

UNIVERSITÀ DEGLI STUDI DI MILANO

Procedura di valutazione per la chiamata a professore di I fascia da ricoprire ai sensi dell'art. 24, comma 6, della Legge n. 240/2010 per il settore concorsuale 02/B2 - Fisica Teorica della Materia, (settore scientifico disciplinare FIS/03 - Fisica della Materia) presso il Dipartimento di FISICA "ALDO PONTREMOLI", Codice concorso 4592

## Alessio Zaccone

### CURRICULUM VITAE

#### INFORMAZIONI PERSONALI

COGNOME	ZACCONE
NOME	ALESSIO
DATA DI NASCITA	07/09/1981

#### Profile

Since my first published paper in 2007, I have developed an international profile across several different areas of condensed matter theory (amorphous solids, soft matter, disordered systems, statistical mechanics, complex fluids, theory of liquids, lattice dynamics, phonons and elasticity, superconductivity, materials science and chemical physics). This has been recognized with several international awards and it is also reflected in a high number of invited talks at international conferences. Recently, this culminated with an invited talk at the APS March Meeting 2021 (held online, on 19/03/2021), which was attended by >100 people in the live session. Over my relatively short (2.5 years) tenure at University of Milan (Unimi), I feel I have contributed significantly to Unimi's international reputation, to Unimi's research output and also teaching innovation. In this short time, I have published 38 papers with the Unimi affiliation in the leading journals (incl. 2 in PNAS, 3 in PRL, 2 in Science Advances and 1 in Nature Communications). Throughout my career (since 2007), I have published 122 articles in peer-reviewed journals, which have attracted over 3000 citations (Google scholar) in total, with almost 600 citations in 2020 alone, and 350 citations in the first 4.5 months of 2021. This has resulted in an h-index equal to 32 (Google Scholar) before the age of 40. Over the past 2.5 years, I have contributed financially to the welfare of Unimi and of the Department through a large grant (>300'000 EUR) awarded by US Army and the US Department of Defense (DoD) (currently paying 40% of my total salary for three years, along with a full post-doc position and generous overheads), and through a new industrial grant from Syngenta AG (Switzerland), which supports a full post-doc position (about 40'000 EUR).

#### A: Personal information

Nationality: Italian

Date of birth: 7 September 1981

<https://www.unimi.it/en/ugov/person/alessio-zaccone>

#### B: Education

2006 – 2010    **PhD in Chemical Physics** supervised by Prof. M. Morbidelli, ETH Zurich.

PhD awarded on 27/04/2010. Short post-doc period at ETH until 30 September 2010.

2000 – 2005    MSc (Laurea) in Chemical Engineering, Politecnico di Torino (Italy). MSc grade: 110/110. MSc thesis carried out at Technical University Berlin, supported by an Erasmus studentship.

1995 – 2000    Liceo Classico "Giovanni Plana", Alessandria. Grade: 100/100.

## C: Employment history

- 2018 – **Associate Professor of Physics**, Department of Physics “A. Pontremoli”, **University of Milan**. Visiting Scholar at the Department of Chemical Engineering and Biotechnology and at the Cavendish Laboratory, University of Cambridge, UK (*unpaid affiliations*).
- 2015 – 2018 **University Lecturer (equivalent to Associate Professor) and Head of the Statistical Physics Group**, Department of Chemical Engineering & Biotechnology, **University of Cambridge**, UK.  
Official Fellow in Physics with teaching responsibilities at Queens’ College, University of Cambridge, UK.
- 2014 – 2015 **W2 Professor of Theoretical Soft Matter Physics**, Physik-Department, **Technical University Munich**, Germany.
- 2011 – 2014 **Oppenheimer Research Fellow in Physics**, Cavendish Laboratory, **University of Cambridge**, UK. Research on soft matter, disordered solids, self-assembled biomaterials, granular materials, disordered systems and complex nanoparticles. Collaborative research stays at ETH Zurich during summer vacations.
- 2010 – 2011 **Swiss National Science Foundation Research Fellow** at Cavendish Laboratory, **University of Cambridge**, UK. Research on theory of soft matter.

## D: International awards

- Gauss Professor of the Göttingen Academy of Sciences and Humanities, **2020**  
<https://de.wikipedia.org/wiki/Gau%C3%9F-Proffessur>
- Journal of Physics: Materials (IoP) Emerging Leader **2020** (nominated as one of the emerging leaders in the field of materials physics worldwide)  
<https://iopscience.iop.org/journal/2515-7639/page/EmergingLeaders>
- Outstanding Reviewer Award **2020** for the journal Soft Matter (Royal Society of Chemistry)
- American Chemical Society I&ECR Class of **2017** Influential Researcher Award (listed as one of the 37 most influential scientists with <12 years of independent career for impact on chemical sciences)  
<https://pubs.acs.org/doi/pdf/10.1021/acs.iecr.7b03758>
- Official Fellow (lifelong), Queens’ College, University of Cambridge, **2015**  
[https://en.wikipedia.org/wiki/Category:Fellows\\_of\\_Queens%27\\_College,\\_Cambridge](https://en.wikipedia.org/wiki/Category:Fellows_of_Queens%27_College,_Cambridge)
- Swiss National Science Foundation (SNSF) Professorship Award, **2014** (*not used*)
- Rudolf Mössbauer Fellowship Award, Technical University Munich, **2014**  
<https://www.ias.tum.de/en/alumni-fellows/zaccone-alessio/>
- Oppenheimer Research Fellowship, University of Cambridge, **2011**
- ETH Zurich Silver Medal Award for outstanding PhD thesis, **2011**
- Swiss National Science Foundation (SNSF) Fellowship for Postdoctoral Researchers, **2010**
- Alexander von Humboldt Stiftung Fellowship (Humboldt-Forschungsstipendium), **2010** (*not used*)

## E: National awards

- Italian Scientific Habilitation (Abilitazione Scientifica Nazionale) as Full Professor in the class of Theoretical Condensed Matter Physics (Fisica teorica della materia 02/B2), awarded in **2017** and valid until **2023**.

## F: Coordination of externally-funded international research projects

- “Hydrodynamic modelling of suspensions of anisotropic particles”, **Unimi – Syngenta** (2021 – ongoing), PI and coordinator
- “Development of a fundamental microscopic theory and simulations of glassy polymers”, **Unimi – US Army – NIST** (2019 – ongoing), PI and coordinator
- “Modelling of colloidal coagulation phenomena in polymerization reactors”, **University of Cambridge – Synthomer**, (2017 – 2020), PI and coordinator
- “Development of chemical design principles for glassy polymers”, **University of Cambridge – US Army**, (2016-2017), PI and coordinator

## G: Summary of publication track record (for the full list of publications see page 9)

### • Total output:

**122 articles** (since 2007) in peer-reviewed journals (including: **12 in Phys. Rev. Lett.**, **5 in PNAS**, **2 in Science Advances**, **1 in Nature Communications**, **1 in Nano Letters**), in large majority of which I am the first/last/corresponding lead author and project leader

**H-index** (since 2007) = **32** (*Google Scholar*)

**i10-index** = **70** (# publications with  $\geq 10$  citations over the past 5 years) (*Google Scholar*)

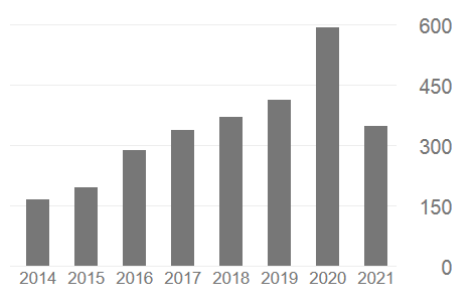
**Citations over the past 15 years: 3022** (*Google Scholar*)

**Nr. of peer-reviewed papers published over the past 15 years: 122**

• **ASN thresholds:** as of today, my bibliometric parameters lie well above all the 3 thresholds set for the Abilitazione Scientifica Nazionale (ASN) for “Professore Ordinario” as well as for “Commissario”

	All	Since 2016
Citations	3022	2364
h-index	32	28
i10-index	75	70

My publications have attracted nearly 600 citations in the year 2020 alone, and 350 citations in the first 4.5 months of 2021. From **Google Scholar** (visited on 15/05/2021).



