Thomas Oikonomou

Professor of Theoretical Physics

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Google Scholar Profile

APPOINTMENTS

2020 – 2022 **Professor of Mathematics**: College of Engineering and Computer Science, VinUniversity, Hanoi, Vietnam.

2015 – 2020 **Professor of Physics**: Department of Physics, Nazarbayev University, Nur-Sultan.

2012 – 2015 **Postdoctoral Fellow**: Department of Physics, University of Crete, Heraklion, Greece (*working on problems of Parity-Time and Breathers*).

2005 – ··· **Collaborating Researcher**: National Center for Scientific Research "Demokritos", Athens, Greece (*DNA Dynamics and Statistical Mechanics*).

2009 - 2012 **Instructor in the Private Sector**: in physics and mathematics for the National University Entrance Examination in Greece, (*advanced courses*).

Mar-May 2009 **Visiting Post-Doctoral Researcher** : Department of Theoretical Physics, Centro Brasileiro de Pesquisas Físicas, Rio de Janeiro, Brasil (*Statistical Mechanics*).

May-Aug 2005 **Marie-Currie Doctoral Fellow**: Center for Nonlinear Phenomena and Complex Systems, Universite Libre De Bruxelles, Bruxelles, Belgium (*Nonlinear Dynamics*).

EDUCATION

2004–2008 **PhD in Theoretical Physics with concentration on Bioinformatics and Statistical Mechanics**, *Kapodistrian University of Athens & National Center for Scientific Research "Demokritos"*, Greece, "Biofunctionality in DNA Sequences"
Thesis advisor: Astero Provata

2001–2003 **Master in Physics: Specializing in General Relativity**, *Friedrich-Schiller University*, Germany, "Head-on Collision of Binary Systems with rotational components in the 3rd Post-Newtonian Approximation"
Thesis advisor: Gerhard Schäfer

1999–2001 **Bachelor in Physics**, *Rheinisch-Westfälische Technische Hochschule Aachen*, Germany

AREAS OF EXPERTISE

- Stochastic Thermodynamics
- Bioinformatics
- Nonequilibrium/Nonadditive Statistical Mechanics
- Long-range Correlations
- Quantum Thermodynamics
- Symbolic Dynamics
- Hamiltonian Lattices
- Quantum Information

LANGUAGES

Greek: Fluent

English: Excellent

German: Excellent

TEACHING

AWARDS

- **Best Professor of the Year, 2019**, Top 5 Finalist, Nazarbayev Univeristy
- **Best Professor of the Year, 2022**, Top 5 Finalist, VinUniveristy

COURSES

VinUniversity, College of Engineering and Computer Science, Hanoi, Vietnam

- **Calculus I :**, *Limits, Continuity, Derivatives, Integrals for single variable functions*
  Book: Single Variable Essential Calculus, Early Transcendentals, J. Stewart
  Average Number of Students: 70
  Taught: 2 Semesters

- **Calculus II :**, *Limits, Continuity, Derivatives and Integrals for multivariable functions, Vector Calculus*
  Book: Calculus, Early Transcendentals, J. Rogawski, C. Adams
  Average Number of Students: 70
  Taught: 2 Semesters

- **Business Mathematics:**, *Applications of calculus on Business*
  Book: Calculus and its Applications, M.L. Bittinger, D.J. Ellenbogen, S.A. Surgent
  Average Number of Students: 50
  Taught: 5 Semesters

- **Thermodynamics:**, *Laws of Thermodynamics and Applications*
  Book: Fundamentals of Enguneering Thermodynamics, M.J. Moran, H.N. Shapiro
  Average Number of Students: 15
  Taught: 1 Semesters

Nazarbayev University, Department of Physics, Nur-Sultan, Kazakhstan

- **Physics for Scientists and Engineers 1:**, *Mechanics, Oscillations and Waves, Thermodynamics*
  Book: Physics for Scientists and Engineers Vol. I, Serway-Jewett
  Average Number of Students: 90
  Taught: 8 Semesters, Course Coordinator: 3 Semesters, Lab Supervisor: 3 Semesters

