

Short Curriculum Vitæ and list of publications

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August 30, 1970

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Education

1984/1989 “Maturità” 60/60 at Liceo Scientifico Sperimentale Filippo Buonarroti in Pisa.

1989/1994 November 18th “Laurea” Degree in Physics 110/110 cum laude at the University of Pisa, Italy.

1995/1997 May 18th Master Degree in Physics at the University of Illinois at Urbana-Champaign, U.S.A..

2001/2004 April 6th Philosophical Degree in Physics at the University of Trieste, Italy.

Positions

1996 summer: Research Assistant in the Physics department at the University of Illinois at Urbana-Champaign. Coordinators David Ceperley and Richard Martin.

1997 summer: Research Assistant in the Physics department at the University of Illinois at Urbana-Champaign. Coordinators David Ceperley and Richard Martin.

1997 fall: Research Assistant in the Physics department at the University of Illinois at Urbana-Champaign. Coordinators David Ceperley and Richard Martin.

2000 Won a Ph.D. position (BAT-O IIa/2) at the Max-Planck-Institute für Plasmaphysik, Teilinstitut Greifswald, Bereich Stellaratortheorie at the 5th of January 2000 which I declined.

2000 Research Assistant (1 year) at the Department of Mathematics and Statistics, University of Limerick, Ireland in the group of S. B. G. O’Brien.

2003 January, Visiting Scientist at the University of Paris-Sud at Orsay. Scientific collaboration with the research group of Prof. Bernard Jancovici.

2004 April 15th, “Assegno di ricerca” (Postdoctoral Fellowship 24 months) at the Department of Chemical Physics, University “Ca’ Foscari” of Venice. Title of the project: “Analysis of proteins in solutions using statistical thermodynamic techniques”. Project PRIN-COFIN2003025755-044. National coordinator Prof. Amos Maritan. Local coordinator Prof. Achille Giacometti.

- 2006** March 17th, “Assegno di ricerca” (Postdoctoral Fellowship 24 months) at the Department of Chemical Physics, University “Ca’ Foscari” of Venice. Title of the project: “Colloidal mixtures, globular proteins and liquid crystal-like phases of biopolymers”. Project PRIN-COFIN2005027330. National coordinator Prof. Amos Maritan. Local coordinator Prof. Achille Giacometti.
- 2009** October 15th, Postdoctoral Fellowship (36 months) at the National Institute of Theoretical Physics (NITheP), Stellenbosch Institute for Advanced Study, Matieland 7602, South Africa.
- 2010** October 10th, Visiting scientist (three months) at the University of Extremadura in Badajoz, Spain. Scientific collaboration with the research group of Prof. Andrés Santos.
- 2012** January 1st, Guest (three years) at S.I.S.S.A., via Bonomea 265, 34136 Trieste, Italy.
- 2012** January 1st, Honorary Fellow at the Department of Molecular Science and Nanosystems, University “Ca’ Foscari” of Venice, Calle Larga S. Marta DD2137, I-30123 Venezia, Italy.
- 2015** July 17th: Habilitation to teach Mathematics and Physics (classes A049, A048, A047, A038) in Italian high-school obtained at the University of Trieste with mark 87/100. One year course with exams. “Abilitazione all’ insegnamento nella scuola secondaria per la classe A049 Matematica e Fisica con punteggio 87/100”.
- 2016** August 24th: Passed a “Concorso per l’ assunzione in ruolo nell’ insegnamento di Matematica (classe A026) nella scuola secondaria di secondo grado con punteggio 72.2/100”.
- 2017** September 1st: “Contratto a tempo indeterminato per l’ insegnamento di Matematica nella scuola secondaria di secondo grado (confirmed on 1st September 2019)”.
- 2019** May 10th: Habilitation for Associate Professor in Theoretical Physics of Matter (sector 02/B2) in the Italian University (until 10 May 2028).

