

BIOGRAPHICAL SKETCH

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NAME: Pesaresi, Paolo

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Full Professor of Genetics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Department of Biotechnology, University of Verona	BS	11/1996	Genetics
Max-Planck-Institute für Züchtungsforschung, Colonia	PHD	03/2002	Genetics
Max-Planck-Institute für Züchtungsforschung, Colonia	Postdoctoral	02/2006	Genetics

A. Personal Statement

I am Full Professor of Genetics at the Department of Biosciences, University of Milan, and I have 28 years of experience in the functional genomics of photosynthesis. This experience has been gained in various laboratories, both in Italy and abroad, both as a student and postdoc and, since 2006, as leader of the PhotoLab research group (<https://sites.unimi.it/PhotoLab/Home.html>). The research activity of the PhotoLab group is structured into several lines of study aimed at deepening the understanding of the molecular mechanisms underlying fundamental biological processes in model species such as *Arabidopsis thaliana* and in agriculturally relevant species such as barley and rice. In particular, the research focuses on the short-term (seconds–minutes) and long-term (hours) regulation of the light phase of photosynthesis and on chloroplast biogenesis. The adopted approach is that of functional genomics, which integrates different disciplines: genetics and the use of mutants to outline the boundaries of the biological process; molecular biology, biochemistry, and biophysics to understand its details at the molecular level; and plant physiology to assess its role in the entire life cycle of the plant. The knowledge gained over more than 25 years of activity is now being transferred to crop species such as barley and rice, through functional genomics strategies and the study of natural genetic variability and its interactions with the environment. At the same time, the PhotoLab group applies the developed technologies to more applied research areas, with the aim of fostering interaction between basic research and industry and promoting technology transfer to the market. In this context, for several years, the group has been engaged in developing alternative, environmentally friendly solutions to traditional pesticides through the use of peptide aptamers and yeast two-hybrid technology. The expertise and the results of the last years in the field of plant protection, biotechnology and biochemistry are consistent with the aim of this new proposal, and I am fully confident in a successful outcome for the project, given also the amount of preliminary data we produced at the PhotoLab.

B. Positions, Scientific Appointments, and Honors

Positions and Scientific Appointments

2023 – Present	Full Professor of Genetics, Department of Biosciences, University of Milan.
2021	Coordinator, Master of Science in Molecular Biology of the Cell, University of Milan.
2018	National Scientific Qualification as Full Professor, in the competitive sector 05/I1 – GENETICS, scientific disciplinary sector BIO18 – Genetics.
2015 – 2023	Associate Professor of Genetics, Department of Biosciences, University of Milan.
2014	National Scientific Qualification as Associate Professor, in the competitive sector 05/I1 – GENETICS and MICROBIOLOGY, scientific disciplinary sector BIO18 – Genetics.
2010 – Present	Member of the board of directors, Botanical Garden Città Studi, University of Milan.
2008 – 2015	Researcher, Genetics, Faculty of Mathematical, Physical and Natural Sciences, University of Milan.
2006 – 2008	Adjunct Professor, Department of Plant Production, University of Milan.
2002 – 2005	Postdoctoral Fellow, Max-Planck-Institute für Züchtungsforschung, Cologne, Germany.
1999 – 2002	PhD Student, Max-Planck-Institute für Züchtungsforschung, Cologne, Germany.

Member, Italian Society of Plant Biology (<http://www.sibv.eu/>)

Member, Italian Genetic Association (<https://www.associazionegeneticaitaliana.it/>).

Honors

2024	SEED4INNOVATION Program Award, Fondazione UNIMI, with the project “Friends4Agri”.
2021	As part of the "Lombardy is Research - 2021 edition" Award, I was among the recipients of 70% of the prize for the implementation of the "Enhancing Photosynthesis" project.
2017	“Excellent Scholar Award” by the Organizing Committee of the XIX International Botanical Congress (IBC 2017), Shenzhen, China.

