

PERSONAL INFORMATION

Mirko Degli Esposti



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Sex Male | Date of birth 18/12/1965 | Nationality Italian

WORK EXPERIENCE

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- 2015–Present **Deputy Rector**
University of Bologna, Bologna (Italy)
- 2020–Present **Vice-Rector for Digital Technologies**
Università di Bologna, Bologna (Italy)
- 2016–Present **Dean of the Alma Mater Foundation**
Fondazione Alma Mater, Bologna (Italy)
- 2008–2015 **Head of the Department of Mathematics**
University of Bologna, Bologna (Italy)
- 2007–Present **Full Professor in Mathematical Physics**
University of Bologna, Bologna (Italy)
- 2015–Present **Dean of the University Center for the protection and promotion of health and safety**
University of Bologna, Bologna (Italy)
- 2018–Present **member of the Council of Administration of the "Fondazione Innovazione Urbana" (FIU, <https://www.fondazioneinnovazioneurbana.it>)**
Fondazione Innovazione Urbana, Bologna (Italy)
- 2020–Present **founder and member of the interdepartmental research centre "ALMA MATER RESEARCH INSTITUTE FOR HUMAN-CENTERED ARTIFICIAL INTELLIGENCE (ALMA HUMAN AI) "**
Università di Bologna, Bologna (Italia)
- 2019–Present **member of the Academy of Sciences of Bologna**
University of Bologna, Bologna (Italy)
- 2018–Present **member of the Expert Group on Science 2.0/Open Science**
European University Association (EUA), Bruxelles (Belgium)
- 2020–Present **member of the CRUI Gruppo "CARE" (Electronic Resources Access Coordination**

- Group))
CRUI (Conference of the Rectors of Italian Universities), Roma (Italia)
- 2016–Present **national coordinator of the CRUI Working Group on University Rankings**
CRUI (Italian National Conference of Rectors), Roma (Italy)
- 2016–Present **national coordinator of the UI GreenMetric World University Rankings**
Universitas Indonesia (Indonesia)
- 2016–Present **member of the IREG executive board , Observatory on Academic Ranking and Excellence**
IREG Observatory, Warsaw (Poland)
- 2016–Present **member of the QS Intelligence Unit Advisory Board**
QS World University Rankings, London (United Kingdom)
- 2016–Present **Dean of the Bologna University Library (BUB)**
University of Bologna, Bologna (Italy)
- 2016–2019 **Dean of the Agricultural Company of the University of Bologna**
University of Bologna, Bologna (Italy)
- 2008–Present **member of the interdepartmental Centre "L. Galvani" for Integrated Studies of Bioniformatics, Biophysics and Biocomplexity**
University of Bologna, Bologna (Italy)
- 2013–2015 **National Secretary of ConScienze, National Conference of Presidents and Directors of University Structures in Science and Technology**
- 2012–2015 **representative of the Academic Senate in the Scientific Committee of the University Library System**
University of Bologna, Bologna (Italy)
- 2012–2015 **member of the Academic Senate**
University of Bologna, Bologna (Italy)
- 2013–Present **member of the Advanced Research Center on Electronic Systems "Ercole De Castro"**
University of Bologna, Bologna (Italy)
- 2005–2008 **member of the Teaching Commission, Faculty of Science**
University of Bologna, Bologna (Italy)
- 2005–2008 **member of the Council of the Department of Mathematics**
University of Bologna, Bologna (Italy)
- 2002–2007 **Associate Professor in Mathematical Physics**

Department of Mathematics, University of Bologna, Bologna (Italy)

1992–2002 **University research assistant**
University of Bologna, Bologna (Italy)

1998–2000 **visiting Professor**
School of Mathematics, Georgia Institute of Technology, Atlanta, GA (United States)

1995 **Professeur Invité**
Laboratoire de Physique Théorique et Mathématique Université Paris VII, Paris (France)

EDUCATION AND TRAINING

1994 **Ph.D. in Mathematics** EQF level 8
Pennsylvania State University, State College, PA (United States)