### Full and up-to-date information at Google Scholar:

<https://scholar.google.co.uk/citations?user=A8gZPRgAAAAJ&hl=en>

or search for Alessio Zaccone on Google Scholar.

### • Publications output contribution at Unimi (11/2018 – present)

Since my appointment at Unimi, I have contributed to the research productivity of the Department with **38 articles over the period of 2.5 years** in peer-reviewed scientific journals (including **3 papers in Phys. Rev. Lett.**, **1 paper in Nature Communications**, **2 papers in PNAS**, **2 papers in Science Advances**). In the majority of these papers, I am the last author or the corresponding/lead author. Three of these papers (see section N, page 7) were featured in University-wide press releases at Unimi.

## H: Teaching activities

Immediately upon starting my employment at Unimi, on 1 November 2018, at the request of the President of the Department teaching committee, I began teaching (starting 1 December 2018) the MSc course level *Metodi matematici della fisica 1: geometria e gruppi*, which was vacant at that time. This was a criticality for the teaching in the Department, since there was no preparatory group theory course for students specializing in theoretical physics at the MSc level. Subsequently, starting February 2019, I took the responsibility for the course *Metodi matematici della fisica*, since, also in this case, there was an unfilled vacancy beginning in 2021. This is a large 2<sup>nd</sup> year undergraduate course with over 200 students and, presently, half of the students attend my course, while the other half attend the course (with the same program and content) given by my colleague Prof. Luca Molinari.

I am strongly committed to modernizing the teaching of theoretical courses within the Physics Department. The mathematical methods teaching style, at the time when I joined Unimi, was suffering from an excessive emphasis on pure mathematics and mathematical formalism, with very little, or fully absent, connections between mathematical methods and physics. Based on my previous teaching experience at the University of Cambridge and at the Technical University Munich, I developed a more modern approach based on the visualization of difficult mathematical and geometric/topological concepts, coupled with a heavy use of examples and calculation problems. I introduced many examples which illustrate how mathematical concepts and techniques become useful in physics, especially with emphasis on quantum mechanics (e.g. in the context of quantum theory of angular momentum), condensed matter physics (with emphasis on group theoretical calculations of atom-level splitting in solids, and crystallographic point groups) and high-energy physics (Lorentz and Poincaré groups and their representations). I also developed, in the MSc level course, a new “hands-on” approach for the covariant formalism used throughout physics from continuum mechanics and elasticity all the way to general relativity. I also introduced topological concepts as relevant for the emerging field of topological matter and topological materials.

At the outset of the pandemic, on 2 March 2020, I was among the very few faculty members (if not the first) to move my teaching completely online due to the emergency. Since then, I have continuously sought to improve and optimize the online teaching framework with a focus on the student experience. From this I have seen extremely rewarding results both in terms of student performance at the exams, and an increase in the enrollment in my MSc course.

### Ongoing teaching roles

- 2019 – present: responsible for *Metodi matematici della fisica*, in the BSc level degree in Physics at University of Milan.
- 2018 – present: responsible for *Metodi matematici della fisica 1: geometria e gruppi*, in the MSc level degree in Physics at University of Milan.

### Past teaching roles

- 2015 – 2018: responsible for the teaching of *Part IA Physics modules* (1<sup>st</sup> year undergraduate courses in Physics) and *Part II modules of Quantum Condensed Matter Physics and Statistical & Thermal Physics* (3<sup>rd</sup> year undergraduates) at the Cavendish Laboratory and Queens’ College, University of Cambridge.
- 2016 – 2018: responsible for teaching *PartIIA Process Dynamics & Control* and *PartIIA Partial Differential Equations*, at the Department of Chemical Engineering, University of Cambridge.
- 2014 – 2015: responsible for the MSc-level course *Advanced Statistical Mechanics*, Physics Department, Technical University Munich.

## I: Supervision of graduate students and post-doctoral researchers

### PhD students:

- Dr. Thomas Gray, PhD student 2016 – until 2018 (co-supervised with Dr. G. Kaminski)
- Dr. Luca Banetta, PhD student 2017 – until 2020
- Dr. Bingyu Cui, PhD student 2017 – until 2020, now post-doc at University of Pennsylvania

- Dr. Rico Milkus, PhD student 2014 – 2017, now working in industry (Beissbarth, Munich)
- Dr. Johannes Krausser, PhD student 2014-2017, now post-doc at University College London
- Dr. Breannan O' Conchuir, PhD student 2011-2014, now R&D group leader at IBM

#### Current Post-Docs:

- Dr. Ivan Kriuchevskiy
- Dr. Carmine Anzivino (starting 01/07/2021)

#### Former Post-Docs:

- Dr. Vladimir V. Palyulin (now Assistant Professor at Skolkovo Tech, Moscow)
- Dr. Chris Ness (now Royal Academy of Engineering Research Fellow at University of Edinburgh)
- Dr. Masoud Abkenar (now R&D developer at Canon Production Printing, Munich)

#### Current research group composition:

Alessio Zaccone (PI), Ivan Kriuchevskiy (post-doc), Carmine Anzivino (post-doc, starting 01/07/2021), Daniele Di Miceli (MSc thesis student), Francesco Leone (MSc thesis student), Simone Riva (MSc thesis student), Francesco Grienti (BSc thesis student), Riccardo Travaglino (BSc thesis student).

## **J: Supervision of undergraduate students**

### Overall supervised undergrads (2010 – present)

#### **16 BSc and MSc student projects supervised**

#### BSc and MSc theses supervised at Unimi (2019 – present)

Luigi Casella (110L, **co-authored two papers Publ. 8 and 10** in the full publications list), Giovanni Chevallard (**co-authored one paper, Publ. 16** in the full list), Beatrice Clemente, Giorgio Frangi (110L)

## **K: Third-party funding record**

### Ongoing grants as the PI at Unimi

- Industrial grant (**39'210 EUR**) from **Syngenta** AG (Switzerland) to hire a post-doctoral fellow for theoretical/numerical research on hydrodynamics of colloidal suspensions, starting July 2021.
- **US Army Research Office** (US ARO) grant (**310'000 \$** since 02/2019 – ongoing until 02/2022 with a no-cost funding extension planned due to COVID-19) including a research associate position to work on theory and computer simulations of polymer glasses. **This grant is currently paying 40% of my salary at Unimi for 3 years (2019-2022).**

### Submitted proposal as the PI at Unimi

- Proposal for an **ERC Consolidator Grant** submitted on 11 April 2020 (**952'785 EUR**).

### Past grants as the PI

- Industrial grant from **Synthomer** Inc. to fund a PhD student for three years (about **60'000 £**) to develop a numerical package to predict aggregation phenomena in colloidal systems under turbulent flow conditions.
- **US Army Research Laboratory** (US ARL) grant which includes the funding of a post-doc to work in my group at Cambridge, **138'120 \$**
- Rudolf Mössbauer Grant at TU Munich, partly from **Marie-Curie EU COFUND** Excellence Program (ca. **600'000 EUR**), from 2014 to 2016. Used to fund myself and two PhD students (Rico Milkus and Johannes Krausser).
- **Swiss National Foundation Professorship** (endowed with **1'510'915 CHF**, awarded in 2014, *not used*)
- **Winton Programme for the Physics of Sustainability**: **80'000 £** for 3 years supporting a PhD student under my supervision (Breannan O. Conchuir), 2011-2014.
- **Ernest Oppenheimer Fund**: **150'000 £**, 2011-2014.

