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	02/1998	Biochemistry
Leibniz University of Hannover, Germany	M.S.	09/2001	Biochemistry
Max Planck Institute of Biophysics and Goethe University, Frankfurt, Germany	Ph.D.	03/2006	Biochemistry
Howard Hughes Medical Institute at the Rockefeller University	Postdoctoral	07/2014	Biochemistry

A. Personal Statement

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. Nuclear positioning of the cell nucleus by motors sustains fundamental processes in brain and muscle development and 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. I am well trained for the proposed work, with a 20-year track record in Structural Biology. During a recent Sabbatical leave (9/2021-8/2022) I have completed a rigorous embedded training program in single-particle cryo-EM at the National NIH Center for Cryo-EM Access and training (NCCAT), with Dr. Bridget Carragher and Dr. Clint Potter, former co-directors of NCCAT. I also trained for three months in neuroscience in the laboratory of Dr. Richard Vallee at Columbia University Medical Center (*e.g.*, Yi J, *et al*., 2023, PLoS Genet 19: e1010642). These recent training periods enhance my expertise in structural biology. As a graduate student with Nobel laureate Hartmut Michel, I determined the crystal 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 used X-ray crystallography to determine the structures of protein components of the nuclear pore complex (e.g. Solmaz *et al.,* 2011, Cell 147: 590). Since 2014, I have successfully established my research group at Binghamton University, which focuses on how the transport of the nucleus is orchestrated by microtubules motors. This pathway facilitates fundamental processes in brain and muscle development and is essential for the generation of most brain cells (*e.g*., Gibson *et al.* 2022, eLife 11:10.7554/eLife.74714; Gibson JM, *et al.*, 2023, Biomolecules 13: 10.3390/biom13101445; Zhao X, *et al.*, 2024, Life Sci Alliance, 7: 10.26508/lsa.202302430; Noell *et al*., 2019, J Phys Chem Lett 10: 4362; Cui *et al*., 2020, Traffic 21: 463-478).

I would like to highlight the following ongoing and recently completed projects:

R01 GM144578 $271,867 Solmaz (PI) 03/01/22 - 01/31/26
Regulation of bidirectional transport of the nucleus by adapter proteins.
Role: Contact PI.

R15 GM128119-01 completed 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.

Citations:

1. Zhao X, Quintremil S, Rodriguez Castro ED, Cui H, Moraga D, Wang T, Vallee RB, **Solmaz SR*** (2024). Molecular mechanism for recognition of the cargo adapter Rab6(GTP) by the dynein adapter BicD2. **Life Sci Alliance** 7. doi: 10.26508/lsa.202302430. PMID: 38719748; PMCID: PMC11077774.
2. Gibson JM, Zhao X, Ali MY, **Solmaz SR***, Wang C* (2023). A structural model for the core Nup358-BicD2 interface. **Biomolecules** 13. doi: 10.3390/biom13101445. PMID: 37892127; PMCID: PMC10604712.
3. Gibson JM, Cui H, Ali MY, Zhao X, Debler EW, Zhao J, Trybus KM*, **Solmaz SR***, Wang C* (2022). Coil-to-α-helix transition at the Nup358-BicD2 interface activates BicD2 for dynein recruitment. **Elife** 11. doi: 10.7554/eLife.74714. PMID: 35229716; PMCID: PMC8956292.
4. Yi J, Zhao X, Noell CR, Helmer P, **Solmaz SR***, Vallee RB* (2023). Role of Nesprin-2 and RanBP2 in BICD2-associated brain developmental disorders. **PLoS Genet** 19: e1010642. doi: 10.1371/journal.pgen.1010642. PMID: 36930595; PMCID: PMC10022797.

B. Positions, Specific Appointments, and Honors

Positions

Since 8/2014	Associate Professor in Biological Chemistry, Department of Chemistry, State University of New York at Binghamton. Started out as Assistant Professor and was promoted in 2020.
9/2021-9/2023	Visiting Associate Professor, Department of Pathology and Cell Biology, Columbia University Irving Medical Center, New York City.
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.
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.
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.

Memberships and Professional Service

04/25/2025	Ad hoc NIH study section member for ZRG1 MBBC-W 02.
11/05/2024	Ad hoc NIH CSR Fellowship Review Panel member for NIH fellowships in cell biology.
06/14/2024	Ad hoc NST-4 National Institute of Neurological Disorders and Stroke and NCFA review panel member for NIH postdoctoral fellowships in neuroscience.
02/21/2024	Ad hoc NST-4 National Institute of Neurological Disorders and Stroke and NCFA review panel member for NIH postdoctoral fellowships in neuroscience.
12/05/2023	Ad hoc NIH study section member, Special Emphasis Review Panel ZRG1 MSOS-D (05) Skeletal Muscle and Exercise Physiology/Musculoskeletal Rehabilitation Sciences.
2/28-3/1/2023	Ad hoc NIH CSR fellowship review panel member in Cell Biology, Developmental Biology and Engineering, ZRG1 F05-Q.
2/17-18/2022	Ad hoc NIH study section member, Macromolecular Structure and Function C.
02/2022	Chair of a session at the 66th Biophysical Society Annual Meeting in San Francisco.
Since 11/2018	Organized the first Binghamton University Conference in Undergraduate Chemistry Research and developed it into an annual event. Co-organized six subsequent iterations of this conference.
Since 11/2016	Reviewer for the Journals eLife, 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, Acta Crystallographica Section D.
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.
Since 2013	Member of the American Society for Cell Biology and the Biophysical 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. **Cargo recognition and activation mechanism of the dynein adapter Bicaudal D2.** 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 essential for brain development. The dynein adapter Bicaudal D2 (BicD2) recognizes cargo such as Nup358 at the nuclear envelope and provides a link to the dynein motors. We have established that BicD2 recognizes its cargo Nup358 via a short cargo-recognition alpha-helix motif. 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. Gibson JM, Cui H, Ali MY, Zhao X, Debler EW, Zhao J, Trybus KM*, **Solmaz SR***, Wang C* (2022). Coil-to-α-helix transition at the Nup358-BicD2 interface activates BicD2 for dynein recruitment. **Elife** 11. doi: 10.7554/eLife.74714. PMID: 35229716; PMCID: PMC8956292.
   b. Gibson JM, Zhao X, Ali MY, **Solmaz SR***, Wang C* (2023). A structural model for the core Nup358-BicD2 interface. **Biomolecules** 13. doi: 10.3390/biom13101445. PMID: 37892127; PMCID: PMC10604712.
   c. Zhao X, Quintremil S, Rodriguez Castro ED, Cui H, Moraga D, Wang T, Vallee RB, **Solmaz SR*** (2024). Molecular mechanism for recognition of the cargo adapter Rab6(GTP) by the dