CURRICULUM VITAE

NAME: Filippo Favretto

BIRTH: 01/03/1986, Mantova (MN), Italy

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EDUCATION

18th April 2014: Ph.D. in Molecular, Industrial and Environmental Biotechnologies (University of Verona, Italy) under the supervision of Prof. Henriette Molinari.
Thesis title: "NMR interaction studies of Human Liver Fatty Acid Binding Protein with putative ligands and associated proteins".
Tutor: Prof. Michael Assfalg.
Thesis committee: Prof. Roberto Barbato, Prof. Andrea Squartini, Dr. Alma Balestrazzi, Dr. Alex Costa and Dr. Francesco Musiani.
Final grade: "**Excellent**".

17th December 2010: Master degree in Molecular and Industrial Biotechnology (University of Verona, Itlay) under the supervision of Prof. Henriette Molinari.
Thesis title: "NMR studies of UIS, a protein involved in malaria parasites development".
Tutor: Prof. Michael Assfalg.
Final grade: **110/110 *cum laude***.

16th July 2008: Bachelor degree in Agro-industrial Biotechnology (University of Verona, Italy) under the supervision of Prof. Giovanni Vallini.
Thesis title: "Molecular taxonomy and study of the degradative capacities of PAHs in *Burkholderia* sp. strains".
Tutor: Prof. Silvia Lampis.
Final grade: **110/110 *cum laude***.

ACADEMIC AND WORK EXPERIENCES

RESPONSABILITIES

January 2017- December 2020: responsible of a PEAQ-ITC automated (Malvern) and an ÄKTA pure system (GE healthcare).

January 2015- December 2020: responsible of a Bruker AVANCE NEO 800 MHz spectrometer equipped with triple resonance cryo-probe.

RESEARCH EXPERIENCES

1st January 2021 – present: Temporary Assistant Professor (RTD-a BIO/10) at the Biochemistry laboratory of the University of Verona, Biotechnology Department.
Projects:

- Structural and biochemical characterization of cyclophilins from the parasite *Toxoplasma gondii*.

Collaborations:

- Structural determination of *T. gondii* cyclophilins by X-ray crystallography.

Collaborator: Prof. Juan A. Hermoso, Director Instituto Química Física "Rocasolano", CSIC (Madrid, Spain).

1st October 2014-31st December 2020: post-doctoral fellow at **German Center for Neurodegenerative Diseases** (DZNE Göttingen, Germany) and guest scientist at the **Max Planck Institute for biophysical chemistry** (MPI-BPC Göttingen, Germany) under the supervision of Prof. Dr. Markus Zweckstetter.

Projects:

- Study of the role of molecular chaperones, with peptidyl prolyl isomerase activity, in the process of tau and α-synuclein aggregation and structural characterization of their interaction with neurotoxic peptides of the abovementioned proteins toward Nuclear Magnetic Resonance (NMR) spectroscopy, X-ray Crystallography and Fluorescence spectroscopy.
- Structural characterization of proteins involved in the biogenesis of mitochondria toward high resolution NMR spectroscopy, Isothermal Titration Calorimetry (ITC) and X-ray crystallography.

Collaborations:

- Structural analysis of the intrinsically disordered splicing factor Spp2 using $^{15}N/^{15}N$-^{13}C NMR experiments, Circular Dichroism (CD) and Dynamic Light Scattering (DLS).
  Collaborator: Prof. Dr. Ralf Ficner (University of Göttingen, Germany).
- Characterization of the interaction between Cyclophilin 40 in complex with tau and α-synuclein toward NMR spectroscopy.
  Collaborator: Dr. Laura J. Blair (University of South Florida, United States of America).
- Molecular investigation of α-synuclein and its interaction with β-synuclein using paramagnetic relaxation experiments to provide information on the determinants of the interaction at an atomic level of resolution. Furthermore, Dr. Favretto was involved in the study of an aggregation-prone variant of alpha-synuclein used as model for synucleopaties.
  Collaborator: Prof. Dr. Tiago F. Outeiro (University Medical Center Göttingen, Germany).