- **Physics for Scientists and Engineers 2:**, *Electricity and Magnetism, Optics*
  Book: Physics for Scientists and Engineers Vol. II, Serway-Jewett
  Average Number of Students: 90
  Taught: 2 Semesters, Course Coordinator: 2 Semesters, Lab Supervisor: 3 Semesters

- **Statistical Mechanics and Thermodynamics**
  Lecture notes: Collection from various books
  Average Number of Students: 10
  Taught: 4 Semesters Undergraduate Level and 4 Semesters Graduate Level

University of Crete, Department of Physics, Heraklion, Greece

- **Calculus I**
  Book: Thomas' Calculus I
  Average Number of Students: 180
  Taught: 2 Semesters

RWTH Aachen, Department of Physics, Aachen, Germany

- **Classical Electrodynamics**
  Taught: 1 Semester, Teaching Assistant

- **Statistical Thermodynamics**
  Taught: 1 Semester, Teaching Assistant

STUDENT MENTORSHIP

Thesis Co-Supervisor

- Aigerim Zholmaganbetova (Mathematics Major) – Master Thesis 05/2019
  Title: The Dynamics of Hamiltonian Lattices With Application to Hollomon Oscillators

- Maksat Temirkhan (Physics Major) – Master Thesis 04/2019
  Title: The Stationary Worldlines and Power Distributions of a Point Charge

- Gaukhar Akmetzhanova (Physics Major) – Master Thesis 04/2017:
  Title: Accelerated Trajectories in Quantum Field Theory

PUBLICATIONS WITH STUDENTS

Graduate Students

2. **M. R. R. Good, Maksat Temirkhan, T. Oikonomou**, *Stationary Worldline Power Distributions* , International Journal of Theoretical Physics **58**, 2942 (2019)

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3. **M. R. R. Good, T. Oikonomou, Gaukhar Akhmetzhanova**, *Uniformly accelerated point charge along a cusp*, Astronomische Nachrichten **338**, 1151 (2017)

SERVICE

COURSE COORDINATOR AND LAB SUPERVISOR

- Coordinator and lab supervisor of 18 physics lab sections with over 600 students from all university departments

– Course

  To ensure equal access to learning materials and begin standardization of course sections I developed lecture notes, new word problems and detailed solutions, and changed course textbook.

– Lab

  Handling of daily lab operations, hiring for positions of Lab Coordinator and Lab Assistants, and oversee the procurement of lab materials, updating student lab report grading system, revision of lab documentation such as meeting minutes and lab manuals as well as instituting standardized training and orientation for new employees.

GRANTS

- VinUni Seed Funding: "Privacy-Preserving Data Publishing for Autonomous Vehicles", Duration: 18 months, Position: Co-PI, University Level.

- ORAU Small Grant: "Casimir light as a probe of vacuum fluctuation simplification" with PN 17098, Duration 3 +1 years, Position: Co-PI, University Level.

- Faculty Development Competitive Research Grant Program:"Accelerating mirrors to investigate black hole radiation and cosmological thermodynamics", Duration: 3 years, Position: Co-PI, University Level

- MES Target Program: "Center of Excellence for Fundamental and Applied Physics" (BR05236454) by the Ministry of Education and Science of the Republic of Kazakhstan, Duration: 3 years, Position: Faculty/Researcher, Ministry Level.

COMMITTEES

- Member of Teaching and Learning Committee

  Oversee the implemenation of the curriculum, including new courses, course changes, and academic policies.

- Member of the University Research Plan Committee

  Responsible for the research priorities and funding of environmental topics.

- Member of Master/PhD Thesis Defense Committee

Physics Department: 5 times, Mathematics Department: 1 time, and Department of Mechanical Engineering: 3 time

Responsibilities included reviewing and grading the thesis and the oral presentation.

- Member of Masters Students Admissions Committee
  Assessed applications and conducted admissions interviews.
- Member of the Organizing Committee of the International Conference "3rd Dynamics Days in Central Asia", September 2-5, 2016, Nazarbayev University, Astana, Kazakhstan
  Prepared the conference schedule and booklet.
- Member of the Physics Curriculum Committee
  Designed and reviewed graduate and undergraduate course requirements
- Member of the ad hoc Health and Fitness (Senate sub-) Committee
  Tasked with resolving Sport Center-Faculty conflicts.