09/1989–08/1990 **graduate school**
Department of Mathematics, Caltech, Pasadena, California (United States)

05/1989–09/1989 **Scholarship of the “Akademie der Wissenschaften zu Berlin”,**
Department of Mathematics, Technische Universität, Berlin (Germany)

1988 **Degree in Physics (cum laude)** EQF level 7
University of Bologna, Bologna (Italy)

1984 **High School Diploma**
Liceo Scientifico Augusto Righi, Bologna (Italy)

PERSONAL SKILLS

Mother tongue(s) Italian

Foreign language(s)

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	B2	B2	B2	B2	B1
Spanish	A2	A2	A2	A2	A1
French	A1	A1	A1	A1	

Levels: A1 and A2: Basic user - B1 and B2: Independent user - C1 and C2: Proficient user
Common European Framework of Reference for Languages - Self-assessment grid

Communication skills In recent years, as **Deputy Rector**, I have developed a great capacity for **dialogue, listening and conflicts resolution**.

Organisational / managerial skills While keeping my research active, I've gained quite a lot of experience in the **University System**: my seven-year experience as **Director of a large Department** (2008-2015) and my current experience as **Deputy Rector** (from 2015) of a so-called public mega university such as the one of Bologna, have naturally and consciously allowed me to acquire skills and experience in the fields of **research policy, research valorisation** and in the **administration and management of higher**

education institutions.

Digital skills

SELF-ASSESSMENT				
Information processing	Communication	Content creation	Safety	Problem-solving
Proficient user	Proficient user	Proficient user	Independent user	Proficient user

Digital skills - Self-assessment grid

ADDITIONAL INFORMATION

My Research at a Glance

As a *mathematical physicist*, I began my research career by addressing fundamental questions of **quantum mechanics**, in particular **quantum chaos**, and the **theory of dynamical systems**, with incursions into **statistical mechanics**.

In the last years I have turned my attention to the use of mathematics in life sciences and humanities, naturally migrating towards a **data-driven mathematics** in close contact with other disciplines.

Essentially there are two areas touched by my current scientific production, **natural language** and **genetic sequences**:

1) *natural language*:

the problems I deal with are the mathematical models of evolution of natural language, the automatic algorithms of author recognition, the origins of long correlations in written language, the artificial generation of natural language through machine learning and artificial intelligence techniques, and lately the study of translation processes from the point of view of dynamical systems. The theory of dynamical systems, information theory and machine learning techniques represent the basis of my skills and approaches to problems.

2) *gene sequences*:

here my research is essentially focused on the exploration of the relationships between symmetries and long correlations in gene sequences and in particular on the understanding of the origin of the so-called "*second Chargaff rule*", with an approach both theoretical and data-driven, addressed with the tools of the theory of dynamic systems and information theory.

I recently participated in the design, creation and start-up of the interdepartmental research center "*Alma Mater Research Institute for Human-Centered Artificial Intelligence*" (*Alma Human AI*)

Publications full list: <https://www.unibo.it/sitoweb/mirko.degliesposti/publications>

Twenty Five (25) Selected Papers:

- Lippi, Marco; Montemurro, Marcelo A; Degli Esposti, Mirko; Cristadoro, Giampaolo, *Natural Language Statistical Features of LSTM-Generated Texts*, «IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS», 2019, 30, pp. 3326 - 3337

- Cristadoro, Giampaolo; Degli Esposti, Mirko; Altmann, Eduardo G., *The common origin of symmetry and structure in genetic sequences*, «SCIENTIFIC REPORTS», 2018, 8, pp. 15817 - 15825

- E. G. Altmann; G. Cristadoro; M. Degli Esposti, *On the origin of long-range correlations in texts*, «PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA», 2012, 109, pp. 11582 - 11587

- Paci, G; Cristadoro, G; Monti, B; Lenci, M; Degli Esposti, M; Castellani, Gc; Remondini, D, *Characterization of DNA methylation as a function of biological complexity via dinucleotide inter-distances*, «PHILOSOPHICAL TRANSACTIONS OF THE ROYAL SOCIETY OF LONDON SERIES A: MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES», 2016, 374, pp. 1 - 11

