

Liam M. Longo, Ph.D.

CONTACT INFORMATION

Tokyo Institute of Technology
Earth-Life Science Institute
Tokyo, Japan

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PROFESSIONAL EXPERIENCE

Specially Appointed Associate Professor (Apr. 2022 – Present)
Tokyo Institute of Technology, Earth-Life Science Institute, Tokyo, Japan

Associate Research Scientist (Jul. 2022 – Present)
Blue Marble Space Institute of Science, Seattle, Washington, USA

Postdoctoral Fellow (Mar. 2020 – Mar. 2022)
Tokyo Institute of Technology, Earth-Life Science Institute, Tokyo, Japan
Blue Marble Space Institute of Science
Advisor: Shawn E. McGlynn

Koshland Postdoctoral Fellow (Mar. 2019 – Feb. 2020)
Weizmann Institute of Science, Department of Biomolecular Sciences, Rehovot, Israel
Advisor: Dan S. Tawfik

Senior Postdoctoral Fellow (Mar. 2018 – Feb. 2019)
Weizmann Institute of Science, Department of Biomolecular Sciences, Rehovot, Israel
Advisor: Dan S. Tawfik

Postdoctoral Fellow (Mar. 2015 – Feb. 2018)
Weizmann Institute of Science, Department of Biomolecular Sciences, Rehovot, Israel
Advisors: Dan S. Tawfik and Sarel J. Fleishman

EDUCATION

Florida State University
Ph.D., Molecular Biophysics (2014)
Dissertation: Symmetry and simplicity in protein evolution and design.

Florida State University
B.A., Biochemistry (2009)

TEACHING EXPERIENCE

Frontiers in Medicine, Protein Design Unit. (2014). Florida State University
Introductory Biology Lab for Majors. (2012). Florida State University
Introductory Chemistry Lab for Majors. (2009). Florida State University

GRANTS, AWARDS and FELLOWSHIPS

Innovation in Systems Biology Award (2017)

Department of Systems Biology, Weizmann Institute of Science

Koshland Prize (2015)

Feinberg Graduate School, Weizmann Institute of Science

Dean of Faculty Fellowship (2015)

Feinberg Graduate School, Weizmann Institute of Science

Dissertation Research Grant (2013)

The Graduate School, Florida State University

Kasha Award (2013)

Institute of Molecular Biophysics, Florida State University

Protein Science Best Paper Award (2012)

The Protein Society

Fisher Undergraduate Research Fellowship (2008)

American Cancer Society

Undergraduate Research and Creativity Award (2008)

The Office of Research, Florida State University

PROFESSIONAL ASSOCIATIONS

The Protein Society

The Protein Science Society of Japan (PSSJ)

PROFESSIONAL DEVELOPMENT

EMBO Laboratory Management Course (2017). Rehovot, Israel

Rosetta Boot Camp, Rosetta Academy (2015). Chapel Hill, USA

INVITED TALKS

Longo, L.M. (2021). Protein fold innovation guided by metabolic network evolution. 23 Annual Symposium of the Japanese Evolution Society. Tokyo, Japan.

Longo, L.M. (2019). Resolving the basic amino acid problem. 19th Annual Symposium of the Protein Science Society of Japan. Kobe, Japan

Longo, L.M. (2013). Experimental support for the foldability-function tradeoff hypothesis. 27th Annual Symposium of the Protein Society. Boston, USA

INTELLECTUAL PROPERTY

Blaber, M. and **Longo, L.M.** (2017). Synthetic foldable proteins generated from peptide segments of folding nuclei of reference proteins. U.S. Patent 9,783,587

PREPRINTS

#**Longo, L.M.**, Hirai, H., and McGlynn, S.E. (2022). An evolutionary history of the CoA-binding domain Nat/Ivy. (*Submitted*)

Jabłońska, J., #**Longo, L.M.**, Tawfik, D.S., and Gruic-Sovulj, I. (2022). The evolutionary history of class I amino-acyl-tRNA synthetases indicates early statistical translation. (*bioRxiv; Submitted*)