1st January 2014- 1st October 2014: post-doctoral fellow, NMR laboratory of University of Verona (Verona, Italy) under the supervision of Prof. Michael Assfalg.

Projects:

- Effect of macromolecular crowding on the human liver fatty acid binding protein by NMR spectroscopy.

1st January 2011- 31st December 2013: Ph.D. student in Molecular, Industrial and Environmental Biotechnologies at the NMR laboratory of University of Verona (Verona, Italy) under the supervision of Prof. Henriette Molinari.

Projects:

- NMR and fluorescence characterization of the interaction between human liver fatty acid binding protein (HLFABP) and small lipophilic molecules of biological relevance.
- Characterization of backbone dynamics of HLFABP in absence and in presence of small ligands toward ^{15}N-NMR backbone relaxation experiments.
- Biochemical and structural investigation of UIS, a protein involved in malaria parasites development and its interaction with HLFABP.

Collaborations:

- NMR and Mass spectrometry investigation of lipids binding to HLFABP.
  Collaborator: Prof. Rita Grandori (University of Milano Bicocca, Italy).

TEACHING AND MENTORING ACTIVITIES

1st October 2021– present: Course **"**Biochemistry and analytical Biochemistry" (2CFU), Bachelor degree in Biotechnology (L2), University of Verona.
1st March 2021– present: Course **"**Protein misfolding and human diseases" (1CFU), Master degree in Molecular and Medical Biotechnology (LM9), University of Verona.
19th-20th December 2022: Course "Biophysical Methods for the Analysis of Protein-Ligand interactions" (1CFU), PhD course "Nanoscience and advanced technologies".
1st March 2021– 11th June 2021: Course **"**Research inspired laboratory" (1CFU), Master degree in Molecular and Medical Biotechnology (LM9), University of Verona.
21st November 2016: "Introduction to nuclear magnetic resonance spectroscopy"**,** Bonn-Aachen International Center for Information Technology (B-IT) (*Bonn, Germany*); Prof. Dr. Jürgen Bajorath: **guest lecturer**. *Course:* ***International Life Science Informatics (LSI) Program *.***

20th November 2015: "Introduction to nuclear magnetic resonance spectroscopy"**,** Bonn-Aachen International Center for Information Technology (B-IT) (*Bonn, Germany*); Prof. Dr. Jürgen Bajorath: **guest lecturer**. *Course:* ***International Life Science Informatics (LSI) Program *.***
2021-present: supervisor of 2 undergraduate students and one master student.
2015-2021: Co-supervisor of two undergraduate students and one Ph.D. candidate at the DZNE (Göttingen, Germany).

2011-2013: Laboratory assistant in the course: "*Organic Chemistry Laboratory*" Bachelor degree in Agro-industrial Biotechnology, University of Verona.
During his Ph.D., Dr. Filippo Favretto, was supervisor of two bachelor students at the University of Verona.

See section:* **Invited Lectures.

AWARDS AND PROJECTS

June 2012: Winner of **"COOPERINT 2011",** international mobility contest organized by University of Verona (4400€).
Project title: "Optimization of advanced NMR tools for the characterization of FABP/ligand complexes".

July 2012- January 2013: As winner of **"COOPERINT 2011",** Dr. Filippo Favretto was **"Visiting student"** at the Fundación Instituto Leloir, Buenos Aires (Argentina), in collaboration with Prof. Daniel Cicero.

April 1st 2023: Winner of ESCMID (European Society of Clinical Microbiology and Infectious Diseases) Research Grant 2023 (20000€).
Project title: "Effect of non-immunosuppressive CsA derivatives on parasite cyclophilins as a potential treatment against toxoplasmosis".