- **Swiss National Foundation Fellowship: 60'000 CHF, 2010 – 2011.**

Total third-party funding income secured as PI (2010 – present) > 2'600'000 EUR

## **L: Administrative activities and service to the community**

### **Administrative activities**

- Member of the Research Committee of the Department of Chemical Engineering & Biotechnology, University of Cambridge (2017-2018). This committee met regularly during each term to discuss strategies related to funding, collaborations, general impact and visibility of the research done in our Department.
- Member of the Visitors Committee of the Department of Chemical Engineering & Biotechnology, University of Cambridge (2016-2018). This committee met regularly to survey and approve all requests to invite academic visitors made by PIs in our Department.
- Active participation in the Graduate Admissions Committee of the Department of Chemical Engineering & Biotechnology, University of Cambridge. This committee met in Michaelmas and Lent terms to survey and rank all applications of perspective postgraduate students.
- Regular participation in the Teaching Committee of the Department of Chemical Engineering & Biotechnology, University of Cambridge (2016-2018).
- Responsible for the selection and interview process of 1<sup>st</sup> year undergraduate students at Queens' College, University of Cambridge (2016-2018).
- Interim Director of Studies in Chemical Engineering at Queens' College, University of Cambridge (2018)
- Regular participation in the Teaching Committee of the Department of Physics, University of Milano, and in the faculty meetings.
- Selection committee member for 3 selection processes of post-doctoral research fellows at Unimi.
- External member of the “Collegio di Dottorato in Ingegneria Chimica”, Politecnico di Torino, 2018-2019.

### **Service to the community**

Peer review of research proposals for the following national foundations:

- National Institute of Standards and Technology (NIST) Center for Neutron Research (NCNR), Gaithersburg, USA – 13 proposals reviewed
- NWO (Netherlands Organisation for Scientific Research) – 1 proposal reviewed
- ERC Advanced grant – 1 proposal reviewed
- Swiss National Science Foundation – 1 proposal reviewed

Member of PhD examining bodies in the following institutions:

- University of Cambridge (1 PhD student examined)
- Queen Mary University of London (1 PhD student examined)
- University of Amsterdam, The Netherlands (4 PhD students examined)
- University of Wageningen, The Netherlands (1 PhD student examined)
- Commissariat pour l'Energie Atomique (CEA), Saclay, France (1 PhD student examined)
- University of Melbourne, Australia (1 PhD student examined)
- Technical University Munich, Germany (2 MSc students examined)
- University of Pisa (1 PhD student examined)
- University of Naples “Federico II” (1 PhD student examined)

Peer review activity for the following scientific journals (typically >10 papers/year):

Physical Review Letters, Nature, Nature Communications, Science Advances, Journal of Chemical Physics, Physical Review E, Physical Review B, Physical Review Materials, Journal of Physical Chemistry B, Soft Matter, Journal of Physics: Materials, Langmuir, Journal of Rheology, Materials Today Physics, Physical Chemistry Chemical Physics, European Physical Journal B, European Physical Journal E, Chemical Communications, Journal of Physics and Chemistry of Solids, Industrial & Engineering Chemistry Research, Physics of Fluids, Applied Physics Letters, Journal of Non-Crystalline Solids, Journal of Colloid and Interface Science, Scientific Reports.

My extensive reviewing activity has been recognized with the Outstanding Reviewer Award 2020 by the journal Soft Matter published by the Royal Society of Chemistry.

#### Memberships of learned societies and contribution to research centers

- Member of the American Physical Society (APS), USA
- Member of the SoftComp (Soft Matter Composites) EU Network of Excellence (2017-2018)
- Member of the Institute of Advanced Studies (IAS), Technical University Munich, Germany
- Member of the Edwards Center for Soft Matter, University of Cambridge
- Fellow and member (lifelong) of Queens' College, University of Cambridge

#### Public engagement and outreach

I maintain an active Twitter presence where I tweet exciting research news, use it as a platform to advertise PhD and Post-Doc positions and boost the Unimi reputation within the international academic community.

[@ZacconeAlessio](#) on Twitter – >640 followers

### **M: International collaborations** (all of which led to one or more joint publications)

Dr. T. W. Sirk (US Army), Prof. D. Weitz (Harvard), Prof. D. Frenkel (Cambridge), Prof. D. Bonn (Amsterdam), Prof. M. Bonn (Max Planck/Mainz), Dr. G. Simpson (Synthomer), Prof. J.-L. Tamarit (Barcelona), Prof. M. Ballauff (Berlin), Prof. P. Mueller-Buschbaum (Munich), Prof. Y.-J. Wang (Beijing), Prof. M.-Q. Jiang (Beijing), Prof. K. Samwer (Göttingen), Prof. G. Wilde (Münster), Prof. J. Brujic (NYU), Prof. T. Knowles (Cambridge), Prof. C. Kaminski (Cambridge), Prof. E. M. Terentjev (Cambridge), Prof. P. Cicuta (Cambridge), Prof. A. Donald (Cambridge), Prof. S. U. Egelhaaf (Düsseldorf), Prof. P. Schall (Amsterdam), Prof. Wei-Hua Wang (Beijing), Prof. V. Fodera' (Copenhagen), Prof. L. Noirez (CEA Saclay), Prof. M. Baggioli (Shanghai), Prof. T. Mori (Tsukuba), Dr. L. Di Michele (Imperial College), Dr. E. Eiser (Cambridge), Prof. C. Papadakis (Munich), Prof. J. Sprakel (Wageningen), Prof. E. Del Gado (Washington, DC), Prof. D. Rodney (Lyon), Prof. T. Mori (Tsukuba).

### **N: Summary of major scientific discoveries and breakthroughs**

(In all these studies I have designed, led and performed the research. In the papers detailing the work, I am the either the first, last or corresponding author.)

2009 – Extended DLVO theory of colloidal stability to systems in shear flows through a new solution to the Smoluchowski convection-diffusion equation (**Zaccone, Gentili, et al. PRE 2009**); confirmed experimentally and used by many labs worldwide (Harvard, Yale, Melbourne, Cambridge, Toronto, KIT, Naples, IIT, WPI, etc) and by industries (BASF, Cabot, Synthomer)

2009 – Analytical theory for the elastic modulus of colloidal gels (**Zaccone, Wu, Del Gado, PRL 2009**), confirmed experimentally in quantitative detail by *Whitaker et al. Nature Commun. (2019)*



