Curriculum Vitae

Personal Information

Name: Sebastian Marius Fica
Nationality: Romanian
Address: Medical Research Council
Laboratory of Molecular Biology
Francis Crick Avenue, Cambridge, CB2 0QH, UK
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Education

September 2007 – November 2013
Doctor or Philosophy (PhD), Cell and Molecular Biology
The University of Chicago, Chicago USA
Advisors: Dr. Jonathan P. Staley and Joseph A. Piccirilli

September 2003 – May 2007
Bachelor of Arts (BA), Biology and Government, *summa cum laude* with Honors
Skidmore College, Saratoga Springs USA
Advisors: Dr. Patricia Hilleren and Timothy Burns

Research Experience

March 2018 – present
Postdoctoral Fellow, Spliceosome structure
Nagai lab, MRC-LMB, Cambridge UK
Solved near-atomic resolution structures of H. sapiens catalytic spliceosomes.

March 2016 – March 2018
Marie Sklodowska-Curie Fellow, Spliceosome structure
Nagai lab, MRC-LMB, Cambridge UK
Solved near-atomic resolution structures of S. cerevisiae catalytic spliceosomes.

Jun 2014 – March 2016
EMBO Long Term Fellow, Spliceosome structure
Nagai lab, MRC-LMB, Cambridge UK
Established protocols for purification of active catalytic spliceosomes suitable for cryo-electron microscopy.

November 2013 – May 2014
Postdoctoral scholar, Catalytic mechanisms of pre-mRNA splicing
Staley lab, The University of Chicago, Chicago USA
Using chemical biology and molecular genetics, showed that a group II intron-like RNA triplex forms in the U6 snRNA.

September 2008 – November 2013
PhD Candidate, Catalytic mechanisms of pre-mRNA splicing
Staley lab, The University of Chicago, Chicago USA
Using chemical biology and molecular genetics, showed that pre-mRNA splicing is catalyzed directly by RNA through positioning of catalytic metal ions.

January 2008 – March 2014
Research Assistant, Role of ubiquitin in spliceosome disassembly
Staley lab, The University of Chicago, Chicago USA
Studied the potential role of ubiquitin in spliceoosme disassembly.

January 2006 – June 2007
Research Assistant, mRNA splicing quality control in *S. cerevisiae*
Hilleren Lab, Skidmore College, Saratoga Springs USA
Using transcription shut-off experiments, studied degradation of unspliced pre-mRNAs in S. cerevisiae.

January 2004 – December 2004
Research Assistant, Hormone action in the brain
Tetel Lab, Skidmore College, Saratoga Springs USA
Studied the role of receptor coactivators during expression of the progesterone receptor in the M. musculus brain.

Teaching Experience

June – August 2015
LMB Summer Student Mentor
Nagai Lab, MRC-LMB, Cambridge UK
Supervised a summer student in the Nagai lab, working on purification of spliceosomes stalled immediately after mRNA formation. I demonstrated electron microscopy and techniques used in biochemical studies of pre-mRNA splicing.

Jan 2008 – Mar 2008
Teaching Assistant, Cell Biology I
The University of Chicago, Chicago USA
This was an introductory cell biology course for graduate students. My responsibilities included grading weekly questions and supervising discussion sections.

Jan 2012 – Mar 2012
Teaching Assistant, Molecular Biology II
The University of Chicago, Chicago USA
This was an advanced molecular biology course for graduate students, focused on RNA processing. My responsibilities included supervising discussion sections and grading proposals written by the students.

Publications

Research articles

Fica, Sebastian M.*, Oubridge, C., Wilkinson, M. E., Newman, A. J., Nagai, K.* (2019) A human postcatalytic spliceosome structure reveals essential roles of metazoan factors for exon ligation. ***Science***, *363*, 710-714, *corresponding authors.

Wilkinson, M. E., Fica Sebastian M., Galej, W. P., Norman, C. M., Newman, A. J., Nagai, K. (2017) Postcatalytic spliceosome structure reveals mechanism of 3'-splice site selection. ***Science***, *358***,** 1283–1288.

Fica, Sebastian M.*, Oubridge, C., Galej, W. P., Wilkinson, M. E., Bai, X.-C., Newman, A. J., & Nagai, K.* (2017). Structure of a spliceosome remodelled for exon ligation. ***Nature***, *542*, 377-380, *corresponding authors.

Galej, W. P., Wilkinson, M. E., Fica, Sebastian M., Oubridge, C., Newman, A. J., & Nagai, K. (2016). Cryo-EM structure of the spliceosome immediately after branching. ***Nature***, *537*, 197–201.