PUBLICATIONS

† *The authors contributed equally.*

1) **Favretto F†**, Jiménez-Faraco E†, Conter C, Dominici P, Hermoso J. A,* and Astegno A* "Structural Basis for Cyclosporin Isoform-Specific Inhibition of Cyclophilins from *Toxoplasma gondii*" *ACS Infectious Diseases*; **Vol. 9(2)**: 365-377.
2) Babu M, **Favretto F**, Rankovic M, Zweckstetter M, "Peptidyl Prolyl Isomerase A Modulates the Liquid-Liquid Phase Separation of Proline-Rich IDPs" *JACS* 2022; **Vol. 144**: 16157-16163.
3) Bombardi L, **Favretto F**, Pedretti M, Conter C, Dominici P, Astegno A, "Conformational Plasticity of Centrin 1 from Toxoplasma gondii in Binding to the Centrosomal Protein SFI1", *Biomolecules* 2022; **vol. 12**: 1115-1131.
4) Conter C, Fruncillo S, **Favretto F**, Fernàndez-Rodríguez C, Dominici P, Martínez-Cruz L. Alfonso and Astegno A, "Insights into Domain Organization and Regulatory Mechanism of Cystathionine Beta-Synthase from Toxoplasma gondii" *Int. J. Mol. Sci*. 2022; **Vol. 23**:8169-8185.
5) Pedretti M†, Bombardi L†, Conter C, **Favretto F**, Dominici P and Astegno A, "Structural basis for the functional diversity of centrins: A focus on calcium sensing properties and target recognition" *Int. J. Mol. Sci.* 2021; **Vol. 22(22)**:1-18
6) Babu M, **Favretto F**, Ibañez de Opakua A, Rankovic M, Becker S and Zweckstetter M, "Proline/arginine dipeptide repeat polymers derail protein folding in amyotrophic lateral sclerosis". *Nat. Commun.* 2021; ***Vol***. **12(3396):** 1-7.
7) Conter C†, Bombardi L†, Pedretti M, **Favretto F,** Di Matteo A, Dominici P and Astegno A, "The interplay of self-assembly and target binding in centrin 1 from *Toxoplasma gondii*". *Biochemical J*; ***Vol.*** **478:** 2571-2587.
8) Gray Amber LH, Steren CA, Haynes IW, Bermejo GA, **Favretto F**, Zweckstetter M and Do Thanh D, "Structural Flexibility of Cyclosporine A Is Mediated by Amide *Cis-Trans* Isomerization and the Chamaleonic Roles of Calcium". *J. Phys. Chem. B,* 2021; ***Vol.*** **125(5):** 1378-1391.
9) Siegert A, Rankovic M, **Favretto F**, Ukmar-Godec T, Strohäker T, Becker S and Zweckstetter M, "Interplay between tau and α-synuclein LLPS". *Prot. Sci.* 2021; **Vol. 30(7)**:1326-1336.
10) **Favretto F**, Flores D, Baker DJ, Strohäker T, Andreas BL, Blair LBJ, Becker S and Zweckstetter M "Catalysis of proline isomerization and chaperone activity in tug of war". *Nat. Commun.* 2020; ***Vol.*** **11(6046):** 1-12.

11) Hamann F†, Schmitt A†, **Favretto F**†, Neumann P, Xiang S, Urlaub H, Zweckstetter M and Ficner R "Structural analysis of the intrinsically disordered splicing factor Spp2 and its binding to the DEAH-box ATPase Prp2". *PNAS*, 2020; ***Vol*. 117(6):** 2948-2956.

12) **Favretto F**, Baker J, Strohäker T, Andreas L, Blair L, Becker S and Zweckstetter M "Molecular basis of the interaction of cyclophilin A with alpha-synuclein". *Angewandte,* 2020; ***Vol*. 117(14)**: 5643-5646.

13) Masaracchia C, König A, Valiente-Gabioud AA, Peralta P, **Favretto F**, Strohäker T, Lázaro D F, Zweckstetter M, Fernandez C O and Outeiro T F, "Molecular characterization of an aggregation-prone variant of alpha-synuclein used to model synucleinopathies" *Biochim Biophys Acta Proteins Proteom*. 2020; **Vol. 1868(1):** 140298.