RESEARCH

PEER-REVIEWED JOURNAL PAPERS

36. **T. Oikonomou**, *Newtonian and Relativistic Particle Mechanics from Local Energy Conservation: A Symmetry-Selected Force–Energy Framework*, Physica Scripta (accepted 2026).
    Q2
35. **Omid Farzadian, T. Oikonomou, Mehdi Moradkhani, & Saule Zhumambayeva**, *Model for melting transition of twisted DNA in a thermal bath*, The European Physical Journal B **96** , 23: 1-9 (2023)
    Q3
34. **Thai-Hung Nguyen, Kok-Seng Wong, & T. Oikonomou**, *Efficient Two-Party Integer Comparison With Block Vectorization Mechanism*, IEEE Access **9** , 123485 (2021)
    Q1
33. **T. Oikonomou, K. Kaloudis, G. B. Bagci**, *The q-exponentials do not maximize the Rényi entropy*, Physica A **578** , 126126 (2021)
    Q1
32. **V. Basios, T. Oikonomou, R. De Gernier**, *Symbolic Dynamics of Music from Europe and Japan* , Chaos **31**, 053122 (2021)
    Q1, Featured Article
31. **A. Bountis, K. Kaloudis, T. Oikonomou, B. M. Manda, C. Skokos**, *Stability Properties of 1-Dimensional Hamiltonian Lattices with Non-analytic Potentials*, International Journal of Bifurcation and Chaos **30**(15), 2030047 (2020)
    Q1
30. **O. Farzadian, T. Oikonomou, M. R. R. Good, M. D. Niry**, *Entropic analysis of the localization-delocalization transition in one dimensional correlated lattice*, Physica A **545**, 123350 (2020)
    Q1

29. **T. Oikonomou, G. B. Bagci**, *Reply to " Comment on 'Rényi entropy yields artificial biases not in the data and incorrect updating due to the finite-size data' "* , Physical Review E **100** , 026102 (2019)
Q1

28. **M. R. R. Good, M. Temirkhan, T. Oikonomou**, *Stationary Worldline Power Distributions* , International Journal of Theoretical Physics **58**, 2942 (2019)
Q2

27. **T. Oikonomou, G. B. Bagci**, *Rényi entropy yields artificial biases not in the data and incorrect updating due to the finite-size data* , Physical Review E **99** , 032134 (2019)
Q1

26. **A. Aydin, T. Oikonomou, G. B. Bagci, A. Sisman**, *Discrete and Weyl density of states for photons and phonons*, Physica Scripta **94**, 105001 (2019)
Q2

25. **B. Canturk, T. Oikonomou, G. B. Bagci**, *The parameter space and third law of thermodynamics for the Borges-Roditi, Abe and Sharma-Mittal entropies*, International Journal of Modern Physics B **32**, 1850274 (2018)
Q4

24. **T. Oikonomou, G. B. Bagci**, *Route from discreteness to the continuum for the Tsallis q-entropy*, Physical Review E **97**, 012104 (2018)
Q1

23. **T. Oikonomou, G. B. Bagci**, *Reply to "Comment on 'Route from discreteness to the continuum for the Tsallis q-entropy' "*, Physical Review E **97**, 066102 (2018)
Q1

22. **M. R. R. Good, T. Oikonomou, G. Akhmetzhanova**, *Uniformly accelerated point charge along a cusp*, Astronomische Nachrichten **338**, 1151 (2017)
Q3

21. **T. Oikonomou, G. B. Bagci**, *Comment on "Troublesome aspects of the Renyi-MaxEnt treatment"*, Physical Review E **96**, 056101 (2017)
Q1

20. **B. Canturk, T. Oikonomou, G. B. Bagci**, *Group theory, entropy and the third law of thermodynamics*, Annals of Physics **377**, 62 (2017)
Q1

19. **T. Oikonomou, G. B. Bagci**, *Misusing the entropy maximization in the jungle of generalized entropies*, Physics Letters A **381**, 207 (2017)
Q2