*Fica, Sebastian M., *Mefford, M. A., Piccirilli, J. A., & Staley, J. P. (2014). Evidence for a group II intron-like catalytic triplex in the spliceosome. ***Nature Structural & Molecular Biology***, *21*, 464–471, *co-first authors.

*Fica, Sebastian M., *Tuttle, N., Novak, T., Li, N.-S., Lu, J., Koodathingal, P., Dai, Q., Staley, J. P., Piccirilli, J. A. (2013). RNA catalyses nuclear pre-mRNA splicing. ***Nature***, *503*, 229–234. *co-first authors.

Schellenberg, M. J., Wu, T., Ritchie, D. B., Fica, Sebastian M., Staley, J. P., Atta, K. A., LaPointe, P. L., MacMillan, A. M. (2013). A conformational switch in PRP8 mediates metal ion coordination that promotes pre-mRNA exon ligation. ***Nature Structural & Molecular Biology***, *20*, 728–734.

Review articles

Fica, Sebastian M.*, & Nagai, K.* (2017). Cryo-electron microscopy snapshots of the spliceosome: structural insights into a dynamic ribonucleoprotein machine. ***Nature Structural & Molecular Biology***, *24*, 791–799, *corresponding authors.

Nguyen, T. H. D., Galej, W. P., Fica, Sebastian M., Lin, P.-C., Newman, A. J., & Nagai, K. (2015). CryoEM structures of two spliceosomal complexes: starter and dessert at the spliceosome feast. ***Current Opinion in Structural Biology,*** *36*, 48–57.

Book chapters

Sebastian M. Fica, Eliza C. Small, Melissa Mefford, and Jonathan P. Staley, Mechanistic Insights into Mammalian Pre-mRNA Splicing, *Posttranscriptional Gene Regulation: RNA Processing in Eukaryotes*, Jane Wu Ed, First Edition, Wiley (2013).

Professional presentations

Oral presentations

Fica, Sebastian M., Oubridge, C., Wilkinson, M. E., Newman, A. J., Nagai, K. Cryo-EM snapshots of the catalytic spliceosome: and RNA heart in a malleable protein body, *PSB Symposium "Macromolecules in action"*, Grenoble, France (2019).

Fica, Sebastian M., Oubridge, C., Wilkinson, M. E., Newman, A. J., Nagai, K. A human postcatalytic spliceosome structure reveals essential roles of metazoan factors for exon ligation, *24th Annual Meeting of the RNA Society*, Krakow, Poland (2019).

Sebastian M. Fica, Max E. Wilkinson, Chris Oubridge, Andrew J. Newman, and Kiyoshi Nagai. Cryo-EM snapshots of the catalytic spliceosome: insights into splice site recognition and ATPase-mediated remodeling, *Murnau Conference on Structural Biology*, Murnau, Germany (2018)

Sebastian M. Fica, Chris Oubridge, Wojtek P. Galej, Max E. Wilkinson, Xiao-Chen Bai, Andrew J. Newman, and Kiyoshi Nagai. Cryo-EM structures of the catalytic spliceosome elucidate remodeling by a DEAH-box ATPase, *China-UK Life Sciences and Medicine Summit*, Beijing, China (2017)

Sebastian M. Fica, Chris Oubridge, Wojtek P. Galej, Max E. Wilkinson, Xiao-Chen Bai, Andrew J. Newman, and Kiyoshi Nagai. Cryo-EM structures of the catalytic spliceosome elucidate remodeling by a DEAH-box ATPase, *2017 RNA Symposium*, Hefei, China (2017)

Sebastian M. Fica, Chris Oubridge, Wojtek P. Galej, Max E. Wilkinson, Xiao-Chen Bai, Andrew J. Newman, and Kiyoshi Nagai. Cryo-EM structures of the catalytic spliceosome elucidate remodeling by a DEAH-box ATPase, *Helicases and nucleic acid-based machines: Structure, mechanism and regulation and roles in human disease*, Kloster Banz, Germany (2017)

Sebastian M. Fica, Chris Oubridge, Wojtek P. Galej, Max E. Wilkinson, Xiao-Chen Bai, Andrew J. Newman, and Kiyoshi Nagai. Cryo-EM Structures of the Catalytic Spliceosome, *EMBO Fellows' Meeting*, Heidelberg, Germany (2017)

Sebastian M. Fica, Chris Oubirdge, Wojtek P. Galej, Max E. Wilkinson, Xiao-Chen Bai, Andrew J. Newman, and Kiyoshi Nagai. Structure of the C* Spliceosome, *5th UK RNA Splicing Workshop*, Rydal Hall, UK (2017)

Sebastian M. Fica, Melissa Mefford, Joseph A. Piccirilli, and Jonathan P. Staley, A group II intron-like catalytic triplex forms in the U6 snRNA during spliceosome activation, *18th annual meeting of the RNA Society*, Davos, Switzerland (2013)