- Benedetto, Dario; Degli Esposti, Mirko, *Dynamics of Style and the Case of the Diario Postumo by Eugenio Montale: A Quantitative Approach*, in: Mirko Degli Esposti, Eduardo G. Altmann, François Pachet, *Creativity and Universality in Language*, Berlin, Springer, 2016, pp. 157 - 176

- Seri, Marcello; Knauf, Andreas; DEGLI ESPOSTI, Mirko; Jecko, Thierry, *Resonances in the two-center Coulomb systems*, «REVIEWS IN MATHEMATICAL PHYSICS», 2016, 28, pp. 1 - 55

- Roberto Artuso; Giampaolo Cristadoro; Mirko Degli Esposti; Georgie Knight, *Sparre-Andersen theorem with spatiotemporal correlations*, «PHYSICAL REVIEW E, STATISTICAL, NONLINEAR, AND SOFT MATTER PHYSICS», 2014, 89, pp. 052111-1 - 052111-4

- Riccardo Gallotti;Armando Bazzani;Mirko Degli Esposti;Sandro Rambaldi, *Entropic measures of individual mobility patterns*, «JOURNAL OF STATISTICAL MECHANICS: THEORY AND EXPERIMENT», 2013, 2013, pp. P10022 - P10041

- G Cristadoro;G Knight;M Degli Esposti, *Follow the fugitive: an application of the method of images to open systems*, «JOURNAL OF PHYSICS. A, MATHEMATICAL AND THEORETICAL», 2013

- Dario Benedetto; Mirko Degli Esposti; Giulio Maspero, *The Puzzle of Basil's Epistula 38: A Mathematical Approach to a Philological Problem*, «JOURNAL OF QUANTITATIVE LINGUISTICS», 2013, 20, pp. 267 - 287

- M. Seri; M. Lenci; M. Degli Esposti; G. Cristadoro, *Recurrence and higher ergodic properties for quenched random Lorentz tubes in dimension bigger than two*, «JOURNAL OF STATISTICAL PHYSICS», 2011, 144, pp. 124 - 138

- D. Benedetto; E. Caglioti; G. Cristadoro; M. Degli Esposti, *Relative entropy via non-sequential recursive pair substitution*, «JOURNAL OF STATISTICAL MECHANICS: THEORY AND EXPERIMENT», 2010, 2010, pp. 1 - 14

- C. Basile; D. Benedetto; E. Caglioti; G. Cristadoro; M. Degli Esposti, *A plagiarism detection procedure in three steps: selection, matches and "squares"*, in: Proceedings of the SEPLN'09 Workshop on Uncovering Plagiarism, Authorship and Social Software Misuse, SINE LOCO, sine

nomine, 2009, pp. 19 - 24

- L. Bunimovich; M. Degli Esposti; M. Horvat; S. Isola; T. Prosen, *On ergodic and mixing properties of the triangle map*, «PHYSICA D-NONLINEAR PHENOMENA», 2009, 238, pp. 395 - 415

- C. Basile; D. Benedetto; E. Caglioti; M. Degli Esposti, *An example of mathematical authorship attribution*, «JOURNAL OF MATHEMATICAL PHYSICS», 2008, 49, pp. 1 - 20

- M. Degli Esposti; S. Isola ; A. Knauf, *Generalized Farey Trees, Transfer Operators and Phase Transitions*, «COMMUNICATIONS IN MATHEMATICAL PHYSICS», 2007, 275, pp. 297 - 329

- M. Degli Esposti; B. Winn; S. Nonnemacher, *Quantum Variance and ergodicity for the baker's map*, «COMMUNICATIONS IN MATHEMATICAL PHYSICS», 2006, 264, pp. 1 - 28

- M. Degli Esposti; M. Horvat; T. Prosen, *Quantum-classical correspondence on compact phase space*, «NONLINEARITY», 2006, 19, pp. 1471 - 1493