- 2011 – Analytical solution to the microscopic elasticity problem of random sphere packings and random elastic networks (including derivation of the critical shear modulus law  $G \sim (z-2d)$ ), based on the analysis of nonaffine particle motions (**Zaccone & Scossa-Romano, PRB 2011**), with my former MSc student Scossa-Romano, now considered by many a landmark paper in the field
- 2013 – The molecular theory of T-dependent shear modulus of glassy polymers and glass transition  $T_g$  formula based on nonaffine molecular motions (**Zaccone & Terentjev, PRL 2013**)
- 2014 – The first mathematical model of adsorption-reaction kinetics for organic redox reactions on polymer-brush stabilized metallic nanoparticles in liquid solvent (**Gu, Wunder, Lu, Ballauff, Fenger, Rademann, Jaquet, Zaccone, JPCC 2014**), considered a seminal paper in the field
- 2015 – Atomic-level closed-form equation for the temperature-dependent viscosity and fragility of liquids, with my former PhD student Krausser (**Krausser, Samwer, Zaccone PNAS 2015**), now referred to by others in the literature as the Krausser-Samwer-Zaccone (KSZ) model
- 2016 – Demonstration that the boson peak anomaly in the Debye-normalized density of states of glasses and crystals is quantitatively related to the local degree of centrosymmetry of the lattice (**Milkus & Zaccone PRB 2016**), with my former PhD student Milkus, considered by many a seminal paper in the field
- 2016 – First theory of crystal nucleation kinetics in shear flows (**Mura & Zaccone PRE 2016**), and first prediction of non-monotonic (with a dome) dependence of nucleation rate on shear rate, with my former MSc student Mura, considered by many a key reference in the field
- 2018 – Theoretical framework (Nonaffine Lattice Dynamics, NALD) for the mechanical deformation behaviour and viscoelastic moduli of polymer glasses in parameter-free agreement with large-scale molecular simulations (**Palyulin, Ness, Milkus, Elder, Sirk, Zaccone, Soft Matter 2018**), recently discussed in *S. Chen, C. W. Peterson et al. Nature Commun. (2021)*
- 2019 – First prediction of boson peak anomaly in the phonon density of states of perfect crystals due to anharmonic phonon damping (**Baggioli & Zaccone, PRL 2019**), used also by industry (3M Science, USA), since confirmed by many experiments and already considered a key reference in the field
- 2020 – First analytical prediction of the logarithmically-enhanced Rayleigh scattering law in amorphous solids (**Cui & Zaccone, Soft Matter 2020**), with my former PhD student Cui
- 2020 – First numerical method which scales up atomistic lattice dynamics calculations (incl. eigenmodes and phonon spectra) of dynamic viscoelasticity of solids up to  $>10^6$  atoms (**Kriuchevskiy, Palyulin, Milkus, Elder, Sirk, Zaccone, PRB 2020**)
- 2020 – Discovery and prediction of the universal  $G' \sim L^{-3}$  law between shear modulus  $G$  and confinement size  $L$  in confined liquids (**Zaccone & Trachenko, PNAS 2020**), found experimentally in many systems (see also **Phillips, Baggioli et al. Phys. Rev. Materials 2021**)  
<https://lastatalenews.unimi.it/scoperta-legge-universale-governa-meccanica-liquidi-livello-atomico>
- 2020 – Discovery and demonstration that colloidal gelation is a nonequilibrium second-order phase transition (**Rouwhorst, Ness, Stoyanov, Zaccone, Schall, Nature Commun. 2020**), mentioned in *B. Keshavarz et al. PNAS (2021)*  
<https://lastatalenews.unimi.it/nuovo-studio-svela-leggi-universali-allorigine-materiali-nanostrutturati>
- 2020 – Prediction and discovery that anharmonic phonon damping can enhance the  $T_c$  of BCS-type superconductors by up to a factor 4 (**Setty, Baggioli, Zaccone, Phys. Rev. B 2020**), first experimental evidence in *Mizukami et al. Phys. Rev. Research 2, 043428 (2021)*



- 2020 – First systematic extension of BCS theory to describe superconductivity of materials at high-pressure by accounting for the role of anharmonicity (**Setty, Baggioli, Zaccone, Phys. Rev. B 2021**)
- 2021 – First fully analytical theory of the vibrational density of states of simple liquids (**Zaccone & Baggioli, PNAS 2021**), which provides a one-parameter quantitative prediction of the specific heat of liquids as a function of temperature, thus solving a century-long puzzle (for the latter application see **arXiv:2101.07585**), mentioned and discussed in *S. Chen, C. W. Peterson et al. Nature Commun. (2021)*.  
<https://lastatalenews.unimi.it/teoria-matematica-per-distribuzione-stati-energetici-liquidi>

## O: Publications in peer-reviewed journals (full list)

### Articles published with the Unimi affiliation

#### 2021 (10 papers)

1. C. Setty, M. Baggioli, A. Zaccone.  
*Anharmonic theory of superconductivity in the high-pressure materials.*  
**Physical Review B** 103, 094519 (2021).
2. A. Zaccone and M. Baggioli.  
*Universal law for the vibrational density of states of liquids.*  
**Proceedings of the National Academy of Sciences of the USA** 118 (5), e2022303118 (2021).
3. A. Zaccone and K. Trachenko.  
*Reply to Angelani et al.: The  $G' \sim L^{-3}$  law for the elasticity of confined liquids can be proved exactly.*  
**Proceedings of the National Academy of Sciences of the USA** 118 (9), e2023987118 (2021).
4. A. D. Phan, A. Zaccone, V. D. Lam, Wakabayashi.  
*Theory of pressure-induced rejuvenation and strain-hardening in metallic glasses.*  
**Physical Review Letters** 126, 025502 (2021).
5. M. Grove, M. Peterlechner, H. Rösner, R. Imlau, A. Zaccone, G. Wilde.  
*Plasmon energy losses in shear bands of metallic glass.*  
**Ultramicroscopy** 223, 113220 (2021).
6. M. Baggioli and A. Zaccone.  
*New paradigm for glassy-like anomalies in solids from fundamental symmetries.*  
**International Journal of Modern Physics B**, 2130002 (2021).
7. A. E. Phillips, M. Baggioli, T. W. Sirk, K. Trachenko, and A. Zaccone.  
*Universal  $L^{-3}$  finite-size effects in the viscoelasticity of amorphous systems.*  
**Physical Review Materials** 5, 035602 (2021).
8. L. Casella and A. Zaccone.  
*Soft mode theory of ferroelectric phase transitions in the low-temperature phase.*  
**Journal of Physics: Condensed Matter** 33, 165401 (2021).
9. A. Zaccone and L. Noirez.  
*Universal  $G' \sim L^{-3}$  law for the low-frequency shear modulus of confined liquids.*  
**Journal of Physical Chemistry Letters** 12, 650–657 (2021).
10. L. Casella, M. Baggioli, T. Mori, A. Zaccone.  
*Physics of phonon-polaritons in amorphous materials.*  
**Journal of Chemical Physics** 153, 244116 (2021).

## 2020 (18 papers)

11. C. Setty, M. Baggioli, A. Zaccone.  
*Anharmonic phonon damping enhances the  $T_c$  of BCS-type superconductors.*  
**Physical Review B** 102, 174506 (2020).
12. B. Cui and A. Zaccone.  
*Vibrational density of states of amorphous solids with long-ranged power-law correlated disorder in elasticity.*  
**European Physical Journal E** 43, 72 (2020).
13. L. Banetta, G. Storti, G. Hoggard, G. Simpson and A. Zaccone.  
*Predictive model of polymer reaction kinetics and coagulation behavior in seeded emulsion co- and ter-polymerizations.*  
**Polymer Chemistry** 11, 6599-6615 (2020).
14. A. Zaccone and K. Trachenko.  
*Explaining the low-frequency shear elasticity of confined liquids.*  
**Proceedings of the National Academy of Sciences of the USA** 117, 19653 (2020).
15. B. Cui and A. Zaccone.  
*Analytical prediction of logarithmic Rayleigh scattering in amorphous solids from tensorial heterogeneous elasticity with power-law disorder.*  
**Soft Matter** 16, 7797-7807 (2020).
16. G. Chevallard, K. Samwer, and A. Zaccone.  
*Atomic-scale expressions for viscosity and fragile-strong behavior in metal alloys based on the Zwanzig-Mountain formula.*  
**Physical Review Research** 2, 033134 (2020).
17. I. Kriuchevskiy, V. V. Palyulin, R. Milkus, R. M. Elder, T. W. Sirk, and A. Zaccone.  
*Scaling up the lattice dynamics of amorphous materials by orders of magnitude.*  
**Physical Review B** 102, 024108 (2020).
18. J. Rouwhorst, C. Ness, S. Stoyanov, A. Zaccone, P. Schall.  
*Nonequilibrium continuous phase transition in colloidal gelation with short-range attraction.*  
**Nature Communications** 11, 3558 (2020).
19. J. Rouwhorst, P. Schall, C. Ness, T. Blijdenstein, and A. Zaccone.  
*Nonequilibrium master kinetic equation modeling of colloidal gelation.*  
**Physical Review E** 102, 022602 (2020).
20. M. Baggioli, C. Setty, A. Zaccone.  
*Effective theory of superconductivity in strongly coupled amorphous materials.*  
**Physical Review B** 101, 214502 (2020).
21. A. Zaccone and E. M. Terentjev.  
*Rheology of hard glassy materials.*  
**Journal of Physics: Condensed Matter** 32, 395402 (2020).
22. J. M. van Doorn, R. Higler, R. Wegh, R. Fokkink, A. Zaccone, J. Sprakel, J. van der Gucht.  
*Propagation and attenuation of mechanical signals in ultrasoft 2D solids.*  
**Science Advances** 6, eaba6601 (2020).