PEER-REVIEWED PUBLICATIONS

*Equal contributions, #Corresponding or Co-corresponding

Seal, M., Weil-Ktorza, O., Despotović, D., Tawfik, D.S., Levy, Y., Metanis, N., #**Longo, L.M.**, Goldfarb, D. (2022). Peptide-RNA coacervates as a cradle for the evolution of folded domains. *Journal of the American Chemistry Society (accepted)*

Despotović, D., Aharon, E., Trofimiyuk, O., Dubovetskyi, A., Cherukuri, K.P., Ashani, Y., Eliason, O., Sperfeld, M., Leader, H., Castelli, A., Fumagalli, L., Savidor, A., Levin, Y., #**Longo, L.M.**, Segev, E. and Tawfik, D.S. (2022). Utilization of diverse organophosphorus pollutants by marine bacteria. *Proceedings of the National Academy of Sciences USA. (accepted)*

#**Longo, L.M.**, Kolodny, R. and McGlynn, S.E. (2021). Evidence for the Emergence of β -Treffolds by 'Peptide Budding' from an IgG-like β -Sandwich. *PLOS Computational Biology*. 18(2): e1009833.

Gruic-Sovulj, I., **Longo, L.M.**, Jabłońska, J. and Tawfik, D.S. (2021). The evolutionary history of the HUP domain. *Critical Reviews in Biochemistry and Molecular Biology*.

Vyas, P., Trofimiyuk, O., **Longo, L.M.**, Kumar-Deshmukh, F., Sharon, M. and Tawfik, D.S. (2021). Helicase-like functions in phosphate loop containing beta-alpha polypeptides. *Proceedings of the National Academy of Sciences USA*. 118: e2016131118

Longo, L.M., Jabłońska, J., Vyas, P., Kolodny, R., Ben-Tal, N. and Tawfik, D.S. (2020). On the emergence of P-loop NTPase and Rossmann enzymes from a beta-alpha-beta ancestral fragment. *eLife*. 9:e64415

Despotović, D.*, **Longo, L.M.***, Aharon, E., Kahana, A., Scherf, T., Gruic-Sovulj, I. and Tawfik, D.S. (2020). Polyamines mediate folding of primordial hyper-acidic helical proteins. *Biochemistry*. 46:4456-4462

Longo, L.M.*, Despotović, D.*, Weil-Ktorza, O.*, Walker, M.J., Jabłońska, J., Fridmann-Sirkis, Y., Varani, G., Metanis, N. and Tawfik, D.S. (2020). Primordial emergence of a nucleic acid-binding protein via phase separation and statistical ornithine-to-arginine conversion. *Proceedings of the National Academy of Sciences USA*. 117:15731-15739

- Faculty Opinions Recommendation

Longo, L.M., Petrović, D., Kamerlin, S.C.L. and Tawfik, D.S. (2020). Short and simple sequences favored the emergence of N-helix phospho-ligand binding sites in the first enzymes. *Proceedings of the National Academy of Sciences USA*. 117:5310-5318

Tenorio, C.A., **Longo, L.M.**, Parker, J.B., Lee, J. and Blaber, M. (2020). Ab initio folding of a trefoil-fold motif reveals structural similarity with a β -propeller blade motif. *Protein Science*. 29:1172-1185

Davidi D, **Longo, L.M.**, Jabłońska, J., Milo, R. and Tawfik D.S. (2018). A bird's-eye view of enzyme evolution: chemical, physicochemical, and physiological considerations. *Chemical Reviews*. 118:8786-8797

Longo, L.M.*, Gao, Y.*, Tenorio, C.A., Wang, G., Paravastu, A.K. and Blaber, M. (2018). The folding nucleus structure persists in thermally-aggregated FGF-1. *Protein Science*. 27:431-440

Noda-Garcia, L., Romero-Romero, M.L., **Longo, L.M.**, Kolodkin-Gal, I. and Tawfik, D.S. (2017). *Bacilli* glutamate dehydrogenases diverged via coevolution of transcription and enzyme regulation. *EMBO Reports*. 7:1139-1149

