

Curriculum vitae of Nenad Ban, 2018

Professor for Structural Molecular Biology
ETH Zurich (Swiss Federal Institute of Technology)
Born May 3rd 1966, Zagreb (Croatia)

Nenad Ban was born in Zagreb, Croatia and educated at the University of Zagreb. He continued with his studies in the US where he obtained a PhD degree at the University of California at Riverside in the group of Alexander McPherson. His interest in understanding the process of protein synthesis led him for his postdoctoral work to the Department of Molecular Biophysics and Biochemistry at Yale University where he determined the atomic structure of the large ribosomal subunit by X-ray crystallography, as part of the group in the laboratory of Thomas Steitz. These results demonstrated that the ribosome is a ribozyme.

Since 2000 Nenad Ban is a professor of structural molecular biology at the ETH Zurich. Structural studies in his group on bacterial and eukaryotic ribosomes and their functional complexes, using a combination of crystallographic, electron microscopic and biochemical experiments, have provided fundamental insights into the process of protein synthesis in all kingdoms of life. His group has obtained detailed structural information on eukaryotic ribosomes, which are considerably larger and more complex than their bacterial counterparts, by determining the first complete structures of both eukaryotic ribosomal subunits each in complex with an initiation factor. His group also obtained a breakthrough in visualizing mammalian mitochondrial ribosomes at atomic resolution, which revealed their unusual structure and the mechanism of how mitochondrial ribosomes, specialized for the synthesis of membrane proteins, are attached to membranes. Nenad Ban is a member of EMBO, the German Academy of Sciences, the Croatian Academy of Arts and Sciences and the recipient of several prizes and awards including the Heinrich Wieland Prize, the Roessler Prize of the ETH Zurich, the Latsis Prize, the Friedrich Miescher Prize of the Swiss Society for Biochemistry, the Spiridon Brusina Medal, the AAAS Newcomb Cleveland Prize, and the Ernst Jung Prize for Medicine.

Degree/Higher education

- B.S., Molecular Biology and Biochemistry, Summa Cum Laude (based on GPA) 1990
Faculty of Natural Sciences and Mathematics University of Zagreb, Croatia
- PhD, Biochemistry, Minor in Computer Science, with Prof. Alex McPherson 1994
University of California at Riverside, USA
- Postdoctoral training, Prof. Thomas A. Steitz 1994 – 1998
Yale University, Department of Molecular Biophysics and Biochemistry

Professional career

- 1999 - Research Scientist, Yale University
- 2000 - Assistant professor, ETH Zurich
- 2004 - Associate professor, ETH Zurich
- 2007 - Professor, ETH Zurich

Institutional responsibilities

- 2006 - 2008, 2014 – 2016 - Chair, Institute of Molecular Biology and Biophysics
- 2010 - 2014 - Member of the board of the Electron Microscopy Center of the ETH Zurich
- 2012 – 2017 - President of the tenure committee of the ETH Zurich
- 2013 - Member of the Wolfgang-Pauli Lectures Committee
- 2013 - Deputy Director of the Zurich Centre for Molecular Structure and Mechanism

Editorial boards: Science, Cell reports, Current opinion in Structural Biology series, ACS Biochemistry

Prizes and awards

- 2017 - **Ernst Jung Prize** for Medicine
- 2012 - **Spiridon Brusina Medal** of the Croatian Society of Genetics, Biology, and Biochemistry

- 2010 - **Heinrich Wieland Prize**
- 2009 - **Roessler Prize of the ETH Zurich**
- 2005 - **Latsis Prize**
- 2004 - **Friedrich-Miescher Prize**, Swiss Society for Biochemistry.
- 2002 - **Newcomb-Cleveland Prize**, American Association for Advancement of Science.
- 2002 - **Human Frontier Science Program** Young Investigator Research Award
- 1999 - **Burroughs Wellcome** Fund Career Award

Honors, memberships

- 2016 - **Shipley** Distinguished Lectureship
- 2012 - **Ramachandran** Memorial Lecture, honorary member of the Indian Biophysical Society.
- 2009 - **EMBL Distinguished Speaker** lecture.
- 2008 - **EMBO** member
- 2008 - Member of the **Leopoldina, German Academy of Sciences**
- 2007 - **Nathan O Kaplan** lecture, University of California at San Diego
- 2006 - **LeFevre Memorial Lecture in Biophysics**, CNRS Strasbourg, France
- 2006 - **Roemer** lecture, Ludwig Maximilian University Munich, Germany

Organization of conferences (recent)

2017 - Co-organizer **12th Symposium "Trends in Structural Biology International Symposium"**

2017 - Member of the Scientific Committee of the **Life Sciences Switzerland** Annual Meeting

2015 - President of the 29th **European Crystallographic Meeting** Program Committee

2015 - **Protein Synthesis and Translational Control** organizer (EMBO conference, alternating with CSHL)

2015 – Co-organizer 11th Symposium **Trends in Structural Biology** (150 participants)

Selected recent Invited Plenary and Keynote Lectures:

- 1) 10th Joint Meeting on Medicinal Chemistry – Dubrovnik, 2017, Plenary lecture
- 2) German Society of Chemistry Scientific Forum Chemistry 2017 - Anniversary Congress - 150 Years – Keynote speaker.
- 3) EMBO Conference: Mitochondrial Molecular Biology, 2016, Stockholm Sweden Keynote speaker.
- 4) International symposium on AARSs, 2015, Barcelona Spain – Keynote (EMBO) speaker.
- 5) Brussels, Belgium, August 19-23 2015 Keynote Lecture Ribosome Synthesis Conference, European Molecular Biology Organization Conference.
- 6) Heidelberg, Germany, September 2013 - Keynote Lecture, Translational Control European Molecular Biology Organization Conference
- 7) Vienna, Austria, 2013 - Max Birnstiel Lectures of the Research Institute of Molecular Pathology
- 8) Mumbai, India January 2013 - G. N. Ramachandran Memorial Lecture of the Indian Biophysical Society

Selected publications

- 1) Kobayashi K, Jomaa A, Lee JH, Chandrasekar S, Boehringer D, Shan SO, Ban N. (2018) Structure of a prehandover mammalian ribosomal SRP·SRP receptor targeting complex. *Science*. 360(6386):323-327. doi: 10.1126/science.aar7924.
- 2) Weisser M, Schäfer T, Leibundgut M, Böhringer D, Aylett CHS, Ban N. (2017) Structural and Functional Insights into Human Re-initiation Complexes *Mol Cell*. 67(3)
- 3) Jomaa A, Boehringer D, Leibundgut M, Ban N. (2017) Structure of the quaternary complex between SRP, SRP receptor, translocon and the translating ribosome *Nat Commun*. 8:15470

- 4) Greber BJ, Gerhardy S, Leitner A, Leibundgut M, Salem M, Boehringer D, Leulliot N, Aebersold R, Panse VG, Ban N. (2015) Insertion of the Biogenesis Factor Rei1 Probes the Ribosomal Tunnel during 60S Maturation. *Cell* 164(1-2):91-102.
- 5) Aylett CH, Sauer E, Imseng S, Boehringer D, Hall MN, Ban N, Maier T (2015) Architecture of human mTOR complex 1. *Science*. 2016 Jan 1;351(6268):48-52.
- 6) Quade N, Boehringer D, Leibundgut M, van den Heuvel J, Ban N. (2015) Cryo-EM structure of Hepatitis C virus IRES bound to the human ribosome at 3.9-Å resolution. *Nat Commun*. 2015 Jul 8;6:7646.
- 7) Greber BJ, Bieri P, Leibundgut M, Leitner A, Aebersold R, Boehringer D, Ban N. (2015) Ribosome. The complete structure of the 55S mammalian mitochondrial ribosome. *Science*. 348(6232):303-8.
- 8) Aylett CH, Boehringer D, Erzberger JP, Schaefer T, Ban N. (2015) Structure of a Yeast 40S-eIF1-eIF1A-eIF3-eIF3j initiation complex. *Nat Struct Mol Biol*. 22(3):269-71.
- 9) Greber BJ, Boehringer D, Leibundgut M, Bieri P, Leitner A, Schmitz N, Aebersold R, Ban N. (2014) The complete structure of the large subunit of the mammalian mitochondrial ribosome. *Nature* 515(7526):283.
- 10) Erzberger JP, Stengel F, Pellarin R, Zhang S, Schaefer T, Aylett CHS, Cimermančič P, Boehringer D, Sali A, Aebersold R, and Ban N. (2014) Molecular Architecture of the 40S•eIF1•eIF3 Translation Initiation Complex. *Cell* 158(5):1123-35.
- 11) Greber BJ, Boehringer D, Leitner A, Bieri P, Voigts-Hoffmann F, Erzberger JP, Leibundgut M, Aebersold R, Ban N. (2014) Architecture of the large subunit of the mammalian mitochondrial ribosome. *Nature* 505(7484):515-9.
- 12) Voigts-Hoffmann F, Schmitz N, Shen K, Shan SO, Ataide SF, Ban N. The structural basis of FtsY recruitment and GTPase activation by SRP RNA. *Mol Cell*. 52(5):643-54.
- 13) Weisser M, Voigts-Hoffmann F, Rabl J, Leibundgut M, Ban N. (2013) The crystal structure of the eukaryotic 40S ribosomal subunit in complex with eIF1 and eIF1A. *Nat Struct Mol Biol*. 20(8):1015-7.
- 14) Greber BJ(1), Boehringer D, Montellese C, Ban N. (2012) Cryo-EM structures of Arx1 and maturation factors Rei1 and Jjj1 bound to the 60S ribosomal subunit. *Nat Struct Mol Biol*. (12):1228-33.
- 15) Klinge S, Voigts-Hoffmann F, Leibundgut M, Arpagaus S, Ban N. (2011) Crystal structure of the eukaryotic 60S ribosomal subunit in complex with initiation factor 6. *Science*, 334, 941-8.
- 16) Ataide SF, Schmitz N, Shen K, Ke A, Shan SO, Doudna JA, Ban N. (2011) The crystal structure of the signal recognition particle in complex with its receptor. *Science*. 2011 Feb 18;331(6019):881-6.
- 17) Rabl J, Leibundgut M, Sandro F, Ataide SF, Haag A and Ban N (2010) Crystal Structure of the Eukaryotic 40S Ribosomal Subunit in Complex with Initiation Factor 1. *Science* 331(6019):881-6.
- 18) Kohler R, Boehringer D, Greber B, Bingel-Erlenmeyer R, Collinson I, Schaffitzel C, Ban N (2009) YidC and Oxa1 form dimeric insertion pores on the translating ribosome. *Mol Cell* 34(3):344-53.
- 19) Mueller M, Grauschopf U, Maier T, Glockshuber R, Ban N (2009) The structure of a cytolitic alpha-helical toxin pore reveals its assembly mechanism. *Nature* 459(7247):726-30.
- 20) Maier T, Leibundgut M, and Ban N (2008) The Crystal Structure of a Mammalian Fatty Acid Synthase. *Science* 321(5894):1315-22
- 21) Bingel-Erlenmeyer R, Kohler R, Kramer G, Sandikci A, Antolić S, Maier T, Schaffitzel C, Wiedmann B, Bukau B, Ban N (2008) A peptide deformylase-ribosome complex reveals mechanism of nascent chain processing. *Nature* 452(7183): 108-11
- 22) Leibundgut M, Jenni S, Frick C, Ban N (2007) Structural Basis for Substrate Delivery by Acyl Carrier Protein in the Yeast Fatty Acid Synthase. *Science* 316: 288-290.
- 23) Jenni S, Leibundgut M, Boehringer D, Frick C, Mikolásek B, Ban N (2007) Structure of Fungal Fatty Acid Synthase and Implications for Iterative Substrate Shuttling *Science* 316: 254-261.
- 24) Schaffitzel C, Oswald M, Berger I, Ishikawa T, Abrahams JP, Koerten HK, Koning RI and Ban N (2006) Structure of the *E. coli* signal recognition particle bound to a translating ribosome. *Nature* 444(7118):503-6.
- 25) Thore S, Leibundgut M, Ban N (2006) Structure of the eukaryotic thiamine pyrophosphate riboswitch with its regulatory ligand. *Science* 312(5777):1208-11.

