

Prof. Francesco Nardi

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Current position

Associate Professor of Genetics
Department of Life Sciences, University of Siena, Italy

Education

1998 – Degree in Biological Sciences, University of Siena, 110/110 cum laude. Dissertation title: “Molecular phylogeny of apterygotan insects (Arthropoda: Insecta)” (in Italian). Supervisor: Prof. Francesco Frati. Awarded on 21/07/1998 from the Faculty of Mathematical, Physical and Natural Sciences.

2002 – PhD in Animal Biology (Zoology), University of Siena. Dissertation title: “The mitochondrial genome of *Tetradontophora bielensis* (Insecta: Collembola). Structure and phylogenetic significance” (in Italian). Supervisors: Prof. Francesco Frati and Prof. Romano Dallai. Awarded on 25/02/2002 from the Department of Life Sciences.

Professional experience

1999/2001 PhD fellow, University of Siena.
2000/2001 Research assistant at the Dept. of Environmental Science, Policy and Management, U.C. Berkeley.
2001, 2005 Visiting researcher at the DOE Joint Genome Institute (Walnut Creek, CA, USA).
2002/2015 Post doctoral fellow and later Adjunct professor at the University of Siena.
2015/2018 High school teacher.
2018/- Associate professor of Genetics at the Department of Life Sciences of the University of Siena.

Habilitations

1999 Habilitation as professional biologist.

2014, 2026 National Scientific Habilitation SC 05/B1, Full Professor level (Zoology and Anthropology).

2017 National Scientific Habilitation SC 05/I1, Associate Professor level (Genetics).

2026 National Scientific Habilitation SC 05/I1, Full Professor level (Genetics).

Research interests

Evolutionary genetics, population genomics, genomics, mitochondrial genomics, phylogeography, molecular evolution, bioinformatics.

FN sequenced his first mitochondrial genomes for the purpose of reconstructing phylogenetic trees to study the evolution of basal hexapods, an interest that expanded to the phylogeny and phylogeography of different insect species of economic, conservational and ecological importance. He later developed an interest for molecular evolution and approached the study of the mitochondrial genome from a structural and functional standpoint. Following the developments in the field, he expanded his interests to genomics, gene expression and population genomics, retaining an overarching evolutionary approach that remain the hallmark of his research.

From a technical standpoint, FN started as a wet-lab scientist but soon delved into data analysis, starting to develop his own analytical tools in perl and R, to become a professional bioinformatician specialized in evolutionary genomic analyses (genome assembly, gene expression, population genomics) including the publication of software for the analysis of genetic data.

Author of 95 publications, including Science and Current Biology.

Support

1999 Young Researchers Program, University of Siena. “The mitochondrial genome of *Tetrodontophora bielanensis*” (24 months, PI)

2003 PRIN. “The mitochondrial genome in basal hexapods: structural and molecular evolution, phylogenetic implications. (24 months, Participant).

2004 Monte dei Paschi Foundation grant. “Reproductive biology and genetic population structure in the olive fly: biological bases for eco-compatible control strategies”. (36 months, Participant).

2004 United States Department of Agriculture NRI grant. “Invasion genetics of the olive fruit fly (*Tephritidae*)” (36 months, Co-PI).

2005/2006/2008 Monte dei Paschi Foundation grant “Organization of the Master in Bioinformatics Alberto del Lungo”. (36 months, Participant).

2005 PRIN. “The mitochondrial genome of key arthropod taxa (basal hexapods and chelicerates” (24 months, Participant).

2010 Systematic Research Fund. “Phylogenetic analysis of Protura using complete mitochondrial genomes” (12 months, PI).

2013 ISCRA class C grant for access to the CINECA-EURORA cyberinfrastructure. “Compositional biases in Metazoan mitochondrial genomes, an evolutionary perspective” (6 months, PI).

2020 HORIZON2020 grant “Integrated Pest Management of the invasive Japanese Beetle, *Popillia japonica*” (48 months, vice-PI).

2022 PRIN. “MitoMicro: Mitochondrial MicroRNAs, a new perspective for mitochondrial function and their role in Eukaryotic evolution.”. (36 months, PI o local unit)

2022 PNRR. “Biological diversity in a fragmented landscape: interactions between man, agriculture and the environment” (36 months, proponent within National Biodiversity Future Center)

General management

2005/2010 Tutor of the Master in Bioinformatics, University of Siena.

2011/2014 Member of the Research Commission of the University of Siena.

2018/- Member (Secretary from 2022) of the Teaching Committee for the Degree in Biological Sciences.

2020/- Representative of UniSi in the framework agreement with CREA

2021/- Deputy Director of the Master in Bioinformatics and Data Science, University of Siena

2023/- Member of the Commission for autochthonous animal genetic resources of the Tuscany region.

2025/- Member of the PhD school in Life Sciences at the University of Siena.

Within the Laboratory of evolutionary and systematic zoology (ESZ_Lab) coordinates research activities connected to the following:

Mitochondrial genomics in lower hexapods” (1999-2003, in collaboration hereafter);

Phylogeography of insects of economic importance” (2001-);

Evolutionary genetics and bioinformatics, genomics and population genomics” (2018-).