- Xia, X.*, **Longo, L.M.***, Sutherland, M.A. and Blaber, M. (2016). Evolution of a protein folding nucleus. *Protein Science*. 25:1227-1240
- Longo, L.M.**, Tenorio, C.A., Kumru, O.S., Middaugh, C.R. and Blaber, M. (2015). Emergence of aromatic amino acid biosynthesis enables halophile to mesophile protein adaptation. *Protein Science*. 24:27-37
- Xia, X., **Longo, L.M.** and Blaber, M. (2015). Mutation choice to eliminate buried free cysteines in protein therapeutics. *Journal of Pharmaceutical Science*. 104:566-576
- Longo, L.M.** and Blaber, M. (2015). Proteins: folding, misfolding, disordered proteins, and related diseases. *Encyclopedia of Cell Biology*. Academic Press, Oxford. 108-114
- Longo, L.M.**, Kumru, O.S., Middaugh, C.R. and Blaber, M. (2014). Evolution and Design of Protein Structure by Folding Nucleus Symmetric Expansion. *Structure*. 22:1377-1384
- Longo, L.M.** and Blaber, M. (2014). Symmetric protein architecture in protein design: top-down symmetric deconstruction. *Methods in Molecular Biology*. 1216:161-182
- Cover Article
- Longo, L.M.** and Blaber, M. (2014). Prebiotic protein design supports a halophile origin of foldable proteins. *Frontiers in Microbiology*. 4:418-419
- Stefanovic, L., **Longo, L.M.**, Zhang, Y. and Stefanovic, B. (2014). Characterization of binding of LARP6 to the 5' stem-loop of collagen mRNAs: implications for synthesis of type I collagen. *RNA Biology*. 11:1386-1401
- Longo, L.M.**, Lee, J. and Blaber, M. (2013). Simplified protein design biased for prebiotic amino acids yields a foldable, halophilic protein. *Proceedings of the National Academy of Sciences USA*. 110:2135-2139
- 2013 Kasha Award
 - Faculty Opinions Recommendation
- Longo, L.M.***, Lee, J.*, Tenorio, C.A. and Blaber, M. (2013). Alternative folding nuclei definitions facilitate the evolution of a symmetric protein fold from a smaller peptide motif. *Structure* 21:2042-2050
- Longo, L.M.**, Şanlı-Mohamed, G. and Blaber, M. (2013). Biophysical characterization of a thermoalkalophilic esterase from *Geobacillus sp.* *Journal of Proteins and Proteomics*. 4:123-128
- Phipps, H., **Longo, L.M.**, Blaber, S.I., Blaber, M. and VanLandingham, J. (2013). Kallikrein-related peptidase 6: a biomarker for traumatic brain injury in rat. *Journal of Brain Injury*. 27:1698-1706
- Longo, L.M.**, Lee, J. and Blaber, M. (2012). Experimental support for the foldability-function tradeoff hypothesis: segregation of the folding nucleus and functional regions in FGF-1. *Protein Science*. 21:1911-1920
- 2012 Protein Science Best Paper Award
- Longo, L.M.** and Blaber, M. (2012). Protein design at the interface of the prebiotic and biotic worlds. *Archives of Biochemistry and Biophysics*. 526:16-21
- Blaber, M., Lee, J. and **Longo, L.M.** (2012). Emergence of symmetric protein architecture from a simple peptide motif: evolutionary models. *Cellular and Molecular Life Sciences*. 69:3999-4006
- Longo, L.M.** and Blaber, M. (2012). Protein design—a vast unexploited resource. *Journal of Proteins and Proteomics*. 3:78-83
- Lee, J., Dubey, V.K., **Longo, L.M.** and Blaber, M. (2008). A logical OR redundancy within the Asx-Pro-Asx-Gly type I β -turn motif, *Journal of Molecular Biology*. 377:1251-1264

Hacisalihoglu, G., Ji, P., **Longo, L.M.**, Olson, S. and Momol, T.M. (2007). Bacterial wilt induced changes in nutrient distribution and biomass and the effect of acibenzolar-S-methyl on bacterial wilt in tomato. *Crop Protection*. 26:978-982

Hacisalihoglu, G., Duke, E. and **Longo, L.M.** (2005). Differential response of common bean genotypes to mycorrhizal colonization. *Proceedings of the Florida State Horticultural Society*. 118:150-152

OTHER PUBLICATIONS

Longo, L.M., Despotović, D., Noda-García, L. (2021). Dan Salah Tawfik (1955-2021): A pioneer of molecular evolution. *Nature Ecology and Evolution*. <https://doi.org/10.1038/s41559-021-01539-4>