23. B. Cui, J. F. Gebbia, M. Romanini, S. Rudic, R. Fernandez-Perea, F. Javier Bermejo, J.-L. Tamarit, and A. Zaccone.  
*Secondary relaxation in the THz range in 2-adamantanone from theory and experiments.*  
**Physical Review B** 101, 104202 (2020).
24. A. Zaccone.  
*Relaxation and vibrational properties in metal alloys and other disordered systems.*  
**Journal of Physics: Condensed Matter** (invited topical review) 32, 203001 (2020).
25. M. Baggioli and A. Zaccone.  
*Unified theory of vibrational spectra in hard amorphous materials.*  
**Physical Review Research** 2, 013267 (2020).
26. L. Banetta and A. Zaccone.  
*Pair correlation function of charge-stabilized colloidal systems under sheared conditions.*  
**Colloid and Polymer Science** 298, 761–771 (2020).
27. D. Han, Dan Wei, J. Yang, H.-L. Li, M.-Q. Jiang, Y.-J. Wang, L.-H. Dai, and A. Zaccone.  
*Atomistic structural mechanism for the glass transition: Entropic contribution.*  
**Physical Review B** 101, 014113 (2020).
28. M. Baggioli and A. Zaccone.  
*Low-energy optical phonons induce glassy-like vibrational and thermal anomalies in ordered crystals.*  
**Journal of Physics: Materials** 3, 015004 (2020) (Emerging Leaders 2020 Collection).

## 2019 (10 papers)

29. M. Baggioli and A. Zaccone.  
*Vibrational spectrum and specific heat in glasses from random matrix theory.*  
**Physical Review E** 100, 062131 (2019).
30. M. Baggioli, B. Cui, A. Zaccone.  
*Theory of the phonon spectrum in host-guest crystalline solids with avoided crossing.*  
**Physical Review B (Rapid Communication)** 100, 220201(R) (2019).
31. B. Cui, A. Zaccone, D. Rodney.  
*Nonaffine lattice dynamics with the Ewald method reveals strongly nonaffine elasticity of  $\alpha$ -quartz.*  
**Journal of Chemical Physics** 151, 224509 (2019).
32. R. M. Elder, A. Zaccone, T. W. Sirk.  
*Identifying nonaffine softening modes in glassy polymer networks: A pathway to chemical design.*  
**ACS Macro Letters** 8, 1160 (2019).
33. G. Ding, C. Li, A. Zaccone, W. H. Wang, H. C. Lei, F. Jiang, Z. Ling, and M. Q. Jiang.  
*Ultrafast extreme rejuvenation of metallic glasses by shock compression.*  
**Science Advances** 5, eaaw6249 (2019).
34. M. Baggioli and A. Zaccone.  
*Hydrodynamics of disordered marginally-stable matter.*  
**Physical Review Research** 1, 012010(R) (2019).

35. B. Cui, G. Ruocco, A. Zaccone.  
*Theory of elastic constants of athermal amorphous solids with internal stresses.*  
**Granular Matter** 21, 69 (2019) - Special Issue in Memoriam T. Behringer.
36. L. Banetta and A. Zaccone.  
*Radial distribution function of Lennard-Jones fluids in shear flows from intermediate asymptotics.*  
**Physical Review E** 99, 052606 (2019).
37. M. Baggioli and A. Zaccone.  
*Universal origin of boson peak vibrational anomalies in ordered crystals and amorphous materials.*  
**Physical Review Letters** 122, 145501 (2019).
38. J. Yang, Y.J. Wang, E. Ma, A. Zaccone, L.H. Dai, M.Q. Jiang.  
*Structural parameter of orientational order to predict the boson vibrational anomaly in glasses.*  
**Physical Review Letters** 122, 015501 (2019).

#### Articles published with previous affiliations

#### **2018 (14 papers)**

39. M. Lu, L. Banetta, L.J. Young, E.J. Smith, G.B. Bates, A. Zaccone, G. S. Kaminski-Schierle, A. Tunnacliffe, C. F. Kaminski.  
*Live-cell super-resolution microscopy reveals a primary role for diffusion in polyglutamine-driven aggregates assembly.*  
**Journal of Biological Chemistry** 294, 257-268 (2018).
40. B. Cui, Z. Evenson, B. Fan, M. Li, W.-H. Wang, A. Zaccone.  
*Possible origin of beta relaxation in amorphous metal alloys from atomic-mass differences of the constituents.*  
**Physical Review B** 98, 144201 (2018).
41. C. Eccles, S. Roy, T. H. Gray and A. Zaccone.  
*Reply to 'Comment on "Temperature dependence of nuclear fission time in heavy-ion fusion-fission reactions"'.*  
**Physical Review C** 98, 029802 (2018).
42. V.V. Palyulin, C. Ness, R. Milkus, R.M. Elder, T.W. Sirk, A. Zaccone.  
*Parameter-free predictions of the viscoelastic response of glassy polymers from nonaffine lattice dynamics.*  
**Soft Matter** 14, 8475 (2018). Featured on the journal cover.
43. B. Cui and A. Zaccone.  
*Generalized Langevin Equation and fluctuation-dissipation theorem for particle-bath systems in external oscillating fields.*  
**Physical Review E** 97, 060102(R) (2018).
44. J. Krausser, A. Lagogianni, K. Samwer, A. Zaccone.  
*Reply to 'Comment on "Disentangling interatomic repulsion and anharmonicity in the viscosity and fragility of glasses"'.*  
**Physical Review B** 98, 016202 (2018).

45. M. Dang, R. Zargar, D. Bonn, A. Zacccone, P. Schall.  
*Nonequilibrium free energy of colloidal glasses under shear.*  
**Journal of Physics D: Applied Physics** 51, 324002 (2018).
46. B. Cui, J. Gebbia, J.-L. Tamarit, A. Zacccone.  
*Disentangling alpha and beta relaxation in orientationally disordered crystals with theory and experiments.*  
**Physical Review E** 97, 053001 (2018).
47. G. M. Cicuta, J. Krausser, R. Milkus, A. Zacccone.  
*Unifying model for random matrix theory in arbitrary space dimensions.*  
**Physical Review E** 97, 032113 (2018).
48. V. Vetri, F. Piccirilli, J. Krausser, G. Buscarino, U. Lapinska, B. Vestergaard, A. Zacccone, V. Fodera'.  
*Ethanol controls the self-assembly and mesoscopic properties of amyloid spherulites.*  
**Journal of Physical Chemistry B** 122, 3101 (2018).
49. A. Zacccone.  
*Harnessing entropy in single-molecule force spectroscopy with semiconducting polymers.*  
**Chem** 4, 191-193 (2018).
50. R. Milkus, C. Ness, V. Palyulin, J. Weber, A. Lapkin, A. Zacccone.  
*Interpretation of the vibrational spectra of glassy polymers using coarse-grained simulations.*  
**Macromolecules**, 51, 1559–1572 (2018).
51. R. Higler, J. Krausser, J. van der Gucht, A. Zacccone, J. Sprakel.  
*Linking slow dynamics and microscopic connectivity in dense suspensions of charged colloids.*  
**Soft Matter**, 14, 780 (2018).
52. L. Perez-Ocampo, A. Zacccone, M. Laurati.  
*A well defined glass state obtained by oscillatory shear.*  
**Journal of Rheology** 62, 197 (2018).

