Emanuele Ratti
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AREAS OF SPECIALISATION

- History and philosophy of science and technology (in particular biology, biomedicine and data science)
- Ethics of science and technology (in particular data science and biomedicine)

AREAS OF COMPETENCE

- Epistemology (including virtue epistemology)

EMPLOYMENT HISTORY

- University Assistant with PhD, i.e. non-tenure track assistant professor (10/2020 - 09/2026), Johannes Kepler University (Linz, Austria), *Institute of Philosophy and Scientific Method*
- Visiting Assistant Professor (01/2019 – 11/2020), University of Notre Dame (IN, USA), *John J. Reilly for Science, Technology, and Values* (joint appointment with *Technology Ethics Center* from 07/2020)
- Postdoctoral Research Associate (01/2016 – 12/2018), University of Notre Dame (IN, USA) in the project *Developing Virtues in the Practice of Science*

EDUCATION

- PhD (2012/2016) in *Foundations and Ethics of the Life Sciences*. European School of Molecular Medicine (SEMM) and University of Milan, Italy
  Dissertation title: *The Context of Discovery of Data-driven Biology*

- Visiting Student (09/2013-06/2014), Department of Philosophy, University of Pennsylvania. Advisor: Professor Michael Weisberg

- MA by Research (2010-2011), Philosophy, University of Hertfordshire, UK. Advisor: Professor Luciano Floridi

- BA, MPhil (2004-2009), Philosophy, Universita' Cattolica del Sacro Cuore, Milan

FELLOWSHIPS

- Embedded EthiCS Fellowship (2020), Harvard University (*declined*)
- UNED Postdoctoral Fellowship (2018), UNED, Madrid (~ 72,800 €, *declined*)
- Juan de la Cierva Postdoctoral Fellowship (2018), UNED, Madrid (60,000 €, *declined*)
- Jacques Loeb Centre for the History and Philosophy of the Life Sciences Postdoctoral Fellowship (2018), Ben-Gurion University of the Negev, *declined*
- 2016-2018: Templeton Religion Trust Fellowship (148,320 USD)
- 2012-2016: European School of Molecular Medicine PhD Scholarship (74,000 €)

PUBLICATIONS[1]

History and Philosophy of Science (Biology, Biomedicine, and Data Science)

Articles in Peer-reviewed Journals

- **Ratti, E.**, Germain, PL. 'A Relic of Design: Against Proper Functions in Biology', accepted for publication in *Biology & Philosophy*
- Ratti, E. 2020. 'What Kind of Novelties Can Machine Learning Possibly Generate? The Case of Genomics', *Studies in the History and Philosophy of Science (Part A)*, https://doi.org/10.1016/j.shpsa.2020.04.001
- Ratti E. 2020. 'Models of' and 'Models for': On the Relation Between Mechanistic Models and Experimental Strategies in Molecular Biology'. *British Journal for the Philosophy of Science*, https://doi.org/10.1093/bjps/axy018
- Lopez-Rubio, E., **Ratti E**[2]. 2019. 'Data Science and Molecular Biology: Prediction and Explanation', *Synthese*, https://doi.org/10.1007/s11229-019-02271-0
- Boem F., **Ratti E. (first author**[3]**)**, et al. 2016. 'Why Genes Are Like Lemons'. *Studies in the History and Philosophy of Science (Part C)*, Vol 57, June, https://doi.org/10.1016/j.shpsc.2016.04.005
- Ratti E. 2015. 'Big Data Biology: Between Eliminative Inferences and Exploratory Experiments'. *Philosophy of Science*, Vol. 82, No. 2 https://doi.org/10.1086/680332

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[1] 258 citations (source: Google Scholar, accessed 27/09/2021)
[2] Authors contributed equally
[3] Boem and Ratti contributed equally

- German PL, **Ratti E. (second author)**, Boem F. 2014. 'Junk or Functional DNA? ENCODE and the Function Controversy' *Biology & Philosophy*, Vol. 29, No. 6, https://doi.org/10.1007/s10539-014-9441-3

- Ratti E. 2014. 'Levels of Abstraction, Emergentism and Artificial Life'. *Journal of Theoretical and Experimental Artificial Intelligence* http://dx.doi.org/10.1080/0952813X.2014.940144

- An O., Pendino V., D'Antonio M., **Ratti E.**, et al. 2014. 'NCG4.0: The Network of Cancer Genes in the Era of Massive Mutational Screenings of Cancer Genomes' *Database: The Journal of Biological Databases and Curation*. https://doi.org/10.1093/database/bau015

Commentary

- Ratti E. 2016. 'The End of Small Biology? Some Thoughts About Biomedicine and Big Science'. *Big Data & Society*, 3 (2), https://doi.org/10.1177/2053951716678430

Chapters in books

- **Ratti, E.,** Stoeger, T. 'Large-scale Biology: Philosophical, Historical, and Computational Perspectives'. In Donohue C., and Love, A.C. (eds). *Perspectives on the Human Genome Project and Genomics* (Forthcoming for Minnesota Studies in the Philosophy of Science, 23)

- Ratti, E. 2020. 'Phronesis and Automated Science: The Case of Machine Learning and Biology'. In Sterpetti, F., and Bertolaso, M. (eds). 2020. *A Critical Reflection on automated Science - Will Science Remain Human?*. Springer

- Bertolaso M., **Ratti E**. (equal contribution). 2018. 'Conceptual Challenges in the Theoretical Foundations of Systems Biology'. In Mariano Bizzarri (eds). *Systems Biology*. Springer Series Methods in Molecular Biology, Vol. 1702

- Boem F., **Ratti E.** (equal contribution). 2016. 'Towards a Notion of Intervention in Big-Data Biology and Molecular Medicine'. In Marco Nathan and Giovanni Boniolo (eds.). 2016. *Philosophy of Molecular Medicine*. London: Routledge

Ethics of Science and Technology

Edited Books

- Ratti E., Stapleford, T. (eds.). *Science, Technology, and the Good Life*. Oxford University Press **(accepted for publication)**

Articles in Peer-reviewed Journals

- Bezuidenhout, L., **Ratti, E.** (equal contribution). 2020. 'What Does it Mean to Embed Ethics in Data Science? An Integrative Approach Based on Microethics and Virtues' *AI & Society,* https://doi.org/10.1007/s00146-020-01112-w

- Bezuidenhout L., **Ratti E.**, Warne N., and Beeler D. 2018. 'Docility as a Primary Virtue in Scientific Research'. *Minerva*, https://doi.org/10.1007/s11024-018-9356-2

Chapters in books

- **Ratti, E**., Warne, N. 2020. 'Vocation, Science, and the Good Life', in Melville, W., and Kerr, D. (eds.) *Virtues, Science, and Science Education*, Routledge Publishers

WORKS IN PROGRESS

- Graves, M, **Ratti, E.**. 'Microethics for Healthcare Data Science: Attention to Capabilities in Sociotechnical Systems' (Under review)

- **Ratti, E.**, Graves, M. 'Microethics for Responsible Data Science With Application to Healthcare Informatics' (Under review)

- **Ratti, E.,** Graves M 'Explaining AI in Medicine Without XAI: Opening the Right Black-box' (Under review)

- **Ratti E**., Lopez-Rubio, E. 'Intelligibility of Mechanistic Models and Machine Learning' (Manuscript)

- Ratti, E., Lopez-Rubio, E. 'Opacity in Natural Language Processing (In progress)

- Ratti, E. 'Explanations-by-Translation and Systems of Practice: XAI in Medicine' (In progress)

- Ratti, E. 'Automated Science and AI' (In progress, invited contribution for a S.I. in *Synthese*)

- Ratti, E. 'The Ethics of AI Ethicist' (In progress)

TEACHING EXPERIENCE AND ADVISING

As instructor

CODATA-RDA Schools of Research Data Science

- *Open Science and Responsible Conduct of Research* (Trieste online summer school, September 6 – November 5 2021)

Johannes Kepler University:

- *Philosophy of Science*, (Fall/Winter 2020 online; Fall/Winter 2021)
- *Philosophy of Medicine* (Fall/Winter 2021)

- *Topics in Practical Philosophy – Environment, Biomedicine, and Emerging Technologies* (Spring 2021 online)

- *Introduction to Science Studies – Scientific Responsibility and Trust in Science* (Spring 2021 online)

University of Notre Dame:

- *Ethics of Emerging Weapons Technology*, (Fall 2020 online, co-taught with Maj Gen Robert Latiff)

- *Technology & Innovation Ethics*, (Summer 2020 online)

- *Data and AI Ethics*, (Spring 2019, Fall 2019, Spring 2020)

- *Science, Technology, and Society*, (Spring 2019, Spring 2020)

- *Philosophy of Science* (graduate course), (Fall 2019)

- *Emerging Ethical Issues in Biomedicine and Neuroscience*, Summer Neuroscience and Behaviour Program, (Summer 2019)

- *Science, Virtues and the Good Life* (co-taught with Nathaniel Warne), (Fall 2018)

- *Philosophy of the Life Sciences*, (Fall 2016)

Advising

- Advisor of Ezequiel Lopez-Rubio, UNED, Madrid. Ezequiel is a Full Professor in Computer Science who has pursued a part-time PhD in History and Philosophy of Science
- Advisor of Helen Streff, University of Notre Dame, *Glynn Family Honors Program* and STV minor. Helen wrote a thesis on the ethics of CRISPR-Cas technology. She has now joined Duke University as a graduate student in a CRISPR-Cas lab

Professional development and training

- *Foundations of Teaching Series* Sessions I-IV and *Introduction to Course Design* sessions I-IV (University of Notre Dame, Kaneb Center for Teaching and Learning, January-March 2017)

- *Striving for Excellence in Teaching* certificate, University of Notre Dame, Kaneb Center for Teaching and Learning

SCIENTIFIC TRAINING

My PhD required training in three different laboratories at the European Institute of Oncology (Milan, Italy)

1. October 2012 - September 2013. Francesca Ciccarelli's Lab: *Bioinformatics and Evolutionary Genomics of Cancer*. Analysis of data from whole-genome and whole-exome screenings for the project *Network of Cancer Genes 4.0*

2. May 2012 - October 2012. Marina Mapelli's Lab: *Molecular Basis of Asymmetric Cell Division*. Training in basic procedures: DNA extraction, PCR, transfection, protein expression test

3. January - May 2012. Diego Pasini's Lab: Epigenetic *Mechanisms and Stem Cell Differentiation and Oncogenesis*. Training in basic lab procedures: DNA extraction, PCR, transfection.

- *Collaborative Institutional Training Initiative Certificate*, Human Research – Social & Behavioral Research. April 2018.

- *Data Science*. Instructor: Dr. Mark Graves. Summer 2018. Auditing.

SELECTED PRESENTATIONS AND SEMINARS

Invited

- 'Explainable AI and Medicine'
    - Center for Logic, Language, and Cognition, University of Turin, March 31st (online)
    - Departments of Humanities and Arts, Technion (Israel Institute of Technology), April 14th (online)
    - PhilinBioMed Seminar, University of Bordeaux, April 28th (online)

- 'Opacity in Data Science', Georgia State University, Department of Philosophy, May 4 2020 (online)

- 'Considerations on AI Ethics: Microethics, Virtues, and Pluralism',

    - *The Ethics of Institutions*, Center for Social Concerns, University of Notre Dame, October 28 2019
    - *Great Lakes Workshop on Data Science*, University of Notre Dame, September 20 2019

- 'Epistemic and Contextual Opacity in Machine Learning'
    - Department of Philosophy, University of Guelph, April 29 2019
    - Department of Philosophy, University of Oregon, January 17 2019
    - Department of Philosophy, Purdue University, January 9 2019

- 'How Big Data and Big Science Influence Contemporary Biology', *Genomics and the Human Genome Project*, National Human Genome Research Institute –NIH, History of Genomics Program, Bethesda MD, 14-16 November 2018

- 'Do Functions Function in Biology?', *Functional and Comparative Genomics: Historical, Conceptual and Philosophical Issues*, National Human Genome Research Institute –NIH, History of Genomics Program, Bethesda MD, 16-17 August 2018

- 'Predictions, Phronesis and Machine Learning in Biology', *Expert Meeting "Will Science Remain Human?"*, Campus Biomedico, Rome, March 5-6 2018

- 'The ENCODE Controversy' (28th May 2013), lgBIG-meeting, University of Geneva

Referred

- 'What does it mean to embed ethics in data science?' (with Louise Bezuidenhout), *Building Inclusive Ethical Cultures in STEM: A Practice-Based Workshop*, Illinois Institute of Technology, April 23-24 2021 (online)

- 'M.E.T.A: A MicroEThical Approach to Data Science' (with Mark Graves), *Rabb Symposium on Embedding AI in Society*, North Carolina State University, 18-19 February 2021 (online)

- 'Mechanistic Models and the Explanatory Limits of Machine Learning', *26th Biennial Meeting of Philosophy of Science Association*, November 1-4 2018, Seattle, WA

- 'Data science and biology', *Workshop on Data-intensive Science,* University of Hannover (Germany), 26-27 October 2017

- 'On Models of and Models for in Molecular Biology', *25th Biennial Meeting of Philosophy of Science Association*, 3-6 November 2016, Atlanta, GA, USA

- 'On the Distinction Between Models of and Models for in Molecular Biology'. *6th Conference of the Society for Philosophy of Science in Practice (SPSP)*, June 2016, Rowan University, Glassboro, New Jersey, USA

- 'Databases, Phenomena Types and Platonic Idealization: Notes on the Structure of Contemporary Molecular Biology', *5th Biennial Conference of the Society for Philosophy of Science in Practice*, 25th June 2015, Aarhus

- 'Data-driven Research: An Approach Framed in the Discovery/Justification Debate', *Third European Advanced Seminar in the Philosophy of the Life Sciences* (4th September 2014), Konrad Lorenz Institute, Vienna

- 'What is Integration in Bioinformatics?' *Fourth conference of the European Philosophy of Science Association* (August 28-31 2013), Helsinki

- (with Federico Boem) 'The Gene after ENCODE: a Wittgensteinian Approach', *ISHPSSB 2013* (9th July 2013) Meeting, Montpellier

- 'Genes, Integral Wholes, Networks and Structural Realism', *First international conference of the German Society for Philosophy of Science* (11th March 2013), University of Hannover

Organized workshops and symposia

- 'Science, Technology and the Good Life – Perspective on Virtues in Science & Technology Studies'. April 5-7 2018, University of Notre Dame (a three-day workshop organized with Professor Thomas Stapleford)

- 'Mechanism Meets Big Data – Different Strategies for Machine Learning in Cancer Research'. Symposium proposal accepted for the Philosophy of Science Association meeting 2018 in Seattle. Organized with William Bechtel, Sara Green and Trey Ideker

SERVICE

- Reviewer for journals: *European Journal for Philosophy of Science*, *Philosophy of Science, Synthese, Philosophy & Technology, Topoi, Biology & Philosophy, Big Data & Society, Research Ethics, Journal for General Philosophy of Science, Studies in the History and Philosophy of Science (Part A), , Studies in the History and Philosophy of Science (Part C), British Journal for the Philosophy of Science, History and Philosophy of the Life Sciences, AI & Society, European Journal of Analytic Philosophy*

- Reviewer for funding agencies: *Science, Technology & Society Program*, *NSF*

REFERENCES

- Professor Sabina Leonelli, Department of Sociology, Philosophy, and Anthropology, University of Exeter, S.Leonelli@exeter.ac.uk

- Professor Don Howard, Department of Philosophy, University of Notre Dame, dhoward1@nd.edu

- Professor David Teira, Department of Logic, History and Philosophy of Science, UNED (Madrid), dteira@fsof.uned.es

Other References:

- Professor Thomas Stapleford (*also teaching*), Program of Liberal Studies, University of Notre Dame, tstaplef@nd.edu

- Professor Michael Weisberg, Department of Philosophy, University of Pennsylvania, weisberg@phil.upenn.edu

- Professor Luciano Floridi, Oxford Internet Institute, University of Oxford, pa.floridi@oii.ox.ac.uk (personal assistant)

- Professor Federica Russo, Department of Philosophy, Universiteit van Amsterdam, F.Russo@uva.nl

- Dr Robert Latiff, Maj. Gen., Reilly Center for Science, Technology, and Values, University of Notre Dame, rlatiff@nd.edu

- Professor Alison Simmons, Department of Philosophy and Embedded EthiCS Program, Harvard University, asimmons@fas.harvard.edu

- Professor Marco Nathan, Department of Philosophy, University of Denver, Marco.Nathan@du.edu

- Professor Philip Sloan (*teaching*), Program of Liberal Studies, University of Notre Dame, psloan@nd.edu