

# Pamela Ferretti, Ph.D.

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Computational biologist with expertise in early life microbiome, primates microbiome, host-microbe interactions in *C. difficile*, microbial ecology and population dynamics, and strain transmission in social groups.

## Current Position

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**Postdoctoral Research Scholar** **2023 - Present**  
Laboratory of Prof. Ran Blekhman (Section of Genetic Medicine, University of Chicago, US)

## Education

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**EMBL International PhD Programme in Computational Biology** **2017 - 2022**  
Laboratories of Prof. Peer Bork (EMBL Heidelberg, Germany) and Prof. Thomas Dandekar (University of Würzburg, Germany). Acceptance rate: 2.7%. Graduated *Magna cum laude*.

**MSc Cellular and Molecular Biotechnology** **2014 - 2016**  
Laboratory of Prof. Nicola Segata (University of Trento, Italy)

**BSc Computer Science** **2011 - 2014**  
Laboratory of Prof. Nicola Segata (University of Trento, Italy)

## Research Experience

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**Postdoctoral Research Scholar (University of Chicago, US)** **2023 - Present**  
*Supervisor:* Prof. Ran Blekhman  
*Main projects:*

- Vertical and intergenerational microbial transmission and stability in wild baboons
- Human milk and infant gut microbiome composition, strain transmission and functional potential

**Bridging Postdoctoral Researcher (EMBL Heidelberg, Germany)** **2022**  
*Supervisors:* Prof. Peer Bork and Dr. Sebastian Schmidt  
*Main Projects:* Completion of the doctoral research projects on *C. difficile* and on animal microbiomes.

**Ph.D. (EMBL Heidelberg, Germany)** **2017- 2022**  
*Supervisors:* Prof. Peer Bork and Dr. Sebastian Schmidt  
*Main projects:*

- Guidelines for microbial strains identification and interpretation in microbiomes
- Large-scale meta-analysis of *Clostridioides difficile* prevalence across age, geography, health and disease
- The gut microbiome of premature infants in a german cohort
- Geographical boundaries in microbial strain distribution in human populations
- MAGs compendium of over 100k shotgun metagenomic samples from public repositories
- Meta-analysis of animal microbiomes on a global scale

**Research Assistant (University of Trento, Italy)** **2016 - 2017**  
*Supervisor:* Prof. Nicola Segata  
*Main projects:*

- The infant gut microbiome in twins
- Vertical microbiome transmission and healthy infant microbiome development.
- Coordination of the collection of 2k+ samples from volunteers in collaboration with the clinicians involved in the study.

## Scientific Publications

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Total number of publications: 18

Total number of citations (according to [Google Scholar](#)): 3,126

H-index: 15

## Publications in peer-reviewed scientific journals

titles are web links, all publications are publicly available

\* indicates equal contribution

1. **Ferretti P\***, Allert M\*, Johnson K, Heisel T, Gale CA, Demerath EW, Knights D, Fields DA, Albert FW and Blekhnman R (\*equal contribution). *Assembly, stability, and dynamics of the infant gut microbiome are linked to bacterial strains and functions in mother's milk*. (2024) [BioRxiv](#)
2. Nishijima S, Stankevic E, Aasmets O, Schmidt TSB, Nagata N, Keller M, **Ferretti P**, Bæk Juel H, Fullam AN, Robbani SM, Schudoma C, Israelsen M, [...], Hansen T, Kuhn M and Bork P. *Fecal microbial load is a major determinant of gut microbiome variation and a confounder for disease associations* (2024) [BioRxiv](#)
3. Schmidt TSB\*, Fullam A\*, **Ferretti P**, Orakov A, Maistrenko O, Ruscheweyh HJ, Duan Y, Van Rossum T, Sunagawa S, Mende D, Kuhn M, Coelho LP, Bork P. *SPIRE: a Searchable, Planetary-scale, Integrated REsource of microbial diversity and function*. (2023) [Nucleic Acids Research](#)
4. **Ferretti P**, Wirbel J, Maistrenko OM, Van Rossum T, Alves R, Fullam A., Akanni W, Schudoma C, Schwarz A, Thielemann R, Thomas L, Kuhn M, Zeller G, Schmidt TSB, Bork P. *C. difficile may be overdiagnosed in adults and is a commensal in infants*. (2023) [eLife](#)
5. Klopp J, **Ferretti P**, Meyer CU, Hilbert K, Haiß A, Marißen J, Henneke P, Hudalla H, Sabine Pirr, Viemann D, Zemlin M, Forslund SK, Härtel C, Bork P, Gehring S, Van Rossum T and the PRIMAL consortium. *Meconium microbiome of very preterm infants across Germany*. (2021) [mSphere](#)
6. Coelho LP, Alves R, del Río AR, Myers PN, Cantalapiedra CP, Giner-Lamia J, Schmidt TSB, Mende D, Orakov A, Letunic I, Hildebrand F, Van Rossum T, Forslund SK, Khedkar S, Maistrenko OM, Jia L, **Ferretti P**, Sunagawa S, Zhao XM, Nielsen HB, Huerta-Cepas J and Bork P. *Towards the biogeography of prokaryotic genes*. (2021) [Nature](#)
7. Hildebrand F, Gossmann TI, Frioux C, Özkurt E, Myers PN, **Ferretti P**, Bahram M, Nielsen HB and Bork P. *Dispersal strategies shape persistence and evolution of gut bacteria*. (2021) [Cell Host & Microbe](#)
8. Bahram M, Netherway T, Frioux C, **Ferretti P**, Coelho LP, Geisen S, Bork B and Hildebrand F. *Global distribution and diversity of bacteria and fungi across diverse habitats*. (2021) [Environmental Microbiology](#)
9. Van Rossum T\*, **Ferretti P\***, Maistrenko OM\* and Bork P. *Diversity within species: interpreting strains in microbiomes*. (2020) [Nature Reviews Microbiology](#)
10. **Ferretti P**, Pasolli E, Tett A, Asnicar F, Gorfer V, Fedi S, Armanini F, Truong DT, Manara S, Zolfo M, Beghini F, Bertorelli R, De Sanctis V, Bariletti I, Canto R, Clementi R, Cologna M, Crifò T, Cusumano G, Gottardi S, Innamorati C, Masè C, Postai D, Savoi D, Duranti S, Lugli AG, Mancabelli L, Turrone F, Ferrario C, Milani C, Mangifesta M, Anzalone R, Viappiani A, Yassour M, Vlamakis H, Xavier R, Koren O, Tateo S, Soffiati M, Pedrotti A, Ventura M, Huttenhower C, Bork P and Segata N. *Mother-to-infant microbiome transmission from different body sites shapes the developing infant gut microbiome* (2018) [Cell Host & Microbe](#)
11. Yassour M, Jason E, Hogstrom L, Siljander H, Selvenius J, Oikarinen S, Hyöty H, Ilonen J, Virtanen S, **Ferretti P**, Pasolli E, Tett A, Asnicar F, Segata N, Vlamakis H, Lander ES, Huttenhower C, Knip M and Xavier RJ. *Strain-level identification of mother-to-child bacterial transmission during the first few months of life*. (2018) [Cell Host & Microbe](#)
12. Dassi E\*, **Ferretti P\***, Covello G, Bertorelli R, Denti MA, De Sanctis V, Tett A and Segata N. *The short-term impact of probiotic consumption on the oral cavity microbiome* (2018) [Scientific Reports](#)
13. Duranti S, Lugli GA, Mancabelli L, Armanini F, Turrone F, James K, **Ferretti P**, Gorfer V, Ferrario C, Milani C, Mangifesta M, Anzalone R, Zolfo M, Viappiani A, Pasolli E, Bariletti I, Canto R, Clementi R, Cologna M, Tiziana Crifò, Cusumano G, Fedi S, Gottardi S, Innamorati C, Masè C, Postai D, Savoi D, Soffiati M, Tateo S, Anna Pedrotti, Segata N, Van Sinderen D and Ventura M. *Maternal inheritance of bifidobacterial communities and bifidophages in infants through vertical transmission* (2017) [Microbiome](#)

14. Asnicar F, Manara S, Zolfo M, Truong D, Scholz M, Armanini F, **Ferretti P**, Gorfer V, Pedrotti A, Tett A and Segata N. *Studying vertical microbiome transmission from mothers to infants by strain-level metagenomic profiling* (2017) [mSystems](#)
15. **Ferretti P**, Farina S, Cristofolini M, Girolomoni G, Tett A and Segata N. *Experimental metagenomics and ribosomal profiling of the human skin microbiome* (2016) [Experimental Dermatology](#)
16. Milani C, Mancabelli L, Lugli G, Duranti S, Turrone F, Ferrario C, Mangifesta M, Viappiani A, **Ferretti P**, Gorfer V, Tett A, Segata N, van Sinderen D and Ventura M. *Exploring vertical transmission of the gut microbiota from mother to child* (2015) [Applied and Environmental Microbiology](#)
17. Fusco da Costa AR, Fedrizzi T, Lopes ML, Pecorari M, Oliveira da Costa WL, Giacobazzi E, da Costa Bahia JR, De Sanctis V, Batista Lima KV, Bertorelli R, Grottola A, Fabio A, Mariottini A, **Ferretti P**, di Leva F, Fregni Serpini G, Tagliacuzzi S, Rumpianesi F, Jousson O, Segata N and Tortoli E. *Characterization of 17 strains belonging to the Mycobacterium simiae complex and description of Mycobacterium paraense sp. nov.* (2015) [International Journal of Systematic and Evolutionary Microbiology](#)
18. Tortoli E, Fedrizzi T, Pecorari M, Giacobazzi E, De Sanctis V, Bertorelli R, Grottola A, Fabio A, **Ferretti P**, Di Leva F, Fregni Serpini G, Tagliacuzzi S, Rumpianesi F, Jousson J and Segata N. *The new phylogenesis of the genus Mycobacterium.* (2014) [International Journal of Systematic and Evolutionary Microbiology](#)

## **Selected Posters and Invited Talks**

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### **Posters:**

6. **EMBL The Human Microbiome Conference** | EMBL Heidelberg, Germany. **2023**  
"Composition, function and strain-sharing between maternal breast milk and the infant gut microbiome".
5. **International Human Microbiome Consortium – IHMC22** | Kobe, Japan. **2022**  
"C. difficile is overdiagnosed in adults and a commensal in infants".
4. **International Society for Microbial Ecology – ISME18** | Lausanne, Switzerland. **2022**  
"C. difficile is overdiagnosed in adults and a commensal in infants".
3. **The Human Microbiome Symposium** | EMBL Heidelberg, Germany. **2018**
  - "The role of the maternal microbiomes in the establishment and maturation of the early infant microbial communities"
  - "Vertical microbiome transmission from maternal breast milk to the infant gut by combined cultivation and metagenomic approaches".
2. **The 7<sup>th</sup> International Human Microbiome Congress** | Killarney, Ireland. **2018**  
"A metagenomic approach to track and characterize the mother-infant microbial transmission and early infant colonisation"
1. **Symbiomes: Systems Biology of Host-Microbiome Interactions** | Pultusk, Poland. **2015**  
"Toward optimizing de novo hybrid assembly from short and long reads sequencing for isolate and microbiome samples".

### **Oral invited presentations:**

8. **Centre for Microbiology and Environmental Systems Science** | University of Vienna **2024**  
"Microbial transmission in human and wild animal populations"
7. **Microbiome Virtual International Forum n.9** **2022**  
"C. difficile is overdiagnosed in adults and a commensal in infants"
6. **Laboratory of Prof. Ran Blekhman** | University of Chicago, US **2022**  
"A metagenomic meta-analysis of C. difficile carriage across age, geography, health and disease"
5. **Laboratory of Prof. Ed Kuijper** | Leiden University, Netherlands **2021**  
"A large-scale meta-analysis of C. difficile prevalence across age, geography, health and disease"

4. **Laboratory of Dr. Falk Hildebrand** | Quadram Institute Bioscience, UK **2020**  
"Mother-to-infant microbiome transmission from different body sites shapes the developing infant gut microbiome"
3. **XIII Incontro della Rete Insieme per l'Allattamento** | Verona, Italy **2018**  
"The impact of the maternal microbiome on the neonatal microbiome development". Conference organized by Unicef.
2. **Comano Incontra la Dermatologia Trentina** | Comano Terme, Italy **2016**  
"The human skin microbiome"
1. **Il Microbiota: Salute, Terme e Alimentazione** | Comano Terme, Italy **2015**  
"The skin microbiome in psoriasis: The Comano Terme Project"

## Awards and Honors

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- Travel Award** for "The Human Microbiome Conference" (Germany) **2023**  
Awarded by the University of Chicago
- Poster Award** at "International Society for Microbial Ecology" (Lausanne, Switzerland) **2022**  
"C. difficile is overdiagnosed in adults and a commensal in infants".
- Poster Award** at "The human Microbiome Symposium" (EMBL Heidelberg, Germany) **2018**  
"The role of the maternal microbiomes in the establishment and maturation of the early infant microbial communities".
- Merit Award** for the "MSc in Cellular and Molecular Biotechnology" (University of Trento, Italy) **2017**  
**Travel Grant** "Symbiomes: Systems Biology of Host-Microbiome Interactions" (Pultusk, Poland). **2015**

## Funding

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- Scholarship - Department of Cellular, Computational and Integrative Biology**, University of Trento, Italy (Decreto n. 259 dd 19.12.2016). Active from Jan 2017- Jul 2017. Total amount: 6,000€
- Scholarship - Department of Information Engineering and Computer Science**, University of Trento, Italy (Decreto n. 134 dd 21.04.2016). Active from May 2016- Nov 2016. Total amount: 6,000€

## Teaching and Mentorship

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### Mentor for

- **Ph.D. Students:** JJ Colgan (Univ. of Chicago, US), Mary Chege (Univ. of Notre Dame, US), Mattea Allert (Univ. of Minnesota, US).
- **Undergraduate Students:** Tess Brunnen (Univ. of Chicago, US).

**Lecture: "The newborn's microbiome: recommendations for the clinical practice"** **2021**  
Santa Chiara Hospital, Trento, Italy.

**EMBL Predoctoral Fellows Course: Python Module** **2018**

**Lecture: "Introductory lesson on the human microbiome"** **2016 - 2017**  
II Level Master in Hydrology and Thermal Medicine, Comano Terme, Italy

**Tutor for BSc and MSc Students** **2014 - 2017**  
C++, Object oriented C++ programming, Project management, Network security and Video compression algorithms.

**Tutor at Web Valley Summer School** **2014**  
Tutor and speaker on genome assembly algorithms and next-generation sequencing platforms.

## Scientific Journal Covers

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**Nature Reviews Microbiology** 2020  
**Cell Host & Microbe** 2018

## Outreach Experience

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**Scienza in Gioco – Outreach for high school students in Rome** 2024  
In collaboration with Yasmin Secanechia and Tommaso Nastasi

**Book Interview** 2023  
by Dr. Valeria Burgio, Faculty member at Università Ca' Foscari Venezia, Dept. of Philosophy and Cultural Heritage. I was interviewed on data visualization best practices and recent trends in microbiome research, as part of a book currently in preparation.

**Book Interview** 2020  
“Anthropology of the microbes: How metagenomics is reshaping human health” ([ISBN 9788879756983](#)) by Prof. Roberta Raffaeta, Università Ca' Foscari Venezia, Dept. of Philosophy and Cultural Heritage. I was interviewed by the author on how researchers approach metagenomics and the current epistemological limitations.

**Local News** “Buongiorno Regione Trentino Alto Adige” 2018

## Extracurricular & Service

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**Peer review of >20 manuscripts by personal invitation** 2021 - Present  
from the following academic journals: *Nature* (co-review), *mSystems*, *ISME*, *PLOS Computational Biology*, *Nature Communications*, *FEMS Microbiology Ecology*, *PeerJ*, *Current Opinion in Microbiology* and *Scientific Reports*.

**Microbiome Virtual International Forum | Organization Committee** 2023 - Present  
Organisation of a virtual, inclusive and monthly-recurring mini-conference, accessible in all time zones, with on average over 200 participants per session.

## Complementary Skills Training

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<b>Preventing Harassment and Discrimination</b> (University of Chicago)	Apr 2023
<b>HIPAA Privacy and Security Awareness</b> (University of Chicago)	Apr 2023
<b>Deep learning and neural networks</b> (EMBL)	Feb 2022
<b>Biological network analysis</b> (EMBL)	Mar 2021
<b>Negotiation for scientists</b> (EMBL)	Jan 2021
<b>Applying for group leader position</b> (EMBL)	Dec 2020
<b>Academic CV</b> (EMBL)	Aug 2020
<b>Grant writing for postdocs</b> (EMBL)	Mar 2020
<b>Scientific writing</b> (EMBL)	Oct 2020
<b>Project Management</b> (University of Trento)	2016

## Languages

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**Italian:** Native  
**English:** Professional working proficiency  
**German:** Limited working proficiency  
**Spanish:** Limited working proficiency  
**Japanese:** Elementary proficiency

August 2024