Congress organization and participation

FN has participated to over 70 meetings including: Evolution 2000 (2000, Bloomington, IN, USA); Evolution 2003 (2003, Chico, CA, USA); XXII International Congress of Entomology (2004, Brisbane, Australia); 7th International Symposium on Fruitflies (2006, Bahia, Brasile); XII European Congress of Entomology (2023, Heraklion, Greece).

FN was member of the organizing committee of the following national and international congresses that took place at the University of Siena: 6th International Seminar on Apterygota (2002), HUPO Proteomics Standard Initiative Spring Workshop (2005), Evolution: Intersecting Natural and Social Sciences (2009), 8th International Seminar on Apterygota (2010), XXVIII Congresso nazionale italiano di entomologia (2025).

FN was chair in the following: 12th European Congress of Entomology (Heraklion, Greece, 2023, session chair); 28th National Congress of Entomology (Siena, Italy, 2025, session chair and session organizer).

Invited lectures

Mitochondrial genomes in lower hexapods: sequence, structure and phylogenetic implications. Vrije University, Amsterdam, 2003.
Evolutionary theory, a discourse on method (in Italian). University of Siena, 2004.
Domestication of olive fly through multiregional host shift to cultivated olives. Entomological Society of America, 2012 (video conference).
Evolution of a non native Mediterranean pest, the olive fly. South and East European Network on Invasive Alien Species, 2013 (video contribution).
Charles Darwin, or how to redesign the World from your armchair (in Italian). University of Siena, 2014. Lectio Magistralis for “Per-Corsi di Qualità”.
Animal Inference on Human Mitochondrial Diseases. University of Siena, 2020. GenoMed PhD school.

Editorial activities

2012/2014 Associate Editor for the journal Psyche (Hindawi)
2020 Co-Editor of special issue “Molecular evolution of the Mitochondrial DNA in Animals” for the journal Genes
2020/ - Associate Editor for the journal Diversity (MDPI)
2020/ - Associate Editor for the journal Genes (MDPI)
2025/- Associate Editor for the journal Scientific Reports (Nature portfolio)

Referee for journals: Gene, Genetica, Genome, Journal of Genetics and Genomics, Insect Molecular Biology, Insect Biochemistry and Molecular Biology, Pesticide Biochemistry and Physiology, Journal of Insect Systematics, Entomologia Experimentalis et Applicata, Bulletin of Entomological Research, Journal of Applied Entomology, Zoologica Scripta, Zoological Science, Molecular Phylogenetics and Evolution, Molecular Ecology, Canadian Journal of Zoology, BMC Genomics, International Journal of Molecular Sciences, PeerJ, Molecular Biology Reports, Bulletin of the National Research Centre, Insects, Journal of Biogeography, OBM Genetics, Journal of Economic Entomology.

Referee for financing agencies: National Science Foundation (USA), NRF (South Africa), Marsden Fund (New Zealand), FWS (Austria).

Language certifications

2014 English certification IELTS (CEFR C2 “mastery or proficiency”; IELTS band 8.5).
2016 Training course on teaching non linguistic subjects in a foreign language, 29/30. University for Foreigners of Siena.

Scientific Societies and Honors

Member of SIBE/ISEB, the Italian Society for Evolutionary Biology (2006/2010).
Member of AGI, Italian Association of Genetics (2018/ -) .
Corresponding member of the Accademia dei Fisiocritici (2020/ -).

Prize Città di Ponzano Romano for Science, organized by the Department of Genetics and Molecular Biology of La Sapienza University (2009, ex aequo).

His research has received ample media coverage, including: BBC News, New Scientist, Berkeley Science Review, Nature science update, Science, Focus.it, La Pravda, Wissenschaft Berliner Zeitung, The Daily Californian, News in Science, Science Beat, The Scientist, Science Daily, Creation Update, Creation-Evolution Headlines, Bright Minds, Current Biology.

Courses

Mastering epigenetics: from basics to breakthroughs. Scuola di Genetica Martio Polsinelli, Cortona 7-8 giugno 2024.

Teaching activity

Genetics for the degree in Biological Sciences (2018/2019 onward), University of Siena.
Introduction to biological data analysis for the master degree in Biodiversity conservation and environmental quality (2020/2021 onward), University of Siena.

Past courses:

Entomological biotechnologies (2003)

Molecular evolution (2004-2006)

Computer science applied to biology (2005)

Mitochondrial genomics for the evaluation of genetic variability (2010)

Entomology and pathology of grapevine cultivations (2004-2005, half)

Introduction to biology (2005-2009, half)

Introduction to bioinformatics (2004-2009, half)

Phylogenetics (2004-2009)

Genomics (2004-2006, half)

Laboratory of biodiversity assessment and monitoring (2012, half)

Bio-App, bioinformatics tools for technicians (2006)

An introduction to molecular evolution (SIBE/ISEB Italian Workshop on Phylogenetic Methods and Applications, Modena 2012)

Outreach

Participates to programs 'Penne amiche della scienza', 'Pianeta Galileo', 'Oracoli', with lectures 'Dalla rupe Tarpea alla banca del seme del genio: la storia controversa dell'eugenetica', '(in)certe somiglianze: dai geni ai genomi all'eredità estesa', 'I colori dell'uomo' (in Italian).

