Fabio Anzà, Ph.D.

Curriculum vitae (October 2021)

Complexity Sciences Center
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Current position

Starting in November 21 — **Research Assistant Professor** at *InQubator for Quantum Simulations*, Department of Physics, University of Washington, Seattle (WA)

12/18 - 08/22 — **Templeton "Power of Information" Fellow** at *Complexity Sciences Center*, *Department of Physics*, University of California, Davis (CA)

08/21 - Today — **Business Development Strategist** at ERGO, San Francisco (CA)

Former positions and Education

09/20 - 06/21 — **Business Development Fellow** at *Mike and Renee Child institute for Innovation and Entrepreneurship*, *Graduate School of Management*, University of California, Davis (CA)

11/19 – 01/20 — **Invited Lecturer** at *Università di Palermo*, Palermo, Italy
Department of Physics and Chemistry "Emilio Segrè"

01/15 – 11/18 — **D. Phil. in Physics** at *University of Oxford*, Oxford, United Kingdom
Clarendon Laboratory, Division of Atomic and Laser Physics

09/15 – 11/18 — **Wilfrid Knapp scholar** at St.Catherine's college of Oxford, Oxford, UK

09/14 – 01/15 — **Research scholar**
Department of Physics and Chemistry, *University of Palermo*, Palermo, Italy

09/10 – 05/14 — **Master Degree in Theoretical Physics**
Department of Physics "Enrico Fermi", *University of Pisa*, Pisa, Italy

09/06 – 03/10 — **Bachelor Degree in Physics**
Department of Physics and Chemistry, *University of Palermo*, Palermo, Italy

Interests

Digest: I believe this is the era of interdisciplinary approaches to science. I am deeply interested in Information Science, both as an evolving language to address fundamental aspects of nature, and as a way to improve on the currently available technologies. I am a firm supporter of mentoring as a way to give back to the community. Moreover, I believe in innovation and an ethical entrepreneurial attitude as means to achieve progress.

Research: Physics of Information; Classical and quantum information theory; Out-of-equilibrium physics and information-theory of many-body open quantum systems at the nanoscale; Classical and quantum information engines; Quantum and stochastic thermodynamics; Thermodynamics of quantum information; Energetics of quantum hardware and software; Classical and quantum stochastic processes; Quantum gravity; Quantum data science.

Peer reviewed publications

- F. Anzà, J.P. Crutchfield - *Beyond Density Matrices: Geometric Quantum States*
  Phys. Rev. A 103, 062218 (2021)
- D. Girolami, F. Anzà - *Quantifying the difference between many-body quantum states*
  Phys. Rev. Lett. 126, 170502 (2021)
- F. Anzà, F. Pietracaprina, J. Goold - *Logarithmic growth of local entropy and total correlations in many-body localized dynamics.* Quantum 4, 250 (2020).

- F. Anzà - *New equilibrium ensembles for isolated quantum systems*
  Entropy 2018, 20, 744.
- F. Anzà, C. Gogolin, M. Huber - *Eigenstate Thermalization for Degenerate Observables*
  Phys. Rev. Lett. 120, 150603 (2018)
- F. Anzà, G. Chirco - *On the fate of the Hoop Conjecture in Quantum Gravity*
  Phys. Rev. Lett. 119, 231301 (2017)
- F. Anzà, V. Vedral - *Information-theoretic equilibrium and observable thermalization*
  Scientific Reports 7, 44066 (2017)
- F. Anzà, G. Chirco - *Typicality in spin-network states of quantum geometry*
  Phys. Rev. D 94, 084047 (2016)
- F. Anzà, S. Speziale - *A note on the secondary simplicity constraints in loop quantum gravity*
  Class. Quantum Grav. 32 (2015) 195015
- T. Aaltonen *et al.* - *Search for resonances decaying to Top and Bottom quark with the CDF experiment*
  Phys. Rev. Lett. 115, 061801 (2015)
- F. Anzà, S. Di Martino, B. D. Militello, A. Messina - *Dynamics of a particle confined in a two-dimensional dilating and deforming domain*
  Phys. Scr. **90** 074062 (2015)
- S. Di Martino, F. Anzà *et al.* - *A quantum particle in a box with moving walls.*
  J. Phys. A: Math. Theor. **46** 365301 (2013)
- T. Aaltonen *et al. Search for a dark matter candidate produced in association with a single top quark in* $p\bar{p}$ *collision at* $\sqrt{s} = 1.96\ TeV$.
  Phys. Rev. Lett. **108** 201802 (2012)
- F. Anzà, B.D. Militello, A. Messina - *Tripartite thermal correlation in an inhomogeneous spin-star system J. Phys. B: At. Mol. Opt. Phys.* **43**, 205501 (2010)

