BIOGRAPHICAL SKETCH

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NAME: **Sozanne R Solmaz, Ph.D.**

eRA COMMONS USER NAME (credential, e.g., agency login): ssolmaz

POSITION TITLE: Associate Professor in Biological Chemistry

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Leibniz University of Hannover, Germany	Vordiplom	02/98	Biochemistry
Leibniz University of Hannover, Germany	M.S.	09/01	Biochemistry
Max Planck Institute of Biophysics and Goethe University, Frankfurt, Germany	Ph.D.	03/06	Biochemistry
Howard Hughes Medical Institute at the Rockefeller University	Postdoctoral	07/14	Biochemistry

A. Personal Statement

Cell cycle-specific positioning of the nucleus sustains fundamental processes in brain and muscle development. We plan to establish how correct timing, directionality and velocity of transport of the nucleus is achieved, by characterizing the interactions of cargo adapter Nup358 with opposing motors Bicaudal D2/dynein and kinesin-1. We intend to apply cryo-EM to determine structures of the dynein adapter Bicaudal D2 with cargo adapters and kinesin-1 bound at atomic resolution. The goal of the proposal is for me to become an independent single-particle cryo-EM researcher. I am well-trained for the proposed work. As a graduate student with Nobel laureate Hartmut Michel, I determined a structure of a 500 kDa integral membrane protein complex that is crucial for essential energy transfer processes. During my postdoctoral training with Nobel laureate Günter Blobel I have applied a combination of structural biology and biophysical methods to characterize protein components of the nuclear pore complex (e.g. Solmaz *et al.,* 2011, Cell 147: 590; Solmaz *et al*., 2013, Proc Natl Acad Sci U S A 110: 5858). In 2014, I started my research group at Binghamton University, which focuses on how the cell cycle-specific transport of the nucleus is orchestrated, which is important for brain and muscle development (e.g. Noell *et al*., 2019, J Phys Chem Lett 10: 4362; Cui *et al*., Traffic, 2020, 21: 463-478; Cui *et al.*, 2019, Biochemistry, 58: 5085; Noell *et al.*, 2018, Biochemistry, 57: 6538; Loftus *et al*., 2017, Cell Cycle, 16: 1414.). This project is supported by my long-standing collaborators, Reza Khayat, who is an expert in cryo-EM and Yusuf. M Ali and Kathy Trybus, who are experts in the motor field and with whom I have also published (Cui, **Ali**, Goyal, Zhang, Loh, **Trybus**, **Solmaz**, 2020, **Traffic** 21: 463).

B. Positions and Honors

Positions

2/2001-8/2001	Diploma thesis work with Nobel laureate **Robert Huber**, Ph.D., Department of Structure Research, Max Planck Institute of Biochemistry, Martinsried, Germany.
11/2001-6/2006	Ph.D. student with Nobel laureate **Hartmut Michel**, Ph.D., supervised by Carola Hunte, Ph.D., Department of Molecular Membrane Biology, Max Planck Institute of Biophysics, Frankfurt, Germany.
7/2006-7/2014	Postdoctoral Associate and Research Associate with Nobel laureate **Günter Blobel**, M.D. Ph.D., Laboratory of Cell Biology, Howard Hughes Medical Institute at the Rockefeller University, New York.
Since 8/2014	Associate Professor in Biological Chemistry, Department of Chemistry, State University of New York at Binghamton since 8/2020. Started out as Assistant Professor.

Memberships and Professional Service

2016 - 2020	Reviewer for the Journals Nature Communications, Cell Chemical Biology, Structure, PLOS Biology, Journal of Visualized Experiments, BBA - Molecular Cell Research, Scientific Reports, and Cellular & Molecular Biology Letters, PLOS One, Trends in Genetics.
11/2018	Organized the first Binghamton University Conference in Undergraduate Chemistry Research. Helped to organize the second and third iteration of the event in 2019 and 2020.
2021 & 2020	SRAA Competition Poster Judge for the Motility & Cytoskeleton Subgroup at the Annual Meeting of the Biophysical Society.
09/2017	Chair of a session at the 2017 Nuclear Transport Meeting, Sant Feliu de Guixols, Spain.
10/2016	Chair of a session at the Northeast Regional Meeting of the American Chemical Society.
Since 2016	The PI interviews prospective candidates for the NY State Master Teacher Program, which mentors STEM teachers of NYS public schools.
2013-2020	Member of the American Society for Cell Biology, the Biophysical Society and the American Chemical Society.
Since 2006	Mentor in the Minerva FemmeNet network for women of the Max-Planck-Society.

Honors

03/2018	Travel Award for the 2018 NSF-CHE Early Career Investigator Workshop, Alexandria, VA.
12/2015	Faculty accomplishment award, Department of Chemistry, SUNY Binghamton.
10/2013	Travel award for the American Society for Cell Biology Annual Meeting.
07/2012	Travel grant for the American Crystallographic Association Meeting.
01/2012	Poster award at the New York Structure Biology Discussion Group 5th Winter Meeting, NYAS, New York.
01/2012	Nominated by the Rockefeller University for the New York Academy of Sciences' Blavatnik Award.

