

## **CURRICULUM VITAE**

### **EUGENIO FERRARI**

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#### **Education**

1978 - 1981	Postdoctoral Fellow Cellular Biology Department The Scripps Research Institute La Jolla, California, USA
1975 - 1978	Postdoctoral Fellow Institute of Genetics University of Pavia, Pavia, Italy
1975 - 1977	Postgraduate School in Biophysics University of Pavia, Pavia, Italy
1974	Doctorate in Biology/Genetics Magna cum Laude Institute of Genetics University of Pavia, Pavia, Italy

## **Professional Experience**

2015 - 2017	Principal Research Fellow Axcella Health Cambridge, MA 02139, USA
2014 - 2015	Senior Director Axcella health (Pronutria Biosciences) Cambridge, MA 02139, USA
2011 - 2014	Adjunct Professor Department of Biology and Biotechnology University of Pavia, Pavia, Italy
1996 - 2010	Senior Staff Scientist Expression and Molecular Biology Department Genencor International Palo Alto, CA, USA
1990 - 1996	Staff Scientist Molecular Biology Department Genencor International South San Francisco, CA, USA
1985 - 1990	Senior Scientist, Molecular Biology Department Genencor, Inc. South San Francisco, CA, USA
1983 - 1985	Scientist Molecular Biology Department Genentech, Inc. South San Francisco, CA, USA
1982 - 1983	Scientist Biocatalysis Department Genentech, Inc. South San Francisco, CA, USA
1981 - 1982	Scientist, Tenured Faculty Institute of Genetics University of Pavia, Pavia, Italy
1971 - 1974	Research Associate Institute of Genetics University of Pavia, Pavia, Italy

## **Scientific interests/Teaching curricula**

### **Scientific interests.**

My scientific interests have spanned, over the years, virtually every aspect of the *Bacillus* Genetics and Molecular biology, being involved in studies concerning metabolism, recombination, sporulation, germination and gene regulation and expression. In particular, most of the work carried out in the last 30 years at Genentech and Genencor, has centered on the expression and secretion of industrial enzymes in Bacilli. Because most of the industrial enzymes expression is temporally regulated, this effort has focused on understanding the role that transition state regulators play on the expression of such genes as well as on the performance of the bacterial host in small and large-scale fermentation. Because of the industrial setting working structure I have been involved in the isolation, engineering and characterization of several enzymes targeted for production, as well as in the inner works of purification and formulation of the same.

Other than the work on *Bacillus*, I have been involved, as a supervisor of junior employees, in the work carried out in other microbial systems utilized for the expression of industrial enzymes (*Streptomyces* and filamentous fungi) as well as in projects of biochemical pathway engineering (using *Escherichia coli* and *Pantoea citrea*) for the production of chemicals such as ascorbic acid and indigo.

### **Teaching and mentoring responsibilities.**

One of my roles at Genencor was to teach, through appropriate series of lectures, new employees and summer students as well as supervise numerous research assistants and associates in their daily activities. I was also responsible for lecturing on microbial molecular genetics at other Genencor Research Centers, e.g. Brabrand (Denmark), Leiden (The Netherland) and Shanghai (China), and train the employees at these Centers on the laboratory techniques needed to implement the best practices in the area of bacterial gene expression

As an Adjunct Professor at the Biology Department of San Francisco State University (1990-2010) I had the responsibility to give several lectures and was responsible for the master thesis experimental work of several students. Furthermore, I have also mentored a number of Bachelor and Master students employed as Summer Interns at Genencor, as well as a number of High School students enrolled in the Biotechnology program at San Mateo High School.

I have been involved in the organization of the Biennial International Conference on Bacilli since 1991 and its sister International Conference on Gram+ Genomics since 2001. I have been invited speaker to numerous meetings such as the ones organized by the American Society for Microbiology (ASM), the Society for Industrial Microbiology (SIM), the Genetics for Industrial Microorganisms (GIM) and the American Chemical Society (ACS).