Sebastian M. Fica, Nicole Tuttle, Qing Dai, Nan-Sheng Li, Jun Lu, Joseph A. Piccirilli, and Jonathan P. Staley, The spliceosome functions as a ribozyme, *Chicagoland RNA Club*, Chicago, USA (2012)

Sebastian M. Fica, Nicole Tuttle, Qing Dai, Nan-Sheng Li, Jun Lu, Joseph A. Piccirilli, and Jonathan P. Staley, Evidence for functional interactions between the substrate and the U6 snRNA during catalysis of pre-mRNA splicing, *FASEB Nucleic Acid Enzymes*, Snowmass, USA (2012)

Sebastian M. Fica, Thaddeus Novak, Prakash Koodathingal, Nan-Sheng Li, Jun Lu, Joseph A. Piccirilli, Jonathan P. Staley, Metal ligands are conserved between the spliceosomal and group II intron active sites, *Eukaryotic pre-mRNA processing*, Cold Spring Harbor, USA (2009)

Poster presentations

Fica, Sebastian M., Oubridge, C., Wilkinson, M. E., Newman, A. J., Nagai, K. A human postcatalytic spliceosome structure: novel insights into metazoan exon ligation factors. *Eukaryotic pre-mRNA processing*, Cold Spring Harbor, USA (2019)

Sebastian M. Fica, Qing Dai, Nan-Sheng Li, Joseph Piccirilli, and Jonathan Staley. A double sulfur substitution at the 5' splice site reveals metal ion interactions between U6 and the pre-mRNA during splicing catalysis, *Eukaryotic pre-mRNA processing*, Cold Spring Harbor, USA (2011)

Sebastian M. Fica, Joseph Piccirilli, and Jonathan Staley. A residue in the RNaseH-like domain of Prp8 is important during the catalytic stage of pre-mRNA splicing, *15th annual meeting of the RNA Society*, Seattle, USA (2010)

Sebastian M. Fica, Thaddeus Novak, Joseph Piccirilli, and Jonathan Staley, October, 2009. Metal ligand conservation between the spliceosomal and group II intron active sites, *CBC Symposium: "The Biology of Non-Coding RNAs: Old Molecules, New Actions"*, Chicago, USA (2013), awarded honorable mention

Cheryl Jenks, Sebastian M. Fica, Caitlin McDonold and Patricia Hilleren. Analysis of pre-mRNA Fate in First-Step Splicing Mutants of *S. cerevisiae*, *13th annual meeting of the RNA Society*, Berlin, Germany (2008)

Relevant technical skills

Cryo-electron microscopy – *Experience in sample preparation, EM imaging and data processing techniques, and model building for the determination of near-atomic resolution structures of RNA-protein complexes by cryo-electron microscopy.*

RNA/ protein complexes – *Experience in the purification and functional study of spliceosomal RNA/ protein complexes through a variety of techniques including immunoprecipitation, UV crosslinking, primer extension, and native gel assays.*

Biochemistry and enzymology – *Experience in protein expression and purification, RNA transcription/ purification, synthetic RNA construction methods and the use of chemical modifications to study RNA-based catalysis.*

Molecular genetics – *Experience in molecular cloning and mutagenesis-based yeast genetics in vivo, as applied to the study of RNA/ protein interactions and the functional study of pre-mRNA processing pathways.*

Awards

June 2014
The Departmental Award for Outstanding Performance in the Field of Cell and Molecular Biology
The University of Chicago, Chicago USA
Awarded annually by the Department of Molecular Genetics and Cell Biology for the best doctoral research work.

June 20014
The Best Dissertation Award
The University of Chicago, Chicago USA
Awarded annually by the Biological Sciences Division for the best doctoral dissertation.

May 2007
The Donald W. Pyle Memorial Award
Skidmore College, Saratoga Springs USA
Awarded annually by the Department of Biology to recognize two outstanding senior student research projects.

May 2007
The Erwin Levine Prize
Skidmore College, Saratoga Springs USA
Awarded annually by the Department of Government to a senior student who has done outstanding work in the study of political theory.

May 2007
The Thoroughbred Award
Skidmore College, Saratoga Springs USA
Awarded annually by the Office of Leadership Activities to students who throughout their college career have demonstrated a commitment to leadership and to the Skidmore community.

June 2005
The Organic Chemistry Award
Skidmore College, Saratoga Springs USA
Awarded annually by the Department of Chemistry to the best student of organic chemistry.

May 2004
The 2004 CRC Press Freshman Chemistry Achievement Award
Skidmore College, Saratoga Springs USA
"In recognition of outstanding scholastic achievement in chemistry during the freshman year at Skidmore College."