## 2017 (16 papers)

53. C. S. Eccles, S. Roy, T. H. Gray, A. Zacccone.  
*Temperature dependence of nuclear fission time in heavy-ion fusion-fission reactions.*  
**Physical Review C** 96, 054611 (2017).
54. A. Maestro and A. Zacccone.  
*Nonaffine deformation and tunable yielding of colloidal assemblies at the air-water interface.*  
**Nanoscale** 9, 18343 (2017).
55. C. Ness, V.V. Palyulin, R. Milkus, R. Elder, T. Sirk, A. Zacccone.  
*Nonmonotonic dependence of polymer glass mechanical response on chain bending stiffness.*  
**Physical Review E (Rapid Communication)** 96, 030501(R) (2017).
56. B Cui, J. Yang, J. Qiao, M. Jiang, L. Dai, Y.-J. Wang, and A. Zacccone.  
*Atomic theory of viscoelastic response and memory effects in metallic glass.*  
**Physical Review B** 96, 094203 (2017).

57. J. Krausser, R. Milkus, A. Zaccone.  
*Non-affine lattice dynamics of defective fcc crystals.*  
**Soft Matter** 13, 6079 (2017).
58. V. Hieronymus-Schmidt, H. Roesner, G. Wilde, A. Zaccone.  
*Shear banding in metallic glasses described by alignments of Eshelby quadrupoles.*  
**Physical Review B** 95, 134111 (2017).
59. M. Abkenar, T. H. Gray, A. Zaccone.  
*Dissociation rates from single-molecule pulling experiments under large thermal fluctuations or large applied force.*  
**Physical Review E** 95, 042413 (2017).
60. S.H. Varol, F. Meng, B. Hosseinkhani, C. Malm, D. Bonn, M. Bonn, A. Zaccone, S. H. Parekh.  
*Nanoparticle amount, and not size, determines chain alignment and nonlinear hardening in polymer nanocomposites.*  
**Proceedings of the National Academy of Sciences of the USA** 114, E3170–E3177 (2017).
61. C. Ness and A. Zaccone.  
*Effect of hydrodynamic interactions on the lifetime of colloidal bonds.*  
**Industrial & Engineering Chemistry Research** 56 (13), 3726–3732 (2017).
62. J. Krausser, A. Lagiogianni, K. Samwer, A. Zaccone.  
*Disentangling interatomic repulsion and anharmonicity in the viscosity and fragility of glasses.*  
**Physical Review B** 95, 104203 (2017).
63. J. Sprakel, A. Zaccone, F. Spaepen, P. Schall, D. A. Weitz.  
*Direct observation of entropic stabilization of bcc crystals near melting.*  
**Physical Review Letters** 118, 088003 (2017).
64. R. Milkus and A. Zaccone.  
*Atomic-scale origin of dynamic viscoelastic response and creep in disordered solids.*  
**Physical Review E** 95, 023001 (2017).
65. B. Cui, R. Milkus, and A. Zaccone.  
*Direct link between boson-peak modes and dielectric  $\alpha$ -relaxation in glasses.*  
**Physical Review E** 95, 022603 (2017).
66. M. Laurati, P. Masshof, K. J. Mutch, S. U. Egelhaaf, and A. Zaccone.  
*Long-lived neighbors determine the rheological response of glasses.*  
**Physical Review Letters** 118, 018002 (2017).
67. B. Cui, R. Milkus, A. Zaccone.  
*The relation between stretched-exponential relaxation and the vibrational density of states in glassy disordered systems.*  
**Physics Letters A** 381, 446 (2017).
68. W.Y. Chen, L. Young, M. Lu Meng, A. Zaccone, F. Ströhl, N. Yu, G. Kaminski Schierle, C. Kaminski.  
*Fluorescence self-quenching from reporter dyes informs on the structural properties of amyloid clusters formed in vitro and in cells.*  
**Nano Letters** 17, 143 (2017).

## 2016 (11 papers)

69. A. Saric, T. Michaels, A. Zaccone, T.P.J. Knowles, D. Frenkel.  
*Kinetics of spontaneous filament nucleation via oligomers: insights from theory and simulation.*  
**Journal of Chemical Physics** 145, 211926 (2016).
70. A. Zaccone, I. Terentjev, T. Herling, T.P.J. Knowles, A. Aleksandrova, E.M. Terentjev.  
*Kinetics of fragmentation and dissociation of two-strand protein filaments: coarse-grained simulations and experiments.*  
**Journal of Chemical Physics** 145, 105101 (2016).
71. A. Lappala, A. Zaccone and E.M. Terentjev.  
*Polymer glass transition occurs at the marginal rigidity point with  $z^*=4$ .*  
**Soft Matter** 12, 7330 (2016).
72. A. Lagogianni, J. Krausser, Z. Evenson, K. Samwer, A. Zaccone.  
*Unifying interatomic potential,  $g(r)$ , elasticity, viscosity, and fragility of metallic glasses: analytical model, simulations, and experiments.*  
**Journal of Statistical Mechanics: Theory and Experiment** 084001 (2016).
73. B.O. Conchuir, C. Tarantini, C. McNeill, S. Huettnner, A. Zaccone.  
*Chain-assisted charge transport in semicrystalline conjugated polymers.*  
**Journal of Physical Chemistry C** 120, 14539 (2016).
74. M. Lattuada, A. Zaccone, H. Wu, M. Morbidelli.  
*Population-balance description of shear-induced clustering, gelation and suspension viscosity in sheared DLVO colloids.*  
**Soft Matter** 12, 5313 (2016).
75. R. Milkus and A. Zaccone.  
*Local inversion-symmetry breaking controls the boson peak in glasses and crystals.*  
**Physical Review B** 93, 094204 (2016).
76. F. Mura and A. Zaccone.  
*Effects of shear flow on phase nucleation and crystallization.*  
**Physical Review E** 93, 042803 (2016).
77. M. T. Dang, D. Denisov, B. Struth, A. Zaccone, P. Schall.  
*Reversibility and hysteresis in the sharp yielding transition of colloidal glasses under oscillatory shear.*  
**European Physical Journal E** 39, 44 (2016).
78. M. Schlegel, J. Brujic, E. M. Terentjev, A. Zaccone.  
*Local structure controls the nonaffine shear and bulk moduli of disordered solids.*  
**Scientific Reports** 6, 18724 (2016).
79. K. Kyriakos, M. Philipp, C.-H. Lin, M. Dyakonova, M. Vishnevetskaya, I. Grillo, A. Zaccone, A. Miasnikova, A. Laschewski, P. Mueller-Buschbaum, C. Papadakis.  
*Quantifying the interactions in the aggregation of thermoresponsive polymers - the effect of cononsolvency.*  
**Macromolecular Rapid Communications** 37, 420 (2016).



## 2015 (6 papers)

80. J. Krausser, K. Samwer, A. Zacccone.  
*Interatomic repulsion softness directly controls the fragility of supercooled metallic melts.*  
**Proceedings of the National Academy of Sciences of the USA** 112, 13762 (2015).
81. D. Denisov, M.T. Dang, B. Struth, A. Zacccone, G. H. Wegdam, P. Schall.  
*Sharp symmetry-change marks the mechanical failure transition of glasses.*  
**Scientific Reports** 5, 14359 (2015).
82. M. Mermet-Guyennet, J. de Castro, S. Varol, M. Habibi, B. Hosseinkhani, N. Martzel, R. Sprik, M. Denn, A. Zacccone, S. Parekh, D. Bonn.  
*Size-dependent reinforcement of composite rubbers.*  
**Polymer** 73, 170 (2015).
83. M. van der Linden, B. O. Conchuir, E. Spigone, A. Niranjana, A. Zacccone, P. Cicuta.  
*Microscopic origin of the Hofmeister effect in gelation kinetics of colloidal silica.*  
**Journal of Physical Chemistry Letters** 6, 2881 (2015).
84. A. Zacccone, I. Terentjev, L. Di Michele, E. M. Terentjev.  
*Fragmentation and depolymerization of non-covalently bonded filaments.*  
**Journal of Chemical Physics** 142, 114905 (2015).
85. S. Gu, J. Kaiserc, G. Marzuna, A. Ott, Y. Lu, M. Ballauff, A. Zacccone, S. Barcikowski, P. Wagener.  
*Ligand-free gold nanoparticles as a reference material for kinetic modelling of catalytic reduction of 4-nitrophenol.*  
**Catalysis Letters** 145, 1105 (2015).