Preprints, essays and notes

- F. Anzà, J. Crutchfield *Quantum information dimension and geometric entropy*
  ArXiv:2111.06374
- F. Anzà, *A kinetic theory of information transport*
  ArXiv:2106.00385
- F. Anzà, J.P. Crutchfield - *Geometric Quantum Thermodynamics*
  ArXiv:2008.08683 - Under review in Physical Review X Quantum
- F. Anzà, J.P. Crutchfield - *Geometric Quantum State Estimation*
  ArXiv:2008.08679
- M. Ashrafi, F. Anzà, J.P. Crutchfield - *Szilard engines as quantum thermodynamical systems*
  ArXiv:2010.14652
- F. Anzà, A. Carollo, D. Valenti, B. Spagnolo - *Theoretical Models for High-*T_C *superconductivity*
  Internal Note, Interdisciplinary group of Theoretical Physics, University of Palermo
- F. Anzà, G. Bellettini, L. Bianchi, *et al.* - *Search for W'-like resonances decaying to a Top and a Bottom quark in the Missing Transverse energy plus Jets Final State*
  CDF Public Note **11110** (2014)
- F. Anzà, D. Bortoletto, Q. Liu, F. Margaroli, B. Fuks, *Search for monotop signature at Tevatron CDF*
  Fermilab Note **10707** (2011)
- F. Anzà - *Typically growing entropy*
  Romulus Magazine, Wolfson College, University of Oxford

Teaching, Mentoring, and Supervising

09/21 - Today Co-Supervisor of 2 PhD Students, University of Oxford and University of California, Davis

11/19 – 12/19 Invited course: **Introduction to Loop Quantum Gravity** at the University of Palermo

09/19 –Today Mentor for **Lead The Future**. Mentored over 10 students, currently mentoring 6, among Bachelor, Master and PhD.

12/18 –Today Co-mentored 1 REU Summer student and helped mentoring 3 PhD students at U.C. Davis

Funding raised for research: Grants, Fellowships and Scholarships

12/18 – 08/22 **"Power of Information" grant** from Templeton World Charity Foundation ∼ 330,000$

01/15 – 12/17 **"Angelo Della Riccia" grant**, *for DPhil at University of Oxford* ∼ 55,000$

10/15 – 07/18 **"Wilfrid Knapp" scholarship**, *St. Catherine's College, University of Oxford* ∼ 20,000$

08/14 – 12/14 **Post-Lauream scholarship**, *University of Palermo* ∼ 20,000$

01/13 – 07/13 **"Perfezionamento Estero" grant**, *University of Palermo* ∼ 6,700$

10/12 – 03/13 **Erasmus Placement Scholarship**, *University of Pisa* ∼ 5,000$

11/12 – 02/13 **University Student Fellowship**, *European Physical Society* ∼ 2,200$

07/11 – 09/11 **INFN Summer Scholarship**, *Fermi National Accelerator Laboratory*, Batavia, IL, USA

Awards

04/21 **Postdoctoral Excellence award** from University of California, Davis

04/19 – 04/19 **"Best oral presentation" award** at the U.C. Davis Postdoctoral Research Symposium