Thanks to the h-index value of 44 (Google Scholar database), I have been included in the list of "Top Italian Scientists", a website that collects Italian scientists of different disciplines with an h-index > 30 (https://topitalianscientists.org/tis/41272/Paolo_Pesaresi)

C. Contributions to Science

- As “Adjunct Senior Scientist” at Ludwig-Maximilians-Universität, Munich, Germany, I supervised PhD students Mathias Pribil, Michael Scharfenberg, Elena Fenino, Luca Tadini, Isidora Romani, and Vera Bonardi. In this context, I contributed to the identification of the phosphatase TAP38, which, together with the kinase STN7, is responsible for the regulatory mechanism known as “*State Transitions*” (1, 2, 3).
 - Armbruster U, **Pesaresi P**, Pribil M, Hertle A, Leister D. Update on chloroplast research: New Tools, New Topics, and New Trends. *Mol. Plant* (2011) 4(1): 1-16, <https://doi.org/10.1093/mp/ssq060>
 - Pesaresi P**, Pribil M, Wunder T, Leister D. Dynamics of reversible protein phosphorylation in thylakoids of flowering plants: The roles of STN7, STN8 and TAP38. *Biochim. Biophys Acta* (2011) 1807:887-896, <https://doi.org/10.1016/j.bbabi.2010.08.002>
 - Pribil M, **Pesaresi P**, Hertle A, Barbato R, Leister D. Role of plastid protein phosphatase TAP38 in LHClI dephosphorylation and thylakoid electron flow. *Plos Biology*. (2010) 8(1): e1000288. <https://doi.org/pros2.lib.unimi.it/10.1371/journal.pbio.1000288>
- As an Adjunct Professor at the University of Milan, Faculty of Agriculture, Department of Plant Production (DI.PRO.VE), where I carried out research and teaching activities, I began laying the foundations and coordinating the research activities of the PhotoLab group. The contract was part of the program “*Incentives in favor of the mobility of Italian and foreign professors working abroad – Brain Gain*” funded by the Italian

Ministry of Education, University and Research (MIUR). The project, entitled “*Factors Involved in Regulation of Photosynthesis*”, aimed to identify genes required to adapt photosynthesis to different environmental conditions. In this context, he focused on characterizing the chloroplast-to-nucleus retrograde signaling pathway activated by alterations in plastid protein synthesis (4, 5).

4. Tadini L, Romani I, Pribil M, Jahns P, Leister D, **Pesaresi P**. Thylakoid redox signals are integrated into organellar-gene-expression-dependent retrograde signalling in the *prors1-1* mutant *Frontiers in Plant Science* (2012) 3: 282, <https://doi.org/10.3389/fpls.2012.00282>
5. Romani I, Tadini L, Rossi F, Masiero S, Pribil M, Jahns P, Kater M, Leister D, **Pesaresi P**. Versatile roles of Arabidopsis Plastid Ribosomal Proteins in plant growth and development *Plant Journal* (2012) 72: 922-934, <https://doi-org.pros2.lib.unimi.it/10.1111/tpj.12000>

Since 2006, I coordinate the “PhotoLab” research group at the University of Milan, Department of Biosciences, first as a researcher and then as an associate professor. The research activity is organized along different lines of investigation, all aimed at acquiring new knowledge on the molecular mechanisms underlying biological processes in model species such as *Arabidopsis thaliana* and agronomically relevant species such as barley.

- **Short-term regulation of the light phase of photosynthesis:** The group contributed to the identification and functional characterization of the genes encoding the thylakoid protein complex responsible for cyclic electron transport around Photosystem I, PGR5–PGRL1, and clarified the role of the PGRL1 protein in mediating electron transfer from ferredoxin to the plastoquinone pool. More recently, PhotoLab played a leading role in identifying a new regulatory mechanism, termed “*Photosynthesis Control*”, which modulates electron flow from Photosystem II to Photosystem I through regulation of Cytochrome b6f activity mediated by the PGR5–PGRL1 protein complex.
- **Long-term regulation of photosynthesis and chloroplast biogenesis:** Communication among plastid, mitochondrial, and nuclear genomes is essential for the molecular processes underlying chloroplast biogenesis and for adapting its functions to the plant’s physiological and environmental conditions. These aspects have been summarized in several reviews. The group has made significant contributions to understanding the role of RNA metabolism in anterograde signaling, through the characterization of genes encoding proteins belonging to the *Pentatricopeptide Repeat Protein (PPR)* family, such as AtPPR4 and CRP1, and the DEAD-box RNA helicase RH50.
- Furthermore, within the projects **BarPLUS** (*Modify canopy architecture and photosynthesis to maximize barley biomass and yield for different end-uses*), **SOUP** (*Signaling the Organelle Unfolded Protein response; funded under the PRIN-2017 research program*), and **ConnectFARMS** (*Connecting sustainable agroecosystems and farming with circular bioeconomy and new technologies; funded under the ERA-NET Cofund program*), the group is exploring the enormous induced (chemical mutagenesis) and natural (collection of 450 barley varieties gathered from different parts of the world) genetic variability available in barley, to identify allelic variants able to improve photosynthesis and/or adapt it better to different environmental conditions for more sustainable and circular agriculture.

For a detailed literature on this last part, refer to: <https://www.sciencedirect.com/author/6603052912/paolo-pesaresi>

In the framework of this proposal, my expertise with yeast two-hybrid techniques and on biochemical strategies to study protein–protein interactions has been applied within the projects **GrAptaResistance** (funded by Fondazione Cariplo under the Industrial Biotechnology program), **NoPest** (funded by the European Innovation Council under the H2020 – Future Emerging Technologies, FET-OPEN program), and a project funded by the industrial partner **CORTEVA**, to identify peptide aptamers (small peptides of 8 amino acids) capable of interacting with essential proteins of the oomycete *Plasmopara viticola*, the causal agent of grapevine downy mildew and other oomycetes, with the goal of inhibiting their activity through the *Protein Interference* strategy and thus preventing infection (6, 7, 8, 9, 10). The results of this research are part of the international patents **PCT/IB2018/059834** and **PCT/EP2024/080901**. From this initial work, my group has set up a preliminary trial to test the production of such peptide aptamers through microbial fermentation, with the goal of testing peptide production at pilot scale to enable large-scale testing of these molecules in greenhouse settings.

6. Colombo M, Mizzotti C, Masiero M, Kater M, **Pesaresi P**. Peptide aptamers: the versatile role of specific protein function inhibitors in plant biotechnology. *Journal of Integrative Plant Biology*. (2015) 57: 892-901, <https://doi-org.pros2.lib.unimi.it/10.1111/jipb.12368>
7. Colombo M, Masiero S, Rosa S, Caporali E, Toffolatti SL, Mizzotti C, Tadini L, Rossi F, Pellegrino S, Musetti R, Velasco R, Perazzolli M, Vezzulli S, **Pesaresi P**. NoPv1: a synthetic antimicrobial peptide aptamer targeting the causal agents of grapevine downy mildew and potato late blight. *Sci Rep*. 2020 Oct 16;10(1):17574. doi: 10.1038/s41598-020-73027-x.
8. Rosa S+, Bertaso C+, **Pesaresi P**, Masiero S, Tagliani A. Synthetic protein circuits and devices based on reversible protein-protein interactions: An overview. *Life* (2021) 11: 1171, <https://doi.org/10.3390/life11111171>; +*The two authors contributed equally to this work*
9. Rosa S+, **Pesaresi P**+, Mizzotti C, Bulone V, Mezzetti B, Baraldi E, Masiero S. Game-changing alternatives to conventional fungicides: small RNAs and short peptides. *Trends in Biotechnology* (2022) 40, 320–337, <https://doi.org/10.1016/j.tibtech.2021.07.003>; +*The two authors contributed equally to this work*
10. Rosa S, Tagliani A, Bertaso C, Tadini L, Visentin C, Gourlay LJ, Priol S, Feni L, Pellegrino S, **Pesaresi P**, Masiero S. The cyclic peptide G4CP2 enables the modulation of galactose metabolism in yeast by interfering with GAL4 transcriptional activity. *Frontiers In Molecular Biosciences*. – ISSN 2296-889X. - 10:(2023), pp. 1017757.1-1017757.15. doi: 10.3389/fmolb.2023.1017757.