In 2011 I have thought the Microbial Genetics course for the Laurea Magistrale in Molecular Biology and Genetics at the University of Pavia. During the Academic years 2013-14 and 2014-15 I have thought the course of Biochimica Industriale della Laurea Magistrale in Biotecnologie Avanzate at the University of Pavia.

## **Professional Societies**

American Association for the Advancement of Science  
American Society for Microbiology

## PATENTS

1. Bott, R. R., E. Ferrari, J. A. Wells, D. A. Estell, D. J. Henner. Procaryotic carbonyl hydrolases, methods, DNA, vectors and transformed hosts for producing them, and detergent compositions containing them. EP 0130756
2. Bott, R. R., E. Ferrari, J. A. Wells, D. A. Estell, and D. J. Henner. DNA mutagenesis method. EP 0247647
3. Ferrari, E., D.J. Henner, M.L. Stahl. Protease deficient *Bacillus*. US 5264366.
4. Bott, R. R., E. Ferrari, J. A. Wells, D. A. Estell, and D. J. Henner. *Bacillus* incapable of excreting subtilisin or neutral protease EP 0246678
5. Bott R., D. Estell , E. Ferrari, D. Henner and J. Wells. *Bacillus* useful for producing subtilisin mutant Japan Patent 1994-319534
6. Bott, R. R, D. A. Estell, E. Ferrari, D. J. Henner, J. A. Wells. Procaryotic carbonyl hydrolases and mutants thereof, and methods for producing and using them. EP 0357157
7. Estell, D.A., E. Ferrari, D.J. Henner, J.A. Wells. Procaryotic carbonil hydrolases. US 5310675.
8. Ferrari, E. Gene expression in *Bacilli*. EP 0600893, US 5,387,521.
9. Ferrari, E. and F. Valle. Mutant *aprE* promoter. EP1244794, US 6509185, US 6911322.
10. Diaz-Torres, M. and E. Ferrari. Production of proteins in gram-positive microorganisms. EP1141310
11. Ferrari, E. and A. Van Kimmenade. Secretion, transcription and sporulation genes in *Bacillus clausii*. US 7247450, US 7544488, US 7544489, US 7544490.
12. Bron, S., E. Ferrari and H. Tjalsma. Improved protein expression in *Bacillus subtilis*. EP1472347
13. Ferrari, E., C. Harbison, M. H. Rashid and W. Weyler. Enhanced protein expression in *Bacillus*. EP 1495128, EP 2339016, US 8124399, US 8383366, US 9175294, US 9617549 B2.
14. Ferrari E. and Peres C. Method for amplifying locus in bacterial cells. EP2257629, US9528114.
15. Ferrari, E., C. Fioresi, C. Peres and A. van Kimmenade. A modified secretion system to increase expression of polypeptides in bacteria. EP2152732, US8343735
16. Cervin, M. A., E. Ferrari and S. D. Power. Enhanced protein production in *Bacillus*. US8512982
17. Estell, D. A. and E. Ferrari. Modified proteases. EP2129779, US8779112
18. Ferrari, E., C. Fioresi and A. van Kimmenade. Proteases with modified Pro-regions. US8530218, US9115351, EP2421973A1
19. Bongiorno, C. and E. Ferrari. *Bacillus* strain for increased protein production. EP2440573, US8293499, US8476042.

## PUBLICATIONS

### PUBLICATIONS: Refereed Journals.

1. Mazza, G., A. Fortunato, E. Ferrari, U. Canosi, A. Falaschi and M.Polsinelli. (1975). Genetic and enzymic studies of the recombination process in *Bacillus subtilis*. *Molec. Gen. Genet.*, **136**, 9-30.
2. Baldi, L., M. Rizzardini, E. Ferrari, A. Galizzi, A.G. Siccardi and G. Mazza. (1975). Protection of DNA by Distamycin from pancreatic DNase digestion. *I.C.R.S. Medical Sciences (Pharmacology)*, **3**, 630.
3. Ferrari, E., U. Canosi and G. Mazza. (1976). Genetic non-homology amongst *Bacillus subtilis* strains. *I.C.R.S. Medical Sciences (Microbiology)*, **4**, 480.
4. Canosi, U., E. Ferrari and G. Mazza. (1976). Genetic location of the mutation determining caffeine resistance in *Bacillus subtilis*. *I. C. R. S. Medical Sciences (Microbiology)*, **4**, 558.
5. Galizzi A. and E. Ferrari. (1976). Identification of Thiobacilli by replica plating on thallos sulfide paper. *Appl. Env. Microbiol.*, **32**, 433-435.
6. Ferrari, E., A.G. Siccardi, A. Galizzi, U. Canosi and G. Mazza. (1977). Host cell reactivation of *Bacillus subtilis* bacteriophages. *J. Bacteriol.*, **131**, 382-388.
7. Canosi, U., F.A. Ferrari, E. Ferrari, G. Mazza and A.G. Siccardi. (1978). PBSX induction in a temperature sensitive mutant of *Bacillus subtilis*. *J. Gen. Virology*, **39**, 81-90.
8. Ferrari, E., U. Canosi, A. Galizzi and G. Mazza. (1978). Studies on transduction process by SPP1 phage. *J. Gen. Virology*, **41**, 563-572.
9. Canosi, U., E. Ferrari, A. Falaschi and G. Mazza. (1979). Effect of 6-(p-hydroxyphenilazo)-uracil on the homologous and heterologous transduction processes in *Bacillus subtilis*. *J. Bacteriol.*, **137**, 124-128.
10. Canosi, U., M.L. Nolli, E. Ferrari, R. Marinone and G. Mazza. (1979). Genetic mapping of caffeine resistant and sensitive mutants of *Bacillus subtilis*. *Microbiologica*, **2**, 167-172.
11. Albertini. A.M., M.L. Baldi, E. Ferrari, E. Isnenghi, M.T. Zambelli and A. Galizzi. (1979). Mutants of *Bacillus subtilis* affected in spore outgrowth. *J. Gen. Microbiol.*, **110**, 351-363.
12. Mazza, G., R. Marinone and E. Ferrari. (1980). Plasmid transformation in *Bacillus subtilis* with pHV14 cloning vector. *Microbiologica*, **3**, 247-258.
13. Ferrari, E., D.J. Henner and J.A. Hoch. (1981). Isolation of *Bacillus subtilis* genes from a Charon 4A library. *J. Bacteriol.*, **146**, 430-432
14. Held, G.A., L.A. Bulla Jr., E. Ferrari, J.A. Hoch, A.I. Aronson and S.A. Minnich. (1982). Cloning and localization of the lepidopteran protoxin gene of *Bacillus thuringiensis* subsp. *kurstaki*. *Proc. Natl. Acad. Sci. USA*, **79**, 6065-6069
15. Ferrari, F.A., E. Ferrari and J.A. Hoch. (1982). Chromosomal location of a *Bacillus subtilis* DNA fragment uniquely transcribed by sigma-28-containing RNA polymerase. *J. Bacteriol.* **152**, 780-785.

16. Ferrari, F.A., D. Lang, E. Ferrari and J.A. Hoch. (1982). Molecular cloning of the *spo0B* sporulation locus in bacteriophage lambda. *J. Bacteriol.* **152**, 809-814.
17. Gay, P., D. Le Coq, M. Steinmetz, E. Ferrari and J.A. Hoch. (1983). Cloning of the structural gene *sacB*, which codes for exoenzyme levansucrase of *Bacillus subtilis*: Expression of the gene in *Escherichia coli*. *J. Bacteriol.* **153**, 1424-1431.
18. Ferrari E. and J.A. Hoch. (1983). A single copy, transducible system for complementation and dominance analyses in *Bacillus subtilis*. *Molec. Gen. Genet.*, **189**, 321-325.
19. Wells, J.A., E. Ferrari, D.J. Henner, D.A. Estell and E.Y. Chen. (1983). Cloning sequencing and secretion of *Bacillus amyloliquefaciens* subtilisin in *Bacillus subtilis*. *Nucleic Acid Res.*, **11**, 7911-7925.
20. Stahl, M.L. and E. Ferrari. (1984). Replacement of the *Bacillus subtilis* subtilisin structural gene with an *in vitro*-derived deletion mutation. *J. Bacteriol.*, **158**, 411-418.
21. Yang, M.Y., E. Ferrari and D.J. Henner. (1984). Cloning of the neutral protease gene of *Bacillus subtilis* and the use of the cloned gene to create an *in vitro* derived deletion mutation. *J. Bacteriol.* **160**, 15-21
22. Ferrari, F.A., K. Trach, D. Le Coq, J. Spence, E. Ferrari and J.A. Hoch. (1985). Characterization of the *spo0A* locus and its product. *Proc. Natl. Acad. Sci. U.S.A.*, **82**, 2647-2651
23. Ferrari, E., D.J. Henner and M.Y. Yang. (1985). Isolation of an alanine racemase gene from *Bacillus subtilis* and its for plasmid maintenance in *B. subtilis*. *Bio/technology*, **3**, 1003-1007.
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25. Ferrari, E., Bott, R. 1985. Bioengineering of proteins. *Chim. Oggi* **6**: 17-20.
26. Yang, M., E. Ferrari, E. Chen and D.J. Henner. (1986). Identification of the pleiotropic *sacQ* gene of *Bacillus subtilis*. *J. Bacteriol.* **166**, 113-119.
27. Ferrari., S.M.H. Howard and J.A. Hoch. (1986). Effect of stage 0 sporulation mutations on subtilisin expression. *J. Bacteriol.* **166**, 173-179.
28. Yang, M., H. Shimotsu, E. Ferrari and D.J. Henner. (1987). Characterization and mapping of the *Bacillus subtilis prtR* gene. *J. Bacteriol.* **169**, 434-437.
29. Albertini, A.M., T. Caramori, D.J. Henner, E. Ferrari and A. Galizzi. (1987). Nucleotide sequence of the *outB* locus of *Bacillus subtilis* and regulation of its expression. *J. Bacteriol.* **169**, 1480-1484.
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32. Ferrari, E., D.J. Henner, M. Perego and J.A. Hoch. (1988). Transcription of *Bacillus subtilis* subtilisin and expression of subtilisin in sporulation mutation. *J. Bacteriol.*, **170**, 289-295.
33. Henner, D.J., E. Ferrari, M. Perego and J.A. Hoch. (1988). Location of the target of the *hpr-97*, *sacU32(Hy)*, and *sacQ36(Hy)* mutations in upstream region of the subtilisin promoter. *J. Bacteriol.*, **170**, 296-300.
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36. Winters, P., R. Caldwell, L. Enfield, and E. Ferrari. (1996). The *ampS-nprE* (124°-127°) region of the *Bacillus subtilis* 168 chromosome: sequencing of a 27 kb segment and identification of several genes in the area. *Microbiology* **142**: 3033-3037.
37. Miller, B. S., A. K. H. Hsu, E. Ferrari and M. R. Diaz-Torres. (1996). Solid medium labeling applied to two-dimensional gel electrophoresis. *Analytical Biochemistry* **245**: 245-247.
38. Olmos, J., R. De Anda, E. Ferrari, F. Bolivar and F. Valle. (1997). Effects of the *sinR* and *degU32(Hy)* mutations on the regulation of the *aprE* gene in *Bacillus subtilis*. *Mol. Gen. Genet.*, **253**:562-567.
39. Shafikhani, S., R. A. Siegel, E. Ferrari and V. Schellenberger. (1997). Generation of large libraries of random mutants in *Bacillus subtilis* by PCR-based plasmid multimerization. *BioTechniques*, **23**:304-310.
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41. Valbuzzi, A., Ferrari, E., Albertini, A.M. (1999). A novel member of the subtilisin-like protease family from *Bacillus subtilis*. *Microbiology*, **145**: 3121-3127.
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43. Kolkman M. A. B. and E. Ferrari. (2004). The fate of extracellular proteins tagged by SsrA. *Microbiology*, **150**: 427-436
44. Tjalsma H., E.J. Koetje, R. Kiewiet, O.P. Kuipers, M. Kolkman, J. van der Laan, R. Daskin, E. Ferrari and S. Bron. (2004) Engineering of quorum-sensing systems for improved production of alkaline protease by *Bacillus subtilis*. *J. Appl. Microbiol.*, **96**: 569-578
45. Antelmann H., R. Sapolsky, B. Miller, E. Ferrari, G. Chotani, W. Weyler, A. Gaertner, M. Hecker. (2004) Quantitative proteome profiling during the fermentation process of pleiotropic *Bacillus subtilis* mutants. *Proteomics*: **8**: 2408-24.
46. Kolkman M. A., R. van der Ploeg, M. Bertels, M. van Dijk, J. van der Laan, J M van Dijl and E. Ferrari. (2008). The twin-arginine signal peptide of *Bacillus subtilis* YwbN can direct either Tat- or

