IN : **Torino, Italy, 28/06/1977** NATIONALITY : **Italian**

Present position

Since 7/06/2012, Ricercatore (Assistant Professor) under *Programma Rita Levi Montalcini* at Physics Department of Torino University

Previous positions

- 1/11/2010 to 6/06/2012 post-doc researcher at the Institute of Physics of the Academy of Science of Czech Republic
- 1/09/2007 to 31/10/2010, ULB+INFN post-doc researcher at ULB, Brussels, Service de Physique Théorique et Mathématique
- 1/09/2006 to 31/08/2007, Marie-Curie RTN post-doc at VUB, Brussels, Theoretical Physics Department
- 1/11/2005 to 31/08/2006, post-doc researcher at ULB, Brussels, Service de Physique Mathématique des Interactions Fondamentales

Postgraduate studies

- 2001–2005 : PhD at SISSA/ISAS, Trieste, Elementary Particles sector, advisor : Prof. Lorianò Bonora
- PhD defended the 4/10/2005, thesis presented : “*D-branes, Rolling Tachyons and Vacuum String Field Theory*”

Undergraduate studies

- Laurea (Master) degree obtained the 26/01/2001 at Torino University *summa cum laude*
- Degree thesis “*Massive Type IIA Supergravity : Geometrical Construction*”, advisor : Prof. Riccardo D’Auria

Brief research description

After graduating at Torino University, I did my PhD at SISSA (2001) where, supervised by prof. Lorianò Bonora, I started working on String Field Theory, in particular on the proposal of Vacuum String Field Theory by Rastelli, Sen and Zwiebach.

After finishing the PhD I joined the string theory group at ULB in Bruxelles, headed by prof. Marc Henneaux. There I had the possibility to broaden my research interests to non commutative field theories and effective actions for multiple M2-branes.

In 2010, together with L. Bonora and D. Tolla, we proposed an explicit OSFT construction describing the end-point of a boundary world-sheet RG-flow and, for the first time, provided a concrete analytic mechanism for Sen second conjecture (lower dimensional branes as tachyon lumps).

In the fall of 2010 I joined the string-group at the Czech Academy of Science, headed by Martin Schnabl. I started a collaboration with Theodore Erler on singular gauge transformations in OSFT (2011- 2012). The tools we developed gave very simple and straightforward way to analytically compute observables in OSFT, using a mechanism (the so-called “phantom-term”) similar in spirit to topological localization. We also shed light on many subtleties that could affect the construction of classical solutions from a pure gauge ansatz.

Together with Martin Schnabl and the Ph-D student M. Kudrna, we devised an explicit gauge invariant way to compute the boundary state from a given OSFT solution, providing a fully explicit connection between string field theory and boundary conformal field theory (BCFT).

In 2014, I discovered a new analytic solution for self- local marginal deformations, in which the D-brane modulus is treated non-perturbatively, showing that OSFT can describe generically “far” configurations in the D-brane moduli space. The solution allows for a direct evaluation of observables, thanks to a newly constructed regularization of old severe singularities (related to the so-called identity string field), which remained unsolved in the previous ten years.

A fundamental result has been achieved in 2014, together with T. Erler : an analytic solution describing transitions between any two generic time-independent D-brane systems has been explicitly constructed, showing the power of OSFT to go beyond the sigma-model world-sheet approach, for example by dynamically generating Chan-Paton’s factors.

After this I concentrated on the structure of classical solutions in OSFT with the aim of searching for a new paradigm to classify D-branes. Results in these directions include the study of how the D-branes moduli space is (non-trivially) described by a corresponding family of OSFT solutions (where I benefit from collaborations with M. Schnabl and M. Kudrna) and, at a more formal level, the (on-going) study of defects operators in OSFT as solution generating techniques.

More recently my research also includes Superstring Field Theory and the construction of supersymmetric effective actions out of it.