- 26) Maier T, Jenni S, and Ban N (2006) Architecture of mammalian fatty acid synthase at 4.5 Å resolution. *Science* 311(5765):1258-62.
- 27) Jenni S, Leibundgut M, Maier T and Ban N (2006) Architecture of a fungal fatty acid synthase at 5 Å resolution. *Science* 311(5765):1263-7.
- 28) Mitra K, Schaffitzel C, Shaikh T, Tama F, Jenni S, Brooks CL, Ban N & Frank J (2005). Structure of the *E. coli* protein-conducting channel bound to a translating ribosome. *Nature* 438(7066): 318-24.
- 29) Leibundgut M, Frick C, Thanbichler M, Bock A, Ban N (2005) Selenocysteine tRNA-specific elongation factor SelB is a structural chimaera of elongation and initiation factors. *EMBO J* 24(1): 11-22.
- 30) Ferbitz L, Maier T, Patzelt H, Bukau B, Deuerling E and Ban N (2004) Trigger Factor in Complex with the Ribosome forms a Molecular Cradle for Nascent Proteins. *Nature* 431:590-6.
- 31) Gutmann S, Haebel P, Metzinger L, Sutter M, Felden B and Ban N (2003) Crystal Structure of the tRNA domain of transfer messenger RNA in complex with SmpB. *Nature* 424 699-703.
- 32) Kramer G, Rauch T, Rist W, Vorderwulbecke S, Patzelt H, Schulze-Specking A, Ban N, Deuerling E, Bukau B (2002) L23 protein functions as a chaperone docking site on the ribosome. *Nature* 419(6903):171-4.
- 33) Ban N, Nissen P, Hansen J, Moore P B, Steitz TA (2000) The complete atomic structure of the large ribosomal subunit at 2.4 Å resolution. *Science* 289, 905-920.
- 34) Nissen P, Hansen J, Ban N, Moore PB, Steitz TA (2000) The structural basis of ribosome activity in peptide bond synthesis. *Science* 289, 920-930.
- 35) Ban N, Nissen P, Hansen J, Capel M, Moore PB, Steitz TA (1999) Placement of Protein and RNA structures into a 5 Å - Resolution Map of the 50S Ribosomal Subunit. *Nature* 400:841-847.
- 36) Ban N, Freeborn B, Nissen P, Penczek P, Grassucci RA, Sweet R, Frank J, Moore PB, Steitz TA (1998). A 9 Å Resolution X-ray Crystallographic Map of the Large Ribosomal Subunit. *Cell* 93(7): 1105-1115.
- 37) Ban N and McPherson A (1995) The Structure of Satellite Panicum Mosaic Virus at 1.9 Å Resolution. *Nat Struct Biol* 10, 882-890.