## 2014 (5 papers)

86. A. Zacccone, P. Schall, E. M. Terentjev.  
*Microscopic origin of nonaffine nonlinear deformation in bulk metallic glasses.*  
**Physical Review B** 90, 140203(R) (2014).
87. S. Gu, S. Wunder, Y. Lu, M. Ballauff, R. Fenger, K. Rademann, B. Jaquet, A. Zacccone.  
*Kinetic analysis of the catalytic reduction of 4-nitrophenol by metallic nanoparticles.*  
**Journal of Physical Chemistry C** 118, 18618-18625 (2014).
88. A. Zacccone, M. Siebenbürger, H. H. Winter, M. Ballauff.  
*Linking self-assembly, rheology, and gel transition in attractive colloids.*  
**Journal of Rheology** 58, 1219 (2014).
89. B. O. Conchuir, Y.M. Harshe, M. Lattuada, A. Zacccone.  
*Analytical model of fractal aggregate stability and restructuring in shear flows.*  
**Industrial & Engineering Chemistry Research** 53, 9109 (2014).
90. A. Zacccone and E.M. Terentjev.  
*Short-range correlations control the G/K and Poisson ratios of amorphous solids and metallic glasses.*  
**Journal of Applied Physics** 115, 033510 (2014).

## 2013 (9 papers)

91. A. Moussa, M. Lattuada, B. O. Conchuir, A. Zacccone, M. Morbidelli, M. Soos.  
*Flow-Induced aggregation and breakup of particle clusters controlled by surface nanoroughness.*  
**Langmuir** 29, 14386 (2013).
92. A. Lappala, A. Zacccone, E.M. Terentjev.  
*Ratcheted diffusion through crowded nanochannels.*  
**Scientific Reports** 3, 3103 (2013).
93. V. Fodera', A. Zacccone, M. Lattuada, A.M. Donald.  
*Electrostatics controls the formation of amyloid superstructures in protein aggregation.*  
**Physical Review Letters** 111, 108105 (2013).
94. A. Zacccone.  
*Slowing-down of diffusion-controlled reactions in dense liquid matter.*  
**Journal of Chemical Physics** 138, 186101 (2013).
95. A. Zacccone and E. M. Terentjev.  
*Disorder-assisted melting and the glass transition in amorphous solids.*  
**Physical Review Letters** 110, 178002 (2013).
96. B. O. Conchuir and A. Zacccone.  
*Mechanism of flow-induced biomolecular and colloidal aggregate breakup.*  
**Physical Review E** 87, 032310 (2013).
97. A. Zacccone, J.J. Crassous, M. Ballauff.  
*Colloidal gelation with variable attraction energy.*  
**Journal of Chemical Physics** 138, 104908 (2013).
98. A. Zacccone.  
*Elastic deformations in covalent amorphous solids.*  
**Modern Physics Letters B** 27, 1330002 (2013).
99. T. Gibaud, A. Zacccone, E. Del Gado, V. Trappe, P. Schurtenberger.  
*Unexpected decoupling of stretching and bending modes in protein gels.*  
**Physical Review Letters** 110, 058303 (2013).

## 2012 (3 papers)

100. L. DiMichele, A. Zacccone, and E. Eiser.  
*Predictive theory of polymer-network mediated attraction between colloid particles.*  
**Proceedings of the National Academy of Sciences of the USA** 109, 10187 (2012).
101. A. Zacccone and E.M. Terentjev.  
*Theory of molecular crowding in Brownian hard-sphere liquids.*  
**Physical Review E** 85, 061202 (2012).
102. A. Zacccone and E.M. Terentjev.  
*Theory of thermally-activated ionization and dissociation of bound states.*  
**Physical Review Letters** 108, 038302 (2012).

## 2011 (5 papers)

103. A. Zaccone, J.R. Blundell, and E.M. Terentjev.  
*Network disorder and nonaffine deformations in marginal solids.*  
**Physical Review B** 84, 174119 (2011).
104. A. Zaccone, J.J. Crassous, B. Beri, and M. Ballauff.  
*Quantifying the reversible association of thermoresponsive nanoparticles.*  
**Physical Review Letters** 107, 168303 (2011).
105. A. Zaccone, N. Dorsaz, C. DeMichele, F. Piazza, M. Morbidelli, and G. Foffi.  
*Crowding, intermolecular interactions and shear-flow effects in the diffusion model of chemical reactions.*  
**Journal of Physical Chemistry B** 115, 7383 (2011).
106. A. Zaccone and E. Scossa-Romano.  
*Approximate analytical description of the nonaffine response of amorphous solids.*  
**Physical Review B** 83, 184205 (2011).
107. A. Zaccone, D. Gentili, H. Wu, M. Morbidelli, and E. Del Gado.  
*Shear-driven solidification of dilute colloidal suspensions.*  
**Physical Review Letters** 106, 138302 (2011).

## 2010 (4 papers)

108. D. Xie, H. Wu, A. Zaccone, L. Braun, and M. Morbidelli.  
*Criticality for shear-induced gelation of charge-stabilized colloids.*  
**Soft Matter** 6, 2692 (2010).
109. A. Zaccone, D. Gentili, H. Wu, and M. Morbidelli.  
*Shear-induced reaction-limited aggregation kinetics of Brownian particles at arbitrary concentrations.*  
**Journal of Chemical Physics** 132, 134903 (2010).
110. H. Wu, E. Tsoutsoura, M. Lattuada, A. Zaccone, and M. Morbidelli.  
*Effect of temperature on high shear-induced gelation of charge-stabilized colloids without adding electrolytes.*  
**Langmuir** 26, 2761 (2010).
111. A. Zaccone and E. Del Gado.  
*On mean coordination and structural heterogeneity in model amorphous solids.*  
**Journal of Chemical Physics** 132, 024906 (2010).

## 2009 (5 papers)

112. A. Zaccone, H. Wu, and E. Del Gado.  
*Elasticity of short-ranged attractive colloids: homogeneous and heterogeneous glasses.*  
**Physical Review Letters** 103, 208301 (2009).
113. A. Zaccone, H. Wu, D. Gentili, and M. Morbidelli.  
*Theory of activated-rate processes under shear with application to shear-induced aggregation of colloids.*  
**Physical Review E** 80, 051404 (2009).

114. A. Zaccone.  
*The shear modulus of metastable amorphous solids with strong central and bond-bending interactions.*  
**Journal of Physics: Condensed Matter** 21, (28) 285103 (2009).
115. A. Zaccone, M. Soos, M. Lattuada, M. U. Bäbler, and M. Morbidelli.  
*Breakup of dense colloidal aggregates under hydrodynamic stresses.*  
**Physical Review E** 79, 061401 (2009).
116. H. Wu, A. Zaccone, E. Tsoutsoura, M. Lattuada, and M. Morbidelli.  
*High shear-induced gelation of charge-stabilized colloids in a microchannel without adding electrolytes.*  
**Langmuir** 25, 4715 (2009).

## 2008 (3 papers)

117. A. Zaccone, H. Wu, Portaluri, M. Lattuada, and M. Morbidelli.  
*Mechanically stirred single-stage column for continuous gelation of colloidal systems.*  
**AIChE Journal** 54, 3106 (2008).
118. A. Zaccone, H. Wu, M. Lattuada, and M. Morbidelli.  
*Charged molecular films on Brownian particles: structure, interactions and relation to stability.*  
**Journal of Physical Chemistry B** 112, 6793 (2008).
119. A. Zaccone, H. Wu, M. Lattuada, and M. Morbidelli.  
*Correlation between surfactant adsorption/association phenomena and colloidal stability studied by light scattering.*  
**Journal of Physical Chemistry B** 112, 1976 (2008).