Short visits and scientific collaborations

- 1995-2000** Collaboration in the Physics Department at the University of Illinois at Urbana-Champaign, USA with the research group of Prof. David Ceperley and Prof. Richard Martin.
- 2000-2001** Collaboration with the Research group of Prof. S. B. G. O’Brien at the Department of Mathematics and Statistics, University of Limerick, Ireland.
- 2001-2004** Collaboration with the research group of Prof. Giorgio Pastore at the Theoretical Physics Department of the University of Trieste, Italy.
- 2003** January: Visiting Scientist (1 month) at the University of Paris-Sud at Orsay. Scientific collaboration with the research group of Prof. Bernard Jancovici at the Laboratory of Theoretical Physics of the University of Paris-Sud at Orsay, France.

- 2004-2006** Title of the project: “Analysis of proteins in solutions using statistical thermodynamic techniques”. Project PRIN-COFIN2003025755-044. University “Ca’ Foscari” of Venice, Italy. National coordinator Prof. Amos Maritan. Local coordinator Prof. Achille Giacometti.
- 2006-2008** Title of the project: “Colloidal mixtures, globular proteins and liquid crystal-like phases of biopolymers”. Project PRIN-COFIN2005027330. University “Ca’ Foscari” of Venice, Italy. National coordinator Prof. Amos Maritan. Local coordinator Prof. Achille Giacometti.
- 2009** Research group of Prof. Michael Kastner at the National Institute of Theoretical Physics of the University of Stellenbosch, South Africa.
- 2009-2011** Research group of Prof. K. K. Müller-Nedebock in the Physics Department at the University of Stellenbosch, South Africa.
- 2010** October 10th: Visiting scientist (three months) at the University of Extremadura in Badajoz, Spain. Scientific collaboration with the research group of Prof. Andrés Santos in the Physics Department at the University of Extremadura in Badajoz, Spain.
- 2011** Research group of Prof. Bert Klumperman in the Polymer Physics Department at the University of Stellenbosch, South Africa.
- 2013** October 20th: Visiting Scientist (one month) at the University of Extremadura in Badajoz, Spain. Scientific collaboration with the research group of Prof. Andrés Santos in the Physics Department at the University of Extremadura in Badajoz, Spain.
- 2014** Research group of Prof. Saverio Moroni in Scuola Internazionale Superiore di Studi Avanzati (SISSA), Italy.
- 2014** June 15th: Visiting Scientist (one week) at the “Laboratoire de Physique ENS de Lyon”, France. Scientific collaboration with the research group of Prof. Angel Alastuey.
- 2017** January 8th: Visiting Scientist (two months) at the University of Extremadura in Badajoz, Spain. Scientific collaboration with the research group of Prof. Andrés Santos in the Physics Department at the University of Extremadura in Badajoz, Spain.
- 2018** March 26th: Visiting Scientist (one week) at the “Laboratoire de Physique ENS de Lyon”, France. Scientific collaboration with the research group of Prof. Angel Alastuey.

Research Interests

Aim of the research is to develop analytical and computational methods for condensed and soft matter starting from the fundamental many-body equations. Apart from the few analytically exactly solvable models our principal instruments are Integral Equation Theory, Density Functional Theory, Thermodynamic Perturbation Theory, Association Theory, and Monte Carlo simulations which can find exact properties of many-body systems. We are combining these approaches to create new methods and to test the accuracy of calculations on materials.

Current studied materials include colloidal suspensions, ionic liquids, polymer mixtures, the electron fluid, the polaron, and boson fluids (like ^4He , $^4\text{He-H}_2$ mixtures, ...). We investigate the structure and thermodynamic properties of the materials including their phase transitions like the gas-liquid-solid first order ones, the percolation threshold, the clustering, the localization, the demixing, the polydispersity, and surface properties.

Teaching

1995/2000 Teaching Assistant in the Physics department at the University of Illinois at Urbana-Champaign (Electricity and Magnetism I and II, Biomolecular Physics, Waves in Physics, Thermal Physics and Fluids, Classical Mechanics, Electricity, Magnetism, and Optics, Waves and Quantum mechanics/Thermal Physics and Fluids).

2004/2006 Teaching at University Ca' Foscari of Venice (Mathematical Methods for Science and Technology of Materials, Analysis II).

2008/2009 Teaching at University of Trieste (General Physics I for Industrial Engineering).

2012/2013 Teaching Assistant at University of Trieste (Laboratory of Optics).

2013/2014 Teaching Assistant at University of Trieste (Laboratory of Calculus).