Sec-dependent secretion of different cargo proteins: secretion of active subtilisin via the *B. subtilis* Tat pathway. *Appl. Environ. Microbiol.* **74**:7507-13.

47. Barbieri G., B. Voigt, D. Albrecht, M. Hecker, A. M. Albertini, A. L. Sonenshein, E. Ferrari, and B. R. Belitsky. (2015). CodY regulates expression of the *Bacillus subtilis* extracellular proteases Vpr and Mpr. *J Bacteriol.* **197**:1423-32
48. Belitsky B. R., G. Barbieri, A. M. Albertini, E. Ferrari, M. A. Strauch and A. L. Sonenshein. (2015). Interactive regulation by the *Bacillus subtilis* global regulators CodY and ScoC. *Mol. Microbiol.* **97**:698-716.
49. Barbieri G, A. M. Albertini, E. Ferrari, A. L. Sonenshein and B. R. Belitsky. (2016). Interplay of CodY and ScoC in the Regulation of Major Extracellular Protease Genes of *Bacillus subtilis*. *J Bacteriol.* **198**:907-20.



### **PUBLICATIONS: Book Chapters**

1. Galizzi, A. E. Ferrari and L. Ginetti. (1975). Identification of Thiobacilli by replica plating, p. 221-223. In: *The conservation of stone, I. Proceed Int. Symp.*, Bologna 1975.
2. Galizzi, A., A.M. Albertini, M.L. Baldi, E. Ferrari, E. Isnenghi and M.T. Zambelli. (1978). Genetics studies of spore germination and outgrowth in *Bacillus subtilis*, p. 150-157. In: G. Chambliss and J.C. Vary (eds). *Spore VII*. American Society for Microbiology, Washington, D.C.
3. Canosi, U., A. Falaschi, E. Ferrari, G. Mazza and M. Polsinelli. (1979). Inhibitors of homologous and heterologous transduction process in *Bacillus subtilis*, p. 235-243. In: S.W. Gower and L.O. Butler (eds), *Transformation 1978*. Costwold press Ltd., Oxford, U.K.
4. Hoch, J.A., A. Nguyen and E. Ferrari. (1981). Strategies for cloning in *Bacillus subtilis*, p. 163-173. In: A. Hollander (ed), *Genetic engeneering of microorganism for chemicals*. Plenum Press, New York and London.
5. Ferrari, E. and J.A. Hoch. (1982). System for complementation and dominance analysis in *Bacillus*, p. 53-63. In: A.T. Ganesan, S. Cheng and J.A. Hoch (eds), *Molecular cloning and gene regulation in Bacilli*. Academic Press, New York
6. Ferrari, E., F.A. Ferrari, D. Lang, D.J. Henner and J.A. Hoch. (1982). Isolation of *Bacillus subtilis* genes from Charon libraries, p. 1-3. In: D. Schlessinger (ed), *Microbiology 1982*. American Society for Microbiology, Washington, D.C.
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8. Wells, J.A., E. Ferrari, D.J. Henner, M.L. Stahl and E.Y. Chen. (1984) Cloning and sequencing of region controlling efficient expression of subtilisin from *Bacillus amyloliquefaciens*, p. 173-180. In A.T. Ganesan and J.A. Hoch, (eds), *Genetics and Biotechnology of Bacilli*. Academic Press, Orlando, Fla.
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