18. **G. B. Bagci, T. Oikonomou**, *Validity of the third law of thermodynamics for the Tsallis entropy*, Physical Review E **93**, 022112 (2016)
Q1

17. **M. Mattheakis, T. Oikonomou, M. I. Molina, G. P. Tsironis**, *Phase Transition in Parity-Time Symmetric Active Plasmonic Systems*, IEEE Journal of Selected Topics in Quantum Electronics, VOL. **22**, NO. 5 (2016)
Q1

16. **G. B. Bagci, T. Oikonomou**, *Comment on "Third law of thermodynamics as a key test of generalized entropies"*, Physical Review E **92**, 016103 (2015)
Q1

15. **T. Oikonomou, A. Nergis, N. Lazarides, G. P. Tsironis**, *Stochastic metastability by spontaneous localization*, Chaos Solitons & Fractals **69**, 228 (2014)
Q1

14. **G. B. Bagci, T. Oikonomou**, *Reply to "Comment on 'Tsallis power laws and finite baths with negative heat capacity' "*, Physical Review E *Accepted but not published due to withdrawal of the original Comment by M. Campisi*, `arXiv:1401.0319v2`, (2014)

13. **G. B. Bagci, T. Oikonomou**, *Tsallis power laws and finite baths with negative heat capacity*, Physical Review E **88**, 042126 (2013)
Q1

12. **T. Oikonomou, G. B. Bagci**, *Clausius versus Sackur-Tetrode entropies*, Studies in History and Philosophy of Modern Physics **44**, 63 (2013)
Q1

11. **T. Oikonomou, G. B. Bagci, U. Tirnakli**, *Canonical equilibrium distribution derived from Helmholtz potential*, Physica A **391**, 6386 (2012)
Q1

10. **T. Oikonomou**, *Comment on "Critique of multinomial coefficient method for evaluating Tsallis and Rényi entropies" by A.S. Parvan*, Physica A **390**, 781 (2011)
Q1

9. **T. Oikonomou, G. B. Bagci**, *A completeness criterion for Kaniadakis, Abe and two-parameter generalized statistical theories*, Reports on Mathematical Physics **66**, 137 (2010)
Q3

8. **T. Oikonomou, G. B. Bagci**, *The maximization of Tsallis entropy with complete deformed functions and the problem of constraints*, Physics Letters A **374**, 2225 (2010)
Q2

7. **T. Oikonomou, G. B. Bagci**, *A note on the definition of deformed exponential and logarithm functions*, Journal of Mathematical Physics **50**, 103301 (2009)
Q2

6. **T. Oikonomou, U. Tirnakli**, *Generalized entropic structures and non-generality of Jaynes' Formalism*, Chaos, Solitons & Fractals **42**, 3027 (2009)
Q1

5. **T. Oikonomou, A. Provata, U. Tirnakli**, *Nonextensive Statistical Approach to Non-coding Human DNA*, Physica A **387**, 2653 (2008)
Q2

4. **T. Oikonomou**, *Tsallis, Rényi and nonextensive Gaussian entropy derived from the respective multinomial coefficients*, Physica A **386**, 119 (2007)
Q2

3. **T. Oikonomou**, *Properties of the "nonextensive Gaussian" entropy*, Physica A **381**, 155 (2007)
Q1

2. **A. Provata, T. Oikonomou**, *Power law exponents characterising human DNA*, Physical Review E **75**, 056102 (2007)
Q1

1. **T. Oikonomou, A. Provata**, *Non-extensive Trends in the Size Distribution of Coding and Non-coding DNA Sequences in the Human Genome*, European Physical Journal B **50**, 259 (2006)
Q1

PRE-PRINTS

4. **A. Bidollina, T. Oikonomou, G. B. Bagci**, *Opening Pandora's Box: Maximizing the q-entropy with Escort Averages* , `arXiv:1904.00581`, (2019)
3. **T. Oikonomou, G. B. Bagci**, *Overcoming the Artificial Biases for the Nonadditive q-Entropy*, `arXiv:1810.06916`, (2018)
2. **T. Oikonomou, G. B. Bagci**, *Entropy Maximization with Linear Constraints: The Uniqueness of the Shannon Entropy*, `arXiv:1803.02556`, (2018)
1. **T. Oikonomou, G. B. Bagci**, *Impossible Mission: Entropy Maximization with Escort Averages*, `arXiv:1704.04721`, (2017)