2016/2017 Teaching Assistant at University of Trieste (Laboratory of Calculus).

Publications

(1) **Fantoni R.** and Tosi M.P., Nuovo Cimento **17D**, 155 (1995)

[dx.doi.org/10.1007/BF02451594](https://doi.org/10.1007/BF02451594)

WOS:A1995QW87300005

2-s2.0-51649140258

(2) **Fantoni R.** and Tosi M.P., Nuovo Cimento **17D**, 1165 (1995)

[dx.doi.org/10.1007/BF02454131](https://doi.org/10.1007/BF02454131)

WOS:A1995TM36400009

2-s2.0-51649138270

(3) **Fantoni R.** and Tosi M.P., Physica B **217**, 35 (1996)

[dx.doi.org/10.1016/0921-4526\(95\)00451-3](https://doi.org/10.1016/0921-4526(95)00451-3)

WOS:A1996TR03900005

2-s2.0-0030561994

(4) **Fantoni R.**, Jancovici B., and Téllez G., J. Stat. Phys. **112**, 27 (2003)

[dx.doi.org/10.1023/A:1023671419021](https://doi.org/10.1023/A:1023671419021)

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- (5) **Fantoni R.** and Pastore G., J. Chem. Phys. **119**, 3810 (2003)
dx.doi.org/10.1063/1.1590642
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2-s2.0-0041376961
- (6) **Fantoni R.** and Pastore G., Phys. Rev. E **68**, 046104 (2003)
dx.doi.org/10.1103/PhysRevE.68.046104
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- (7) **Fantoni R.** and Pastore G., Physica A **332**, 349 (2004)
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- (8) **Fantoni R.** and Pastore G., J. Chem. Phys. **120**, 10681 (2004)
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- (9) **Fantoni R.**, Gazzillo D., Giacometti A., J. Chem. Phys. **122**, 034901 (2005)
dx.doi.org/10.1063/1.1831275
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- (10) **Fantoni R.**, Gazzillo D., Giacometti A., Phys. Rev. E **72**, 011503 (2005)
dx.doi.org/10.1103/PhysRevE.72.011503
WOS:000230886900043
2-s2.0-27244434158
- (11) **Fantoni R.**, Gazzillo D., Giacometti A., and Sollich P. J. Chem. Phys. **125**, 164504 (2006)
dx.doi.org/10.1063/1.2358136
WOS:000241722000048
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- (12) Gazzillo D., Giacometti A., **Fantoni R.**, and Sollich P., Phys. Rev. E. **74**, 051407 (2006)
dx.doi.org/10.1103/PhysRevE.74.051407
WOS:000242408700047
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- (13) Gazzillo D., **Fantoni R.**, and Giacometti A., Mol. Phys. **104**, 3451 (2006)
dx.doi.org/10.1080/00268970601050892
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2-s2.0-34547821930
- (14) **Fantoni R.**, Gazzillo D., Giacometti A., Miller M. A., and Pastore G., J. Chem. Phys. **127**, 234507 (2007)
dx.doi.org/10.1063/1.2805066
WOS:000251908500033
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- (15) Gazzillo D., **Fantoni R.**, and Giacometti A., Phys. Rev. E **78**, 021201 (2008)
[dx.doi.org/10.1103/PhysRevE.78.021201](https://doi.org/10.1103/PhysRevE.78.021201)
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- (16) Santos A., **Fantoni R.**, and Giacometti A., Phys. Rev. E **77**, 051206 (2008)
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- (17) **Fantoni R.** and Téllez G., J. Stat. Phys. **133**, 449 (2008)
[dx.doi.org/10.1007/s10955-008-9616-x](https://doi.org/10.1007/s10955-008-9616-x)
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- (18) **Fantoni R.**, Giacometti A., Malijevský A., and Santos A., J. Chem. Phys. **131**, 124106 (2009)
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- (19) Gazzillo D., **Fantoni R.**, and Giacometti A., Phys Rev. E **80**, 061207 (2009)
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- (20) Santos A., **Fantoni R.**, and Giacometti A., J. Chem. Phys. **131**, 181105 (2009)
[dx.doi.org/10.1063/1.3265991](https://doi.org/10.1063/1.3265991)
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2-s2.0-72949085930
- (21) **Fantoni R.**, Giacometti A., Malijevský A., and Santos A., J. Chem. Phys. **133**, 024101 (2010)
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- (22) **Fantoni R.**, J. Stat. Mech. P07030 (2010)
[dx.doi.org/10.1088/1742-5468/2010/07/P07030](https://doi.org/10.1088/1742-5468/2010/07/P07030)
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- (23) **Fantoni R.**, A. Giacometti, F. Sciortino, and G. Pastore, Soft Matter **7**, 2419 (2011)
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2-s2.0-79952395236
- (24) **Fantoni R.**, A. Malijevský, A. Santos, and A. Giacometti, Europhys. Lett. **93**, 26002 (2011)
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- (25) **Fantoni R.**, A. Malijevský, A. Santos, and A. Giacometti, *Mol. Phys.* **109**, 2723 (2011)
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- (26) **Fantoni R.** and K. K. Müller-Nedebock, *Phys. Rev. E* **84**, 011808 (2011)
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- (27) **Fantoni R.** and Santos A., *Phys. Rev. E* **84**, 041201 (2011)
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- (28) **Fantoni R.**, *Eur. Phys. J. B* **85**, 108 (2012)
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- (31) **Fantoni R.**, *Phys. Rev. B* **86**, 144304 (2012)
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2-s2.0-84867308368
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2-s2.0-84868286397
- (33) **Fantoni R.**, *Physica B* **412**, 112 (2013)
[dx.doi.org/10.1016/j.physb.2012.12.032](https://doi.org/10.1016/j.physb.2012.12.032)
WOS:000314764900023
2-s2.0-84873386313
- (34) **Fantoni R.**, *Solid State Communications* **159**, 106 (2013)
[dx.doi.org/10.1016/j.ssc.2013.01.028](https://doi.org/10.1016/j.ssc.2013.01.028)