14) Baker J D†, Shelton L B†, Zhen D†, **Favretto F**, Nordhues A N, Darling A, Sullivan L E, Sun Z, Solanki P K, Martin M D, Suntharalingam A, Sabbagh J J, Becker S, Mandelkow E, Uversky V N, Zweckstetter M, Dickey C A, Koren J III and Blair L J "Human Cyclophilin 40 Unravels Neurotoxic Amyloids." *PloS Biol.* 2017; **Vol. 15(6):** e2001336.

15) Pérez Santero S, **Favretto F**, Zanzoni S, Chignola R, Assfalg M and D'Onofrio M "Effects of macromolecular crowding on a small lipid binding protein probed at the single-amino acid level". *Arch. Biochem. Biophys.,* 2016; **Vol. 606:**99-110**.**

16) Tenreiro S, Rosado-Ramos R, Gerhardt E, **Favretto F**, Magelhães F, Popova B, Becker S, Zweckstetter M, Braus G H and Outeiro T F "Yeast reveals similar molecular mechanisms underlying alpha- and beta-synuclein toxicity." *Hum Mol Genet.*, 2015; ***Vol.* 25(2):** 275-90.

17) **Favretto F**, Santambrogio C, D'Onofrio M, Molinari H, Grandori R and Assfalg M "Bile salt recognition by human liver fatty acid binding protein." *FEBS Journal*, 2015; ***Vol.* 282(7)**: 1271-1288.

18) **Favretto F**, Ceccon A, Zanzoni S, D'Onofrio M, Ragona L, Molinari H and Assfalg M "The unique ligand binding features of subfamily-II iLBPs with respect to bile salts and related drugs" *PLEFA*, 2015; ***Vol.* 95**: 1-10.

19) Ragona L, Pagano K, Tomaselli S, **Favretto F**, Ceccon A, Zanzoni S, D'Onofrio M, Assfalg M and Molinari H "The role of dynamics in modulating ligand exchange in intracellular lipid binding proteins." *Biochimica et Biophysica Acta*, 2014; ***Vol.* 1844:** 1268-1278*.*

20) **Favretto F**, Assfalg M, Gallo M, Cicero D O, D'Onofrio M and Molinari H "Ligand binding promiscuity of human liver fatty acid binding protein: structural and dynamic insights from an interaction study with glycocholate and oleate." *ChemBioChem*, 2013; ***Vol.* 14**: 1807-1819.

21) Santambrogio C, **Favretto F**, D'Onofrio M, Assfalg M, Grandori R and Molinari H "Mass spectrometry and NMR analysis of ligand binding by human liver fatty-acid binding protein." *Journal of mass Spectrometry*, 2013; ***Vol.* 48**: 895-903.

22) **Favretto F**, Assfalg M, Molinari H and D'Onofrio M "Evidence from NMR interaction studies challenges the hypothesis of direct lipid transfer from L-FABP to malaria sporozoite protein UIS3.", *Protein Science*, 2013; ***Vol.* 22**:133-138.

PUBLISHED ABSTRACTS

1) D'Onofrio M, **Favretto F**, Zanzoni S, Pérez Santero S, Assfalg M, Molinari H, Santambrogio C, Grandori R "Understanding promiscuous and selective ligand binding by liver FABP." *Protein Science,* 2015; **Vol. 24**: 6-7.

ORAL PRESENTATIONS

6th-9th September 2022: "Functional and Structural Characterization of two Cyclophilins from the parasite *Toxoplasma gondii*", oral, *4th ISFMS-Biochemistry, Molecular Biology and Druggability of Proteins* (Firenze, Italy).

8th-10th September 2021: "The role of proline *cis*/*trans* isomerization and chaperon activity in the process of αSyn aggregation" F. Favretto, short oral, *XLIX National Congress on Magnetic Resonance* (*online*).

19th-21st September 2018: "Unraveling the role of Cis-Trans Peptidylprolyl Isomerases in Parkinson's Disease" F. Favretto, short oral, *XLVII National Congress on Magnetic Resonance* (*Torino, Italy)*.

4th-8th February 2018: "Dynamic protein interactions: TIM23ims and MAP/tubulin" F. Favretto, SFB860 Retreat 2018, *Marburger Haus, Sport-und Studienheim der Universität Marburg (Hirschegg, Austria).*

8th-10th June 2017: "The dynamic nature of Tim50 a key component of the tim23 complex" F. Favretto, SFB860 Symposium 2017, *Tagungshaus "Alte Mensa" (Göttingen, Germany).*

20th-22nd September 2016: "Toward structural understanding of the TIM23 complex" F. Favretto, SFB860 Retreat 2016, *Waldhotel Berghof (Luisenthal*, *Germany).*
22nd-24th September 2014: "Characterization of bile salt binding to recombinant human liver fatty acid binding protein" F. Favretto, short oral, *XLIII National Congress on Magnetic Resonance* (*Bari, Italy)*.
3rd-6th November 2013: "NMR characterization of bile salt binding by the human liver fatty acid binding protein: towards a better understanding of intracellular lipid shuttling" F. Favretto, short oral, *8th International Conference on Lipid Binding Proteins* (*La Plata, Argentina*).
10th-12th June 2013: "NMR study of hlfab in complex with hydrophobic molecules of biological relevance" F. Favretto, short oral, *5th European Conference Chemistry for Life Sciences* (*Barcelona, Spain*).

INVITED LECTURES

21st November 2016: "Introduction to nuclear magnetic resonance spectroscopy"**,** Bonn-Aachen International Center for Information Technology (B-IT) (*Bonn, Germany*); Prof. Dr. Jürgen Bajorath.
20th November 2015: "Introduction to nuclear magnetic resonance spectroscopy"**,** Bonn-Aachen International Center for Information Technology (B-IT) (*Bonn, Germany*); Prof. Dr. Jürgen Bajorath.

CONFERENCE PROCEEDINDS

1) **Favretto F**, Conter C, Bombardi L, Pedretti M, Dominici P and Astegno A, "BIOCHRMICAL AND FUNCTIONAL CHARCTERIZATION OF TWO CYCLOPHILINS FROM *TOXOPLASMA GONDII*" *Proteine 2022: Interaction of proteins with small ligands and macromolecules (Pisa, Italy) 18-20 May 2022.*
2) **Favretto F**, D'Onofrio M, Zanzoni S, Ceccon A, Silvia Perez Santero, Molinari H, and Assfalg M, "CHARACTERIZATION OF BILE SALT BINDING TO RECOMBINANT HUMAN LIVER FATTY ACID BINDING PROTEIN" *XLIII National Congress on Magnetic Resonance* (*Bari, Italy) 22-24 September 2014*.

3) **Favretto F**, D'Onofrio M, Zanzoni S, Ceccon A, Assfalg M, and Molinari H, "NMR STUDY OF HLFABP IN COMPLEX WITH HYDROPHOBIC MOLECULES OF BIOLOGICAL RELEVANCE". *5th European Conference Chemistry for Life Sciences* (*Barcelona, Spain*) *10-12 June 2013*.

4) **Favretto F**, D'Onofrio M, Zanzoni S, Ceccon A, Assfalg M, and Molinari H. "CHARACTERIZATION OF HUMAN LIVER FATTY ACID BINDING PROTEIN COMPLEXES WITH VARIOUS MOLECULES OF BIOLOGICAL RELEVANCE" *Instruct Biennial Structural Biology Meeting (Heidelberg, Germany) 22-24 May 2013*.

5) **Favretto F**, D'Onofrio M, Assfalg M, Gallo M, Cicero D.O, and Molinari H, "BACKBONE DYNAMICS OF HUMAN LIVER FATTY ACID BNDING PROTEIN IN COMPLEX WITH OLEATE AND GLYCOCHOLATE" *XLVIII Annual Meeting for Biochemistry and Molecular Biology (Mendoza, Argentine) 29 October-1 November 2012.*

6) **Favretto F**, D'Onofrio M, Zanzoni S, Ceccon A, Assfalg M, and Molinari H, "NMR STUDIES OF THE INTERACTION OF HLFABP WITH UIS, A PROTEIN INVOLVED IN MALARIA PARASITES DEVELOPMENT" *XL National Congress on Magnetic Resonance (Parma, Italy) 29 August-2 September 2011*.

ATTENDED COURSES

23rd-27th September 2019: Bruker Maintenance course: "Troubleshooting", MPI-BPC (Göttingen, Germany).
19th-20th November 2018: Bruker Maintenance course: "Troubleshooting: **cryoprobes**", MPI-BPC (Göttingen, Germany).
26th-30th September 2016: Bruker Maintenance course: "Troubleshooting", MPI-BPC (Göttingen, Germany).
2014: G-NMR school, München (Germany).
10th-15th August 2014: EMBO practical course "Multidimensional NMR in Structural Biology", Joachimsthal (Berlin) (Germany).
1st-5th September 2014: Advanced NMR school, Torino (Italy).
21st-25th January 2013: Practical Course "Advanced methods for the integration of other structural data with NMR data" Sesto Fiorentino (Firenze, Italy).
22nd September 2011: AKTA User Day, Padova (Italy).
29th August-2nd September 2011: Basic NMR school, Villa Gualino, Torino (Italy).

TECHNICAL SKILLS

** The most relevant technical skills for the applied position are underlined:*

- Protein purification techniques: affinity chromatography, ion exchange, gel-filtration (**including ÄKTA prime and ÄKTA pure systems**).
- Biotechnology techniques for gene cloning and site-specific mutagenesis: PCR, cloning, plasmid DNA extraction and purification, gel electrophoresis.
- Biophysical techniques: Isothermal Titration Calorimetry (including automated system PEAQ-ITC and MicroCal ITC systems), Fluorescence Spectroscopy, Circular Dichroism, Microscale Thermophoresis and Dynamic Light Scattering.
- Programming languages and mathematical packages: Python3, MATLAB (basic programming and multiple data fitting), OriginLab and Prism-GraphPad.
- Protein expression in rich, minimal, deuterated and perdeuterated media (form *E. coli*) and selective methyl labeling.
- Advanced knowledge of solution NMR Spectroscopy techniques for protein backbone assignment and [^{15}N]-backbone NMR relaxation experiments.
- Knowledge of isotope-filtered NMR methods for the study of bio-molecular structure and ligand/protein interactions.
- Backbone assignment of small molecules using 2D homonuclear [^{1}H-^{1}H] NMR experiments (COSY, TOCSY and NOESY).
- NMR related software (NMRViewJ, CARA, CcpNMR Analysis, Sparky, NMRPipe)
- Docking and modeling software (HADDOCK).
- CS-Rosetta to perform *de novo* protein structure determination.

CERTIFICATES

- **June 2020: CS1301xIII: Computing in Python III: Data Structures,** Georgia Institute for technology.
- **May 2020: CS1301xII: Computing in Python II: Control Structures,** Georgia Institute for technology.
- **April 2020: CS1301xI: Computing in Python I: Fundamentals and Procedural Programming,** Georgia Institute for technology.
- **April 2020: Python Data Structures,** University of Michigan.
- **April 2020: Programming for everybody (Getting started with Python),** University of Michigan.

LANGUAGES

Italian: mother tongue.
English: fluent oral and written.
Spanish: fluent oral.
German: fluent oral (Level B2, Göttingen University).

Il sottoscritto Filippo Favretto, nato a Mantova (MN, Italy) il 01/03/86, codice fiscale FVRFPP86C01E897O, autorizza il trattamento dei dati personali contenuti nel presente curriculum vitae in base all'art. 13 del D. Lgs. 196/2003 e dell'art. 13 GDPR 679/2016. Consapevole che le dichiarazioni false comportano l'applicazione delle sanzioni penali previste dall'art. 46, 47 e 76 del D.P.R. 445/2000, dichiara che le informazioni riportate nel presente *curriculum vitae* sono veritiere.

Luogo e data
Göttingen, 27/06/2020

SIGNATURE: Filippo Favretto