26/07/2018 **"Information Engines Young Scholar" 2018** from Telluride Science Research Center

26/09/2016 **"Gilberto Bernardini" award**, *for "Scientific industriousness"*, awarded by the "Società Italiana di Fisica" (Italian Physics Society)

Other professional activities

10/19 - Today **Organizer** of Davis Quantum Journal Club - over 50 participants from 5 departments

05/19 – 12/19 **Guest Editor** at "Entropy" (MDPI)

10/16 – 12/17 **Visiting D.Phil. student**, International Centre for Theoretical Physics, Trieste, ITA

10/16 – 03/17 **Organizer** of the Fifth Conference on Quantum Thermodynamics, Oxford, UK

09/16 - Today **Referee** for European Physical Journal Plus, Journal of Physics A (IOP), Quantum, Entropy (MDPI), Nature Quantum Information (NPJ), Journal of Statistical Physics, Physical Review X Quantum, General Relativity and Gravitation

06/15 – 12/17 **Member of COST Action MP1209,** *"Thermodynamics in the quantum regime"*

09/12 – 06/13 **Erasmus Placement Internship**, *Centre de Physique Theorique*, Marseille, France

06/11 – 09/11 **Summer Internship**, *Fermi National Accelerator Laboratory*, Batavia, IL, USA

01/09 – 10/09 **Apprenticeship for the goverment**, ARPA, *Simulation and analysis of electromagnetic fields in urban areas*, Palermo, Italy

10/06 – 10/09 **Departmental Service**, *Member of the governing body of the Faculty "Scienze MM.FF.NN.", University of Palermo, representing students*, Palermo, Italy

Professional Networks and societies

03/21 - Today Invited member of the "Foundational Questions Institute" FQXi

03/15 - Today Member of "Institute of Physics", London

04/12 - Today Member of "European Physical Society"

04/10 - Today Invited Member of "Società Italiana di Fisica" (Italian physics society)

Review panels - 2019

07/2019 FQXi large grants call: Intelligence and Agency in the physical world

Invited talks

10/19/2021 Qubit and Spacetime colloquium at Okinawa Institute for Science and Technology

Talk's title: *Quantum thermodynamics of spacetime as a conceptual arena for quantum theories of gravity*

07/23/2021 Information Engines at the frontier of nanoscale thermodynamics

Talk's title: *A geometric approach to the physics of open quantum systems*

07/30/2019 Information Engines at the frontier of nanoscale thermodynamics

Talk's title: *Thermalization and Log-growth of local entanglement in Many-Body Localized systems*

07/01/2018 FQXi Workshop, The physics of Very simple observers

Talk's title: *Pure-states statistical mechanics: On its foundations and applications to quantum gravity*

21/02 – 24/02 British Applied Mathematics Colloquium 2017, University of Surrey

Talk's title: *Information-theoretic equilibrium and observable thermalization*

Contributed talks

2013 - 2020 Over 30 contributed talks at conferences and workshops in: United Kingdom, Italy, United States, France, Germany, Poland, Slovakia, Malta, Canada.

Some topics *Exploiting and developing geometric tools for Quantum Information Science, Dynamical Systems approach to quantum physics, Quantum Thermodynamics, Quantum Statistical Mechanics, Quantum Gravity*

Outreach

04/19 - Today **Outreach volunteer** *for the Ventricular Foundation*

01/16 – 12/17 **Workshop leader**, *Key Stage 3 Challenge Day, "Workshops on lasers"*

Languages

- **Italian** (native), **English** (proficient)

Computing skills

- Knowledge and experience with *Python*, *MatLab*, *Mathematica*
- Long working experience under *MacOS*, *Linux/Unix* and *Windows*
- Commercial software: *AutoCAD*, *WinEDT*

References

- **Prof. James P. Crutchfield**
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- **Prof. Vlatko Vedral**
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