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2-s2.0-84875448172

- (35) **Fantoni R.** and Pastore G., Europhys. Lett. **101**, 46003 (2013)
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2-s2.0-84874834405
- (36) Maestre M. A. G., **Fantoni R.**, Giacometti A. and Santos A., J. Chem. Phys. **138**, 094904 (2013)
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- (37) **Fantoni R.** and Santos A., Phys. Rev. E **87**, 042102 (2013)
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- (38) **Fantoni R.** and Pastore G., Phys. Rev. E **87**, 052303 (2013)
[dx.doi.org/10.1103/PhysRevE.87.052303](https://doi.org/10.1103/PhysRevE.87.052303)
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- (46) **Fantoni R.** Giacometti A. and Santos A., J. Chem. Phys **142**, 224905 (2015)
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- (49) Alastuey A. and **Fantoni R.**, J. Stat. Phys. **163**, 887 (2016)
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- (52) **Fantoni R.**, J. Stat. Phys. **166**, 1334 (2017)
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- (53) **Fantoni R.**, Physica A **477C**, 187 (2017)
http://dx.doi.org/10.1016/j.physa.2017.02.064
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<https://doi.org/10.1016/j.physa.2018.09.107>
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- (61) **Fantoni R.**, Physica A **524**, 177 (2019)
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WOS:000476966100018
2-s2.0-85064919235
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WOS:000543007600002
2-s2.0-85086857771
- (63) **Fantoni R.**, J. Low Temp. Phys. **202**, 247 (2021)
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- (64) **Fantoni R.**, Eur. Phys. J. B **94**, 63 (2021)
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- (65) **Fantoni R.** and Klauder J. R., Phys. Rev. D **103**, 076013 (2021)
<https://doi.org/10.1103/PhysRevD.103.076013>
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- (66) **Fantoni R.**, J. Stat. Mech P083102 (2021)
<https://doi.org/10.1088/1742-5468/ac0f69>
WOS:000680165100001
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- (67) **Fantoni R.** and Klauder J. R., J. Stat. Phys. **184**, 28 (2021)

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- (68) **Fantoni R.** and Klauder J. R., Phys. Rev. D **104**, 054514 (2021)