C. Contributions to Science

1. **Regulation of the Nup358/Bicaudal D2 pathway of nuclear positioning and activation of Bicaudal D2 for dynein recruitment upon cargo-binding.** The cell nucleus is positioned by the dynein machinery in G2 phase of the cell cycle, a process that is important for initial stages of mitotic spindle assembly and brain development. We have established cell cycle-specific regulatory mechanisms for the Nup358/Bicaudal D2 pathway of nuclear positioning, which is essential for the differentiation of certain brain progenitor cells to neurons. Furthermore, we have provided mechanistic insights into how the dynein adapter Bicaudal D2 is activated for dynein recruitment upon cargo-binding, which is a key regulatory step for transport, as cargo-bound dynein adapters are required to activate dynein for processive motility.
   a. Cui H, Ali MY, Goyal P, Zhang K, Loh J-Y, Trybus KM, **Solmaz SR*** (2020). Coiled-coil Registry Shifts in the F684I Mutant of Bicaudal D Result in Cargo-Independent Activation of Dynein Motility. **Traffic**, 21: 463-478. DOI: 10.1111/tra.12734. PMID: 32378283. PMCID: PMC7437983
   b. Cui H, Noell CR, Behler RP, Zahn JB, Terry LR, Russ BB, **Solmaz SR*** (2019). Adapter proteins for opposing motors interact simultaneously with nuclear pore protein Nup358. **Biochemistry**, 58: 5085-5097. DOI: 10.1021/acs.biochem.9b00907. PMCID: PMC7243271.
   c. Noell CR, Loh JY, Debler EW, Loftus KM, Cui H, Russ BB, Zhang K, Goyal P, **Solmaz SR*** (2019). Role of Coiled-Coil Registry Shifts in the Activation of Human Bicaudal D2 for Dynein Recruitment upon Cargo Binding. **J Phys Chem Lett**,10: 4362-4367. DOI: 10.1021/acs.jpclett.9b01865. PMCID: PMC7243283.
   d. Noell CR, Loftus KM, Cui H, Grewer CT, Kizer M, Debler EW, and **Solmaz SR*** (2018). A quantitative model for BicD2/cargo interactions. **Biochemistry**, 57: 6538-6550. DOI: 10.1021/acs.biochem.8b00987. PMCID: PMC6520106.
   *Corresponding author.

2. **Regulation of the Nup133/CENPF pathway of nuclear positioning.** We have provided mechanistic insights into how this pathway is regulated by cyclin-dependent kinase 1 (Cdk1), which is active in G2 phase. We identified Cdk1-specific phosphorylation sites within the bipartite classical nuclear localization

signal (cNLS) of CENP-F. Thus, we propose that in G2 phase, the cNLS is weakened by phosphorylation through Cdk1, likely resulting in nuclear export of CENP-F via the still active nuclear export pathway. Once CENP-F resides in the cytosol, it can engage in pathways that are important for cell cycle progression and the faithful segregation of chromosomes into daughter cells.

a. Loftus, KM, Cui, H, Coutavas, E, King, DS , Ceravolo, A, Pereiras, D, and **SOLMAZ, SR*** (2017). Mechanism for G2 phase-specific nuclear export of the kinetochore protein CENP-F. **Cell Cycle,** 16: 1414-1429. DOI: 10.1080/15384101.2017.1338218. PMCID: PMC5553399.
   *Corresponding author.
b. Cui, H, Loftus, KM, Noell, CR, and **SOLMAZ, SR*** (2018). Identification of cyclin-dependent kinase 1 specific phosphorylation sites by an *in vitro* kinase assay. **J Vis Exp**, 135. DOI: 10.3791/57674. PMCID: PMC6101106.
   *Corresponding author.

3. **Molecular architecture of the transport channel of the nuclear pore.** Nuclear pore complexes (NPCs) are central gatekeepers for selective transport between cytoplasm and nucleus. As such, they regulate crucial cellular processes such as mitosis, DNA and RNA metabolism and gene expression. To provide insights into the molecular design of the central transport channel of the NPC, we determined x-ray structures of minimal complexes of the three channel nucleoporins that line the channel and characterized these complexes by biophysical methods. Based on the different conformations of Nup54 and Nup58, we proposed the Ring cycle model. The hallmark of this model is the notion that the channel nups can exist in multiple structural conformations, which translate into large-scale structural changes in the context of the NPC transport channel. As a result, the NPC transport channel would reversibly transition between several dilated and constricted structural states, based on cellular demands for nuclear transport. A flexible transport channel would also help to maintain the integrity of the permeability barrier during the transport of large and rigid cargo such as ribosomal subunits and viruses.
   a. **SOLMAZ, SR**, Chauhan, R, Blobel, G, and Melcak, I (2011). Molecular architecture of the transport channel of the nuclear pore complex. **CELL** 147: 590-602. PMID: 22036567.
   b. **SOLMAZ, SR***, Blobel, G* and Melcak, I* (2013). Ring cycle for dilating and constricting the nuclear pore. **Proc Natl Acad Sci U S A** 110: 5858-5863. PMID 23479651.
      *Corresponding author.
      Journal cover. Selected as science highlight by Advanced Light Source (ALS), Berkeley, CA.
   c. Sharma, A[1], **SOLMAZ, SR[1]**, Blobel, G and Melcak, I (2015). Ordered regions of channel nucleoporins Nup62, Nup54, and Nup58 form dynamic complexes in solution. **J Biol Chem** 290: 18370-18378. PMID 26025361.
      [1]First author, equally contributed. Journal cover.
   d. **SOLMAZ, SR*** (2018)**.** On the Role of the Channel Nucleoporins in Nuclear Transport. In: Nuclear-Cytoplasmic Transport, edited by Yang, W. **Nucleic Acids and Molecular Biology**, vol. 33, pp 65-112, Springer, Cham, Switzerland. DOI: 10.1007/978-3-319-77309-4_5
      *Corresponding author.