- M. Degli Esposti; S. O'Keefe; B. Winn, *semi-classical study of the Casati-Prosen triangle map*, «NONLINEARITY», 2005, 18, pp. 1073 - 1094

- P. Contucci; M. Degli Esposti; C. Giardina; S. Graffi, *Thermodynamical limit for correlated Gaussian random energy models*, «COMMUNICATIONS IN MATHEMATICAL PHYSICS», 2003, 236 (1), 55-63

- M. Degli Esposti; G. Del Magno; M. Lenci, *Escape orbits and ergodicity in infinite step billiards*, *Nonlinearity*, 2000, 13 (4), 1275

- V. Baladi; M. Degli Esposti; S. Isola; E. Järvenpää; A. Kupiainen; *The spectrum of weakly coupled map lattices*, *Journal de mathématiques pures et appliquées*, 1998, 77 (6), 539-584

- S. De Bievre; M. Degli Esposti; R. Giachetti, *Quantization of a class of piecewise affine transformations on the torus*, «COMMUNICATIONS IN MATHEMATICAL PHYSICS», 1996, 176 (1), 73-94

- M. Degli Esposti; S. Graffi; S. Isola, *Classical limit of the quantized hyperbolic toral automorphisms*, *Communications in Mathematical Physics*, 1995, 167 (3), 471-507

- M. Degli Esposti; S. Graffi; J. Herczynski, *Quantization of the classical Lie algebra in the Bargmann representation*, 1991, *Annals of Physics* 209 (2), 364-392

Citations Google Scholar: [Mirko Degli Esposti](#)

Publications **Editor:**

- "*Computational Synthesis and Creative Systems*", with F. Pachet, P. Gervás and A. Passerini

- "*Creativity and Universality in Language*", with F. Pachet and E. Altmann, *Lecture Notes in Morphogenesis*, Springer (2015)

- "*The Mathematical Aspects of Quantum Chaos*", with S. Graffi, *Lecture Notes in Physics*, Springer (2003)

- "*La Matematica nella Società e nella Cultura*", U.M.I. (Union of the Italian Mathematics)

I am also co-author of the **University textbooks:**

- *Matematica per scienze della vita*, Dario Benedetto, Mirko Degli Esposti, Carlotta Maffei, Casa

Editrice Ambrosiana. Zanichelli exclusive distribution (third edition)

- *Dalle funzioni ai modelli*, il calcolo per le bioscienze, Dario Benedetto, Mirko Degli Esposti, Carlotta Maffei, Casa Editrice Ambrosiana. Zanichelli exclusive distribution

Teaching I'm currently teaching an undergraduate course "*Calculus for genomics*" (in English), inside the undergraduate degree in "*Genomics*":

<https://www.unibo.it/sitoweb/mirko.degliestposti/teachings>

In the past I have taught undergraduate and graduated courses in mathematical physics and its applications to life sciences.

Citations **Media:**

- *Appello per Patrick George Zaki - Che tempo che fa* 16/02/2020

- *Focus Storia*, settembre 2015, "*Codice Segreto*".

- *Unibo Magazine*, novembre 2014, "*Il Diario Postumo di Montale è un Falso ?*"

- *Corriere di Bologna*, novembre 2014, "*I ricercatori dell'Alma Mater: «Il Diario postumo di Montale è falso»*".

- *Le scienze*, novembre 2012, "*Romanzo Matematico*".

- *Ansa.it*, luglio 2012, "*I Romanzi nel mirino della Matematica*".

- *Radio 3 Scienza*, settembre 2006, "*Sgominata l'Anonima Scrittori*".

Projects Right now I'm participating in two European projects:

- **Harmony** (*Healthcare Alliance for Resourceful Medicines Offensive against Neoplasms in Hematology*)

<https://www.unibo.it/en/research/projects-and-initiatives/research-projects-horizon-2020-1/harmony>

- **VEO** (*Versatile Emerging infectious disease Observatory*)

<https://cordis.europa.eu/project/id/874735/it>

Remark: In recent years I have not coordinated any European project, but I have instead spent most of my energy on ensuring that many researchers could have the environment and the ideal conditions to win their own European research projects, and I would say with good results.