## 2007 (3 papers)

120. A. Zaccone, M. Lattuada, H. Wu, and M. Morbidelli.  
*Theoretical elastic moduli for disordered packings of interconnected spheres.*  
**Journal of Chemical Physics** 127, 174512 (2007).
121. A. Zaccone, A. Gäbler, S. Maaß, D. Marchisio, and M. Kraume.  
*Drop breakage in liquid-liquid stirred dispersions - Modelling of single drop breakage.*  
**Chemical Engineering Science** 62, 6297-6307 (2007).
122. S. Maass, A. Gäbler, A. Zaccone, A. Paschedag, and M. Kraume.  
*Experimental investigations and modelling of breakage phenomena in stirred liquid/liquid systems.*  
**Chemical Engineering Research & Design** 85, 703 (2007).

## P: Book chapters

1. E. Del Gado, D. Fiocco, G. Foffi, S. Manley, V. Trappe, A. Zaccone.  
*Colloidal Gelation.* Chapter 14 in “*Fluids, Colloids and Soft Materials: An Introduction to Soft Matter Physics*”, Eds. A. Fernandez-Nieves and A. M. Puertas, John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.

## Q: Invited talks at international conferences and at departmental seminar series and colloquia worldwide

Zaccone A. (2021). Understanding the boson peak in glasses and glassy polymers. **Invited talk** at the American Physical Society (APS) March Meeting 2021, Session X20, 19/03/2021.

Zaccone A. (2021). Lattice dynamics and elasticity of complex materials: from soft matter to superconductors. **Invited Colloquium talk**, Department of Physics, City University of Hong Kong, Hong Kong, 19/02/2021.

Zaccone, A. (2021). Lattice Dynamics and Elasticity of Complex Materials: from Soft Matter to Superconductors. **Invited talk** within the Department of Physics Seminar series, Department of Physics, Hong Kong University of Science and Technology, Hong Kong, 04/01/2021.

Zaccone A. (2020). Lattice dynamics, phonons and mechanics in disordered and dissipative systems. **Invited talk** within the departmental seminar series, Department of Mathematics, Bar-Ilan University, Ramat-Gan, Israel, 05/02/2020.

Zaccone A. (2019). Non-affine lattice dynamics: A new method to bridge time and length scales in the dynamical simulation of glasses. **Invited talk** within the NIST Center for Neutron Research (NCNR) seminar series, National Institute of Standards and Technology (NIST) Gaithersburg, USA, 27/06/2019.

Zaccone A. (2019). Towards a new understanding of disorder and dissipation in solids. **Invited lecture** within the Statistical Physics Seminar, Department of Physics of Complex Systems, The Weizmann Institute of Science, Rehovot, Israel, 04/02/2019.

Zaccone A. (2018). Generalized Langevin Equation modelling of viscoelastic and dielectric properties of glasses. **Invited talk** at the CECAM workshop on “Dynamic Coarse-Graining and Memory Effects in Soft Matter Systems”, at Max-Planck Institute for Polymer Research, Mainz, Germany, 24-26/10/2018.

Zaccone A. (2018). Microscopic modelling of dielectric alpha and beta relaxation in glasses and orientationally disordered crystals based on Generalized Langevin Equations. **Invited talk** at the 10<sup>th</sup> Broadband Dielectric Spectroscopy (BDS) Conference, Brussels, Belgium, 27-31/08/2018.

Zaccone A. (2018). Recent experimental and theoretical advances in soft matter: new understanding of viscoelasticity of liquids and polymers. **Invited talk** at the Thomas Young Centre (TYC) Soiree of The London Centre for the Theory and Simulation of Materials, London, 28/06/2018.

Zaccone A. (2017). The origin of the boson peak and its link with the dielectric and dynamic mechanical response of amorphous solids. **Invited talk** at the 8<sup>th</sup> International Discussion Meeting on Relaxation in Complex Systems, Wisla, Poland, 25-27/08/2017.

Zaccone A. (2017). Colloids in shear. **Invited plenary talk** at the SoftComp Annual meeting 2017, organized by the SoftComp (Soft Composites) EU research network. Venice, Italy, 29-31 May 2017.

Zaccone A. (2017). Understanding polymer glasses and their deformations at the monomer-level. **Invited talk** at the German Physical Society (DPG) Spring Meeting (Division of Chemical Physics). Dresden, Germany, 19-24/03/2017.

Zaccone A. (2017). Towards a nonequilibrium atomic-scale theory of the dynamical response of metallic glasses. **Invited talk** at the German Physical Society (DPG) Spring Meeting (Metal and Material Physics Division). Dresden, Germany, 19-24/03/2017.

Zaccone A. (2017). Bottom-up framework for the atomistic simulations of mechanical response of polymer glasses. **Invited talk** at the US Army Research Laboratory, Weapons & Materials Division, Aberdeen Proving Grounds, MD, USA, 04/01/2017.

Zaccone A. (2016). Nonaffine lattice dynamics of metallic glasses. **Invited talk** at the Glass Meeting Goettingen (GMG) workshop. University of Goettingen, Germany, 16/06/2016.

Zaccone A. (2015). Yielding of colloidal glasses. **Invited talk** at the Flowing Matter Across the Scales, COST conference. Rome, Italy, 25/03/2015.

Zaccone A. (2015). Inversion-symmetry breaking controls the boson peak of glasses and disordered crystals. **Invited talk** at the Institute of Physics, University of Amsterdam (UvA).

Zaccone A. (2015). Statistical mechanics of self-assembly of functional nanoparticles and protein systems. **Invited talk** at the National Institute of Standards and Technology, Center for Neutron Research, Gaithersburg MD, USA.

Zaccone A. (2015). Mechanical response of soft functional materials. **Invited seminar** at the Department of Physics, Georgetown University, Washington DC, USA, 06/2015.

Zaccone A. (2014). Microscopic origin of nonlinear nonaffine deformations in metallic glasses. **Invited talk** at the Physikalisches Institut, University of Goettingen.

Zaccone A. (2014). Molecular self-assembly and gelation. **Invited talk** at Institute of Applied Physics, University of Tuebingen, Germany.

Zaccone A. (2013). Molecular-level theory of soft and biological matter. **Invited talk**, Department of Physics, Durham University, UK 29/05/2013.

Zaccone A. (2013). Mechanics of disordered matter at the molecular level and the glass transition. **Invited talk** within the Theoretical Physics Seminar series, Department of Physics, University of Bristol, UK 15/05/2013.

Zaccone A. (2013). The low-T side of the glass transition: melting of amorphous solids and polymers. **Invited talk** at the departmental seminar of the School of Physics and Astronomy, University of Leeds, UK 19/02/2013.

Zaccone A. (2012). Statistical mechanics of elasticity in disordered solids. **Invited talk** within the Series of Seminars in Statistical Mechanics, Laboratoire de Physique Theorique de l'Ecole Normale Supérieure, Paris, France, 26/01/2012.

Zaccone A. (2012). Mechanical properties of disordered matter. **Invited talk** within the Lorentz Seminar, Lorentz Institute for Theoretical Physics, University of Leiden, The Netherlands, 7/02/2012.

Zaccone A. (2011). Shear-induced solidification of dilute colloidal suspensions: the ambiguous role of shear. **Keynote presentation** at the 25th European Colloid and Interface Society (ECIS) Conference. Berlin, Germany, 04-09/09/2011.

Zaccone A. (2010). Shear-driven solidification in colloidal suspensions: from Brownian liquids to granular suspensions. **Invited talk** at the Gordon Research Conference on Granular & Granular-Fluid Flow. Colby College, Waterville, USA, 24/06/2010.

Zaccone A. (2009). Activated-rate processes in shear and application to shear-induced phenomena in soft matter. **Invited talk** at the Helmholtz Institute for Materials and Energy (formerly Hahn-Meitner Institute), Berlin, Germany, 16/11/2009.

Data

15/05/2021

Luogo

Alessandria