Supervision (2018 onwards)

Tutor for freshmen students since 2020.

Undergraduate level:

Seven students from the degree in Biological Sciences

Master level:

Nine students from the master degree in Bioinformatics and data science; one from Human reproduction; two from Biodiversity conservaton and environmental quality, one from Sanitary biology

PhD level:

Maria Bauzà dal Mar (University of the Balearic Islands, internship 6 months in 2011, evaluation committee)

Alejandro Hernández Delgado (University of the Balearic Islands, internship 3 months in 2023)

Post Doctoral level:

Dr. Filippo Di Giovanni (RTDA, 2021/2023)

Dr. Claudio Cucini (Post Doc, 2022/2024)

Dr. Giovanni Marturano (Post Doc, 2022/2024)

Selected publications

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Scopus: 7006438478

~ 2800 citations, h-index 27

3 - Nardi F, Carapelli A, Fanciulli PP, Dallai R, Frati F

The complete mitochondrial DNA sequence of the basal hexapod *Tetrodontophora bielanensis*: evidence for heteroplasmy and tRNA translocations.

Molecular Biology and Evolution. 18: 1293-1304 (2001)

6 - Nardi F, Spinsanti G, Boore J, Carapelli A, Dallai R, Frati F

Hexapod origins: Monophyletic or Polyphyletic?

Science 299:1887-1889 (2003)

13 - Nardi F, Carapelli A, Dallai R, Roderick GK, Frati F.

Population structure and colonization history of the olive fly, *Bactrocera oleae* (Diptera, Tephritidae).

Molecular Ecology. 14: 2729-2738 (2005)

29 – Cicconardi F, Nardi F, Emerson BC, Frati F, Fanciulli PP.

Deep phylogeographic divisions and long-term persistence of forest invertebrates (Hexapoda: Collembola) in the North-Western Mediterranean basin.

Molecular Ecology. 19:386-400 (2010)

33 - Nardi F, Carapelli A, Boore JL, Roderick GK, Dallai R, Frati F.

Domestication of Olive Fly through a Multi-Regional Host Shift to Cultivated Olives: Comparative Dating using Complete Mitochondrial Genomes.

Molecular Phylogenetics and Evolution. 57:678-86 (2010)

43 – Bauzà-Ribot MM, Juan C, Nardi F, Oromì P, Pons J Jaume D.

Mitogenomic phylogenetic analysis supports continental-scale vicariance in subterranean thalassoid crustaceans.
Current Biology. 22:2069-74 (2012)

53 – Nardi F, Frati F, Liò P.
Animal inference on human mitochondrial diseases
Computational Biology and Chemistry, 62:17-28 (2016)

79 – G. Limonta, C. Panti, M.C. Fossi, F. Nardi, M. Bainsi
Exposure to virgin and marine incubated microparticles of biodegradable and conventional polymers modulates the hepatopancreas transcriptome of *Mytilus galloprovincialis*.
Journal of Hazardous Materials 468:133819 (2024)

80 – C. Cucini, S. Boschi, R. Funari, E. Cardaioli, N. Iannotti, G. Marturano, F. Paoli, M. Bruttini, A. Carapelli, F. Frati, F. Nardi
De novo assembly and annotation of *Popillia japonica*'s genome with initial clues to its potential as an invasive pest.
BMC Genomics 25:275 (2024)

82 – F. Nardi, S. Boschi, R. Funari, C. Cucini, E. Cardaioli, D. Potter, S.-I. Asano, D. Toubarro, M. Meier, F. Paoli, A. Carapelli, F. Frati
The direction, timing and demography of *Popillia japonica* (Coleoptera) invasion reconstructed using complete mitochondrial genomes.
Scientific Reports 14:7120 (2024)

83 – G. Marturano, D. Carli, C. Cucini, A. Carapelli, F. Plazzi, F. Frati, M. Passamonti, F. Nardi
SmithHunter: a workflow for the identification of candidate smithRNAs and their targets.
BMC Bioinformatics 25:286 (2024)

88 - R. Funari, E. Parvizi, C. Cucini, S. Boschi, E. Cardaioli, D.A. Potter, S.I. Asano, D. Toubarro, L. Jelmini, F. Paoli, A. Carapelli, A. McGaughran, F. Frati, F. Nardi
Whole genome resequencing reveals origins and global invasion pathways of the Japanese beetle *Popillia japonica*.
Molecular Ecology e70008 (2025)

89 – C. Cucini, R. Funari, G. Marturano, E. Cardaioli, L. Marianelli, F. Paoli, A. Carapelli, F. Frati, F. Nardi
Behind the scenes of *Popillia japonica* integrated pest management: differentially expressed gene analysis following different control treatments
BMC Genomics 788 (2025)