4. **Structure of an electron transfer complex**. In the mitochondrial respiratory chain, which is important to generate energy equivalents, cytochrome *c* transfers electrons from Complex III to Complex IV by transiently binding to the membrane proteins. As a graduate student with Hartmut Michel, Ph.D., and Carola Hunte, Ph.D., at the Max Planck Institute of Biophysics, I determined the structure of Complex III of the yeast respiratory chain, a 500 kDa large integral membrane protein complex, with cytochrome *c* and an antibody F_V-fragment bound at 1.9 Å resolution. By determining several structures of this ternary complex, I identified a core interface, which is likely a feature to gain specificity for formation of the reactive electron transfer complex.
   a. **SOLMAZ, SR**, and Hunte, C (2008). Structure of complex III with bound cytochrome *c* in reduced state and definition of a minimal core interface for electron transfer. **J Biol Chem** 283: 17542-17549. PMID: 18390544.
   b. Hunte, C, **SOLMAZ, S**, Palsdottir, H, and Wenz, T (2008). A structural perspective on mechanism and function of the cytochrome bc_1 complex. **Results Probl Cell Differ** 45: 253-278. PMID: 18038116.
   c. Hunte, C, **SOLMAZ, S**, and Lange, C (2002). Electron transfer between yeast cytochrome bc1 complex and cytochrome c: a structural analysis. **Biochim Biophys Acta** 1555: 21-28. PMID: 12206886.

5. Additional publications in structural biology.

a. Zhao J, Liu X, Blayney A, Gandy L, Yang C, Liu X, Xiao Y, Cosgrove MS, **SOLMAZ SR**, Zhang Y, Ban D, Loh SN, Chen J and Wang C (2021). EGCG Binds Intrinsically Disordered N-terminal Domain of p53 and Disrupts p53-MDM2 Interaction. **Nat Commun**, 12: 986. DOI: 10.1038/s41467-021-21258-5. PMCID: PMC7881117.

URL to full publication list

https://www.ncbi.nlm.nih.gov/myncbi/18yYo5cdBfekq/bibliography/public/

D. Research Support

Ongoing Research Support

R15 GM128119-01 $448,607 Solmaz (PI) 06/01/18 - 05/31/22
Cell cycle-specific recognition of the cell nucleus as cargo for dynein-dependent transport.
Role: Contact PI.

GUP-69832 Solmaz (PI) 01/01/20 - 01/01/22
Molecular mechanism for cell cycle-specific transport of the nucleus.
Role: Contact PI.
General User Proposal at Advanced Photon Source (APS). This proposal awards regular shifts for data collection at APS NECAT beam lines for X-ray crystallography.

GUP- 2786 Solmaz (PI) 07/08/19-07/08/21
Cell cycle-specific recognition of the nucleus as cargo for dynein-dependent transport.
Role: Contact PI.
General User Proposal at Cornell High Energy Synchrotron Source (CHESS). This proposal awards regular shifts for data collection at CHESS for X-ray crystallography and small-angle X-ray scattering.

Proposal No. V39-50; Submission ID: 26459 Solmaz (PI)
Structural characterization of a bi-directional transport module for positioning of the nucleus.
User proposal that awards us 2.0 days of instrument time at the National Institute of Standards and Technology (NIST) Center for Neutron Research (NCNR), Gaithersburg, MD.

Research Support Recommended for Funding (Declined)

NSF MCB-1817662 $695,829 Solmaz (PI) 07/01/18 - 06/30/21
Establishing general principles for cargo selection by the dynein adaptor Bicaudal D2.
Role: Contact PI.
Due to overlap with the R15, I had to decline this award.

Completed Research Support

GUP-58972 Solmaz (PI) 06/01/18 - 01/01/20
Title: Molecular mechanism for cell cycle-specific transport of the nucleus.
Role: Contact PI.
General User Proposal at Advanced Photon Source (APS) synchrotron.

Beam time request proposals 2507 & 2149 Solmaz (PI) 11/30/15 - 06/01/18
Cornell High Energy Synchrotron Source (CHESS), Cornell University, Ithaca
Title: Structural studies of building blocks of the nuclear pore complex.
Role: Contact PI.
This proposal awarded shifts for X-ray data collection at the CHESS synchrotron.