Invited talks at Conferences

1. *String Field Theory and Related aspects*, Sao Paolo, June 2016, “**D-branes moduli and Open String Field Theory**”
2. *Theories of Fundamental Interactions 2015*, Naples, November 2015, “**Defects in open string field theory**”
3. *Physics on the Riviera 2015*, Sestri Levante, September 2015 “**D-branes in open string field theory : classical solutions and topological defects**”

4. *String Field Theory and Related aspects*, Sichuan University, Chengdu, May 2015, **“Tachyon Vacuum on a separated brane-antibrane system”**
5. *The String Theory Universe*, Mainz, september 2014 **“String Field Theory Solution for Any Open String Background”**
6. *String Field Theory and Related aspects*, SISSA, Trieste July 2014, **“String Field Theory Solution for Generic Background Shifts”**
7. *IX Avogadro Meeting*, SISSA, Trieste, Italy, December 2013 **“Recent trends in string field theory”**
8. *Symmetry of the Universe and of the Fundamental Interactions*, Scuola Normale Superiore, 16-17 May 2013 **“Charting the OSFT Landscape : Boundary State from Classical Solutions”**
9. *Vth International conference on String Field Theory and Related aspects*, Jerusalem, Israel, October 2012, **“Boundary State from Ellwood Invariants”**
10. *XVIII European Workshop on String Theory*, Corfú, Greece, September 2012, **“Boundary State from Open String Field Theory Invariants”**
11. *IVth International conference on String Field Theory and Related aspects*, Prague, Czech Republic, September 2011, **“On Lumps from RG flows”**
12. *IIIrd International conference on String Field Theory and Related aspects*, Kyoto, Japan, October 2010, **“A solution for relevant deformations in Open String Field Theory”**
13. *Problemi Attuali di Fisica Teorica*, Vietri, Italy, April 2010 **“On lower dimensional D-branes in Open String Field Theory”**
14. *Current Trends in String Field Theory*, Pohang, South Korea, December 2009, **“The ghost sector in SFT : analysis and applications”**
15. *IInd International conference on String Field Theory and Related aspects*, Moscow, Russia, April 2009, **“On the ghost sector of Open String Field Theory”**
16. *IV Avogadro Meeting*, SISSA, Trieste, Italy, December 2008, **“Membranes Dynamics”**
17. *IIIrd RTN Workshop on Constituents, Fundamental Forces and Symmetries of the Universe*, Valencia, Spain, October 2007, **“New Vortices in Non-commutative Gauge Theory”**
18. *Problemi Attuali di Fisica Teorica*, Vietri, Italy, April 2004 **“D-Brane spectrum from Vacuum String Field Theory”**
19. *Incontro del Gruppo IV, INFN*, Perugia, Italy, December 2003, and *Zagreb University*, Croatia, February 2004 **“Dressed Sliver Solutions in Vacuum String Field Theory”**
20. *Convegno di Fisica Teorica*, Cortona, Italy, May 2003 **“Properties of the Ghost product in Open String Field Theory”**
21. *Problemi Attuali di Fisica Teorica*, Vietri, Italy, April 2003 **“On Star Product in Open String Field Theory”**

Invited Lectures

- Lectures at International school on String Field Theory and Higher Spin Theory, Chengdu, 4-8/5/2015
- Lectures at International school on String Field Theory and Higher Spin Theory, Trieste, 21-26/7/2014
- *1st and 2nd Joint Paris–Bruxelles–Amsterdam PHD program*, Brussels, Belgium, October–November 2006 and October 2007
 - Topics in Superstring Theory
 - Introduction to String Field Theory
- *2nd Modave Summer School in Mathematical Physics*, Modave, Belgium, August 2006
 - Basics of Open String Field Theory

Seminars

1. Theory seminars, Pisa University ,February 2016 “**D-branes moduli in open string field theory**”
2. Joint Seminars ULB-VUB-KUL-UMONS, Bruxelles March 2015 and String Theory Seminars at IFT, Lisbon “ **Open String Field Theory and D-Branes**”a
3. *Rencontres Theoriciennes*, Ecole Normale, String Theory in Greater Paris, September 2014 “**String Field Theory Solution for Any Open String Background**”
4. *Torino University*, Italy, October 2011 “ **Relevant Deformations in Open String Field Theory**”
5. *ULB and Leuven, Bruxelles*, Belgium, March 2005, “**Bubbling AdS and Vacuum String Field Theory : a correspondence**”
6. *ULB and Leuven, Bruxelles*, Belgium, June 2005, “**Background Independence in VSFT : Chan Paton’s and Higgsing**”
7. *ULB and Leuven, Bruxelles*, Belgium, October 2004, and *Von Humboldt University, Berlin*, Germany, November 2004 “**D–Branes and their decay in Vacuum String Field Theory** ”

Organization

- Organization of the international conference “String Field Theory and Related Aspects”, SISSA, Trieste, July 2014
- Organization of Avogadro Meeting on Strings, Supergravity and Gauge Theories, years 2009 (SISSA) and 2010-2011 (GGI, Florence)
- Seminar organizer for the String Theory Group at Torino University (2012–present)

Recognitions

- Winner of a Rita Levi Montalcini Grant (2009) from the Italian Ministry of Research (holding)

- Selected for final auditions for FIRB 2013, Principal Investigator
- Reviewer for Grant Proposals of Croatian Science Foundation (HRZZ) 2013
- Reviewer for Grant Proposals of Croatian Science Foundation (HRZZ) 2014
- Review request for Grant Proposal FIR 2014, Italian Ministry of Research (declined)
- Referee for JHEP

Students supervision

- Co-supervision on Master Thesis (Lucrezia Ravera, “D-Branes and deformed super-Yang-Mills Theories”, 2014)
- Co-advisor for PhD project (Pier Vittorio La Rocca, subject : String Field Theory and D-branes moduli space, 2015-2016)
- Advisor for PhD project (Alberto Merlano, subject : Super String Field Theory, started in early 2016)

Academic Teaching (assistant professor)

- Mathematical methods for Physics II (AA 2015-2016),
- Mathematical methods for Physics II (AA 2014-2015),
- Mathematical methods for Physics II (AA 2013-2014),
- Mechanics (AA 2012-2013),
- Mathematical methods for Physics II (AA 2012-2013)

Publications

1. M. Kudrna and C. Maccaferri, “*BCFT moduli space in level truncation*,” JHEP **1604** (2016) 057 [arXiv :1601.04046 [hep-th]].
2. C. Maccaferri and M. Schnabl, “*Large BCFT moduli in open string field theory*,” JHEP **1508** (2015) 149 arXiv :1506.03723 [hep-th].
3. T. Erler and C. Maccaferri, “*String Field Theory Solution for Any Open String Background*,” JHEP **1410** (2014) 029 [arXiv :1406.3021 [hep-th]].
4. C. Maccaferri, “*A simple solution for marginal deformations in open string field theory*,” JHEP **1405** (2014) 004 [arXiv :1402.3546 [hep-th]].
5. M. Kudrna, C. Maccaferri and M. Schnabl, “*Boundary State from Ellwood Invariants*,” JHEP **1307** (2013) 033 [arXiv :1207.4785 [hep-th]].
6. T. Erler and C. Maccaferri, “*The Phantom Term in Open String Field Theory*,” JHEP **1206** (2012) 084 [arXiv :1201.5122 [hep-th]].
7. T. Erler and C. Maccaferri, “*Connecting Solutions in Open String Field Theory with Singular Gauge Transformations*,” JHEP **1204** (2012) 107 [arXiv :1201.5119 [hep-th]].
8. T. Erler, C. Maccaferri, “*Comments on Lumps from RG flows*,” JHEP **1111** (2011) 092 [arXiv :1105.6057 [hep-th]].
9. L. Bonora, C. Maccaferri and D. D. Tolla, “*Relevant Deformations in Open String Field Theory, a Simple Solution for Lumps*” JHEP **1111** (2011) 107 [arXiv :1009.4158 [hep-th]].

10. L. Bonora, C. Maccaferri and D. D. Tolla, “*Ghost story. III. Back to ghost number zero*,” JHEP **0911** (2009) 086 [arXiv :0908.0056 [hep-th]].
11. L. Bonora, C. Maccaferri, R. J. Scherer Santos and D. D. Tolla, “*Ghost story. II. The midpoint ghost vertex*,” JHEP **0911** (2009) 075 [arXiv :0908.0055 [hep-th]].
12. C. Krishnan, C. Maccaferri and H. Singh, “*M2-brane Flows and the Chern-Simons Level*,” JHEP **0905** (2009) 114 [arXiv :0902.0290 [hep-th]].
13. C. Krishnan and C. Maccaferri, “*Membranes on Calibrations*,” JHEP **0807** (2008) 005 [arXiv :0805.3125 [hep-th]].
14. L. Bonora, C. Maccaferri, R. J. Scherer Santos and D. D. Tolla, “*Ghost story. I. Wedge states in the oscillator formalism*,” JHEP **0709**(2007)061 arXiv :0706.1025 [hep-th].
15. N. Bouatta, J. Evslin and C. Maccaferri, “*Puffed Noncommutative Nonabelian Vortices*,” JHEP **0704** (2007) 037 [arXiv :hep-th/0702042].
16. L. Bonora, N. Bouatta and C. Maccaferri, “*Towards open-closed string duality : Closed strings as open string fields*,” arXiv :hep-th/0609182.
17. L. Bonora, C. Maccaferri, R. J. Scherer Santos and D. D. Tolla, “*Bubbling AdS and vacuum string field theory*,” Nucl. Phys. B **749** (2006) 338 arXiv :hep-th/0602015.
18. C. Maccaferri, “*Chan-Paton factors and higgsing from vacuum string field theory*,” JHEP **0509** (2005) 022 [arXiv :hep-th/0506213].
19. L. Bonora, C. Maccaferri, R. J. Scherer Santos and D. D. Tolla, “*Fundamental strings in SFT*”, Phys. Lett. B **619** (2005) 359 arXiv :hep-th/0501111.
20. C. Maccaferri, R. J. Scherer Santos and D. D. Tolla, “*Time-localized projectors in string field theory with E-field*”, Phys. Rev. D **71** (2005) 066007 arXiv :hep-th/0501011.
21. L. Bonora, C. Maccaferri, R. J. Santos, D. D. Tolla, “*Exact time-localized solutions in Vacuum String Field Theory*”, Nucl. Phys. B **715** (2005) 413 arXiv :hep-th/0409063.
22. L. Bonora, C. Maccaferri and P. Prester, “*The perturbative spectrum of the dressed sliver*”, Phys. Rev. D **71** (2005) 026003, arXiv :hep-th/0404154.
23. L. Bonora, C. Maccaferri and P. Prester, “*Dressed sliver solutions in vacuum string field theory*”, JHEP **0401** (2004) 038, arXiv :hep-th/0311198.
24. C. Maccaferri and D. Mamone, “*Star democracy in open string field theory*”, JHEP **0309** (2003) 049, arXiv :hep-th/0306252.
25. L. Bonora, C. Maccaferri, D. Mamone and M. Salizzoni, “*Topics in string field theory*”, arXiv :hep-th/0304270.
26. F. Bazzocchi, M. Cirafici, C. Maccaferri and S. Profumo, “*Matrix models of noncommutative (2d+1) lattice gauge theories*”, Int. J. Mod. Phys. A **19** (2004) 4287, arXiv :hep-th/0211060

Proceedings

1. C. Maccaferri, “*Boundary state from open string field theory invariants*,” PoS Corfu **2012** (2013) 100.

2. C. Maccaferri, “*A solution for relevant deformations in open string field theory,*” Prog. Theor. Phys. Suppl. **188** (2011) 83-93.
3. C. Krishnan and C. Maccaferri, “*Membranes, Strings and Integrability,*” Fortsch. Phys. **57** (2009) 632 [arXiv :0810.3825 [hep-th]].
4. C. Maccaferri, “*Basics of Open String Field Theory*”, Proceedings of the Second Modave Summer School in Mathematical Physics, International Solvay Institutes
5. L. Bonora, C. Maccaferri and P. Prester, “*The dressed sliver in VSFT*”, Proceedings of the 9th Adriatic Meeting, “Particle Physics and the Universe” Springer-Verlag, eds : J. Trampetic, J. Wess.
6. L. Bonora and C. Maccaferri, “*On star products in open string field theory,*” In *Kovras, O. (ed.) : Frontiers in field theory* 155-182

References

- Prof. Nathan Berkovits
South American Institute for Fundamental Research, Sao Paolo, Brasil
nathan.berkovits at gmail.com
- Prof. Lorian Bonora
Scuola Internzaionale di Studi Avanzati (SISSA), Trieste
bonora at sissa.it
- Prof. Nobuyuki Ishibashi
Tsukuba University, Japan.
ishibash at het.ph.tsukuba.ac.jp
- Prof. Yuji Okawa
Komaba Institute of Physics, Tokyo University, Japan.
okawa at hep1.c.u-tokyo.ac.jp
- Prof. Martin Schnabl
Academy of Science of Czech Republic, Prague
schnabl at gmail.com
- Prof. Ashoke Sen
Harish Chandra Research Institute, Allahabad, India
ashokesen1999 at yahoo.com
- Prof. Barton Zwiebach
Massachusetts Institute of Technology (MIT), Boston, USA
zwiebach at mit.edu