Institutional Activities

While keeping my research active, I've gained quite a lot of experience in the university system: my seven-year experience as Director of a large Department (2008-2015) and my current experience as deputy rector (from 2015) of a so-called public mega university such as the one of Bologna, have naturally and consciously allowed me to acquire skills and experience in the fields of research policy, research valorisation and in the administration and management of higher education institutions.

Since 2015 I have gained an in-depth and even transversal knowledge of University dynamic. This has allowed me to address in the first person all the most important and fundamental issues in the management and development of a higher education institution.

Just a few of them here:

1) *Enhancement of research and international attractiveness*: since 2015 I have been working, together with the Rector and the Research Pro-Rector, to increase the international attractiveness of the university, exploiting and encouraging the national measures in force, such as calls from abroad or direct calls for winners of competitive projects. I helped design a system of incentives and co-funding (to individuals and/or facilities) closely related to ministerial provisions, together with a targeted international communication campaign, which allowed us to considerably increase the quality and quantity of researchers and competitive projects attracted. The current experience of UNA-Europa (European network of 8 major universities) allows me to work on the three major missions of the University (research, teaching and third mission) in a concrete European and international context and

perspective.

2) *Graduate School*: since 2015, the valorization of the graduate school has been a key objective of the University's Strategic Plan. I have been involved, together with the Rector and the Research Pro-Rector, in reviewing the administrative, organizational and financial management system of the graduate schools of the University of Bologna. The revision of the funding system, the review of the methods and timing of enrollment and access to the graduate school, the simplification of some internal management mechanisms and, above all, the reasoned opening of new multidisciplinary PhDs aimed at new frontier research topics, has allowed us to increase by about 50% the funded PhD fellowships.

3) *Infrastructures and spaces for research*: in recent years I have learned that it is possible, indeed necessary, to combine the transformation of research spaces with good liveability, sustainability and safety. The processes that lead from planning, to design and then to the realization either of simple transformations of spaces or new structures, large or small, are complex, fragmented and often very viscous. I have understood quite well how they work and how to manage them but, above all, as the University's health and safety supervisor, I have developed a high sensitivity and a strong competence on these aspects, which are fundamental for me.

4) *Open Access and Open Science*: as a member of the Expert Group on Science 2.0/Open Science of the EUA (European University Association) and of the CRUI-CARE group (coordination access to electronic resources) I follow with particular interest the activities at national and European level concerning access to scientific resources and the more general topics of open science. I am particularly interested in the dynamics of transformation of publishing contracts, the economic and cultural impact on research communities and in general, the processes of transformation towards a FAIR (Findable, Accessible, Interoperable and Reusable) use of data.

5) *the relationship with the city and the territory*: there is no doubt that for a great institution of excellence the international context is the natural one for growth, comparison and innovation. However, I also consider fundamental, if not vital, the relationship with the territory, not only the relationship with the productive fabric through research and development, but also and above all the relationship with the cultural and social environment. I believe in the social role of science, the dissemination of science and fundamental sciences in addressing and narrating the challenges and transformations of our times. A role that SISSA seems to me to be playing a leading role, for a long time now. It is important to consolidate and adapt this changing role to new challenges, such as that of citizen science or the impact of data and data science on the urban, cultural and social dynamics of the area, especially the local area and the region. Developing and consolidating all this requires a capacity for dialogue and confrontation with political, cultural and social institutions, which is part of my expertise. In this context, the following is certainly not an example that can be simply transposed to other contexts, but in Bologna I significantly contributed to the design, creation and activation of the Urban Innovation Foundation (FIU, <https://www.fondazioneinnovazioneurbana.it/>).

6) *innovation in teaching*: teaching science requires a great balance between tradition and innovation. The COVID emergency is allowing me to experience firsthand the accelerated transformations and the great possibilities (but also risks) of using technologies to support teaching and knowledge sharing. A great challenge that touches all institutions of higher education and that I would like to continue to follow.