CONFERENCE TALKS

7. **Th. Oikonomou**, *MaxEnt Principle and the Problem of the Partition Function*, 14th Joint European Thermodynamics Conference Budapest, 21/05-25/05, 2017
6. **Th. Oikonomou**, *Parity-Time Plasmonic Instabilities*, Green Photonics Astana 2015, Astana-Kazakhstan, 29/10-30/10 2015
5. **Th. Oikonomou**, *Is Shannon entropy always additive?*, SigmaPhi2011 International Conference on Statistical Physics, Larnaca-Cyprus, 11/07-15/07 2011
4. **Th. Oikonomou**, *On the definition of deformed* $\ln - \exp$*-functions*, XXXII Encontro Nacional de Fisica da Materia Condensada, Águas de Lindóia, Brazil, 11/05-15/05 2009
3. **Th. Oikonomou**, *Nonextensivity in the Coding and Non-coding Size Distributions of Human DNA Sequences*, New Directions in Complex Systems, Istanbul, Turkey, 03/09-09/09 2006
2. **Th. Oikonomou**, *Nonextensive Analysis of Human DNA*, School and Conference on Complex Systems and Nonextensive Statistical Mechanics, Abdus Salam ICTP, Trieste, Italy, 31/07-08/08 2006
1. **Th. Oikonomou**, *Non-Linear Analysis of 6 Human Chromosomes*, 3rd Annual Scientific Conference, Medical School, University of Athens, Athens, Greece, May 2006

CONFERENCE POSTERS

2. **Th. Oikonomou**, *"The Failure of the MaxEnt Principle for the generalized entropies", The Ninth International Conference on Guided Self-Organisation (GSO-2018): Information Geometry and Statistical Physics, 26/03-28/03 Leipzig, Germany*, 2018
1. **Th. Oikonomou**, *"Parity-Time plasmonic instabilities", IS-PALD 2015, CentraleSupélec Metz, France*, 4/11-6/11 2015

UNIVERSITY TALKS

Invited Speaker

- **Subadditivity of Tsallis and Rényi entropies**, *International Conference on Statistical Physics, Chania, Crete, Greece*, Jul 2023
- **Phenomenological vs. Statistical ideal gas entropy**, *Ege University, Department of Physics, Faculty of Science, Izmir, Turkey*, Feb 2014
- **Non-correspondence between the discrete Shannon measure and its Jaynes' continuous generalization**, *National Center for Scientific Research "Demokritos", Institute of Physical Chemistry, Athens, Greece*, Feb 2013

Selected Talks

- **Deriving the Canonical Distribution without Thermodynamic Limit & Equiprobability Postulate**, *Nazarbayev University, School of Science, Department of Physics, Astana, Kazakhstan*, Jan 2016
- **"Clausius vs. Boltzmann-Gibbs entopies"**, *University of Crete, Department of Physics, Heraklion, Greece*, Apr 2014
- **Derivation of the Sackur-Tetrode entropy within classical thermodynamics**, *National Center for Scientific Research "Demokritos", Institute of Physical Chemistry, Athens, Greece*, Nov 2011
- **Cumulative Analysis of DNA Sequences in the Human Genome**, *School of Medicin, Department of Biological Chemistry, University of Athens, Athens, Greece*, March 2006

JOURNAL PEER REVIEW

- Central European Journal of Physics
- Entropy
- European Physical Journal B
- Journal of Mathematical Physics
- Modern Physics Letters B
- International Journal of Modern Physics B
- Progress of Physics
- Symmetry
- Physica A
- Physica B
- Physica D
- Physics Letters A
- Physical Review E
- Results in Physics
- Europhysics Letters
- Scientific Reports

– Awarded with a certificate of appreciation from the journals "*Physica D*" and "*Results in Physics*" for my peer review contribution.