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- (69) **Fantoni R.**, Maestre M. A. G., and Santos A., J. Stat. Mech P103210 (2021)

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- (70) **Fantoni R.**, Mol. Phys. **120**, (2021)

<https://doi.org/10.1080/00268976.2021.1996648>
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- (71) **Fantoni R.** and Klauder J. R., Int. J. Mod. Phys. A **37**, 2250029 (2022)

<https://doi.org/10.1142/S0217751X22500294>
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- (72) **Fantoni R.** and Klauder J. R., Int. J. Mod. Phys. A **37**, 2250094 (2022)

<https://doi.org/10.1142/S0217751X22500944>
WOS:000811562100003
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(73) **Fantoni R.**, Eur. Phys. J. C accepted (2022)

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WOS:

2-s2.

Books

(1) **Fantoni R.** “Regole di somma in un gas di elettroni stratificato”, ISBN 978-889-101-539-6

(2) **Fantoni R.** “Classical liquids: exact results, integral equations theory, and Monte Carlo simulations”, ISBN 978-889-101-543-3

(3) **Fantoni R.** “The Janus fluid, from a theoretical perspective”, SpringerBriefs in Physics, (2013), ISBN 978-3-319-00406-8 (Print) 978-3-319-00407-5 (Online)
[dx.doi.org/10.1007/978-3-319-00407-5](https://doi.org/10.1007/978-3-319-00407-5)

Schools and Conferences

1994 Napoli CNR meeting. Poster on publication (1).

2002 National school of Matter Physics on “Fisica di base delle Nanostrutture e Calcolo ed Informazione Quantistica” (Torino Villa Gualino 9/9/2002-20/9/2002).

2002 School on “Fisica Statistica, Teoria della Probabilità e Complessità computazionale” (ICTP Trieste 26/8/2002-7/9/2002).

2003 XXII Fai della Paganella meeting: “Fisica Teorica e Struttura della Materia”. Posters on publication (4) and on publication (5).

2004 XXIII Fai della Paganella meeting: “Fisica Teorica e Struttura della Materia”. Poster on publication (6).

2004 “IX Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi” (Parma 22-24 June). **Talk** on publication (8).

2004 IV Giovanni Paladin Memorial: “Statistical Mechanics, Chaos and Condensed Matter Theory” (Rome 22-24 September). Poster on publication (9).

2005 “X Convegno Nazionale di Fisica Statistica e dei Sistemi Complessi” (Parma 29-1 July). Poster on publications (9) and (10).

2005 “6th Liquid Matter Conference” (Utrecht, the Netherlands 2-6 July). Poster on publications (9) and (10).

2006 “31st Conference of the Middle European Cooperation in Statistical Physics” (Primošten, Croatia 23-26 April). Poster on publication (10).

- 2007** “Fluid phase behaviour and critical phenomena from liquid state theories and simulations” (CECAM, Lyon, France 12 July). **Talk** on publications (14) and (15).
- 2007** “Statphys23” (Genova, Italy 9-13 July). Poster on publications (14) and (15).
- 2008** “7th Liquid Matter Conference” (Lund, Sweden 27 June-1 July). Poster on publications (14) and (15).
- 2009** “Long-range Interactions in Classical and Quantum Physics” (Stellenbosch, South Africa 16-27 November). **Invited talk** on publication (17).
- 2010** “21st Chris Engelbrecht Summer School in Theoretical Physics” (Stellenbosch, South Africa 18-27 January).
- 2010** “35th Conference of the Middle European Cooperation in Statistical Physics” (Abbaye des Prémontrés, Pont-à-Mousson, France 15-19 March). Poster on publication (16), (18), and (20).
- 2010** “Statphys24” (Cairns, Australia 19-23 July). **Talk** on publication (17).
- 2010** **Invited talk** at the University of Extremadura in Badajoz on publications (16), (18), (20), (21), and (24).
- 2011** “22st Chris Engelbrecht Summer School in Theoretical Physics” (Stellenbosch, South Africa 19-30 January).
- 2011** “Equilibration and Equilibrium 2nd Stellenbosch Workshop on Statistical Physics” (Stellenbosch, South Africa 7-18 March). **Invited talk** on publication (24).
- 2011** “Workshop on Frontiers in Ultracold Fermi Gases” (Trieste, ICTP, Italy 6-10 June). Poster on publications (33) and (39).
- 2011** “8th Liquid Matter Conference” (Vienna, Austria, 6-10 September). Poster on publications (23) and (24).
- 2011** “National Institute for Theoretical Physics of South Africa (NITheP)” (Stellenbosch, South Africa, 21 September). **Invited talk** on publication (23).
- 2011** “International Workshop on Ultracold Molecules” (Stellenbosch, South Africa, 7-11 November).
- 2012** “XCVIII Congresso Nazionale SIF” (Napoli, Italy, 17-21 September). **Talk** on publication (30).
- 2013** “38st Conference of the Middle European Cooperation in Statistical Physics” (Trieste, Italy, 25-27 March). Poster on publications (34) and (39).
- 2013** “Italian National Conference on Condensed Matter Physics” (Milano, Italy, 9-13 September). **Talk** on publication (41).
- 2013** “XCIX Congresso Nazionale SIF” (Trieste, Italy, 23-27 September). Abstract on Publication (36) and (40).

- 2013 Invited talk** at the University of Extremadura in Badajoz on publications (41).
- 2014** “Sigma-Phi-2014” (Rhodes, Greece, 7-11 July). **Chairman** and **talk** on publication (43) and (44).
- 2015** “Italian National Conference on Condensed Matter Physics (FisMat 2015)” (Palermo, Italy, 28 September-2 October). **Talk** on publication (46).
- 2017 Invited talk** at the University of Extremadura in Badajoz on publications
- 2017** “Workshop on Understanding Quantum Phenomena with Path Integrals: From Chemical Systems to Quantum fluids and Solids — (smr 3131)” (Trieste, ICTP, 3-7 July). Participant.
- 2017** “10th Liquid Matter Conference” (Ljubljana, Slovenia, 17-21 July). Poster on publications (55)
- 2017** “Italian National Conference on Condensed Matter Physics (FisMat 2017)” (Trieste, Italy, 1-5 October). **Talk** on publication (55)
- 2018** “6th World Congress and Expo on Nanotechnology and Material Science” (Valencia, Spain, 16-18 April). **Invited Talk** on publication (59).

Supervision of students

- Cosupervision of the Ph.D. thesis of Joris W. O. Salari in the department of polymer chemistry of the University of Technology of Eindhoven in the Netherlands. Supervisor: Prof. Bert Klumperman.
- Cosupervision of the Ph.D. thesis of Miguel A. G. Maestre in the physics department of the University of Extremadura in Spain. Supervisor: Prof. Andrés Santos.

Scientific software available to the research international community

- Development of a Mathematica notebook which evaluates the radial distribution functions for binary mixtures of nonadditive hard spheres, according to the method described in R. Fantoni and A. Santos, “Nonadditive hard-sphere fluid mixtures. A simple analytical theory”, Phys. Rev. E **84**, 041201 (2011).
- Development of a Gibbs Ensemble Monte Carlo algorithm to determine the phase properties of a ionic fluid of non-additive hard spheres, according to the method described in R. Fantoni and G. Pastore “Monte Carlo simulation of the nonadditive restricted primitive model of ionic fluids: Phase diagram and clustering”, Phys. Rev. E **87**, 052303 (2013).
- Development of a new Quantum Monte Carlo algorithm to determine the phase properties of a quantum fluid of bosons, according to the method described in R. Fantoni and S. Moroni, “Quantum Gibbs ensemble Monte Carlo”, J. Chem. Phys. **141**, 114110 (2014).

Other activities

- reviewer for the American Mathematical Society (AMS), the American Physical Society (APS), the American Institute of Physics (AIP), the Institute of Physics (IOP), the Royal Society of Chemistry (RSC)
- member of SAIP, SIF, EPS
- ranked C3 by the National Research Foundation of South Africa (Division of Research Development) in 2011
- Responsibility in projects of supercomputing: Use of the facilities of NCSA at Urbana-Champaign, Illinois, U.S.A. (1995-2000); Use of the facilities of CHPC at Cape Town, South Africa (2010-2012); Use of the facilities of CINECA at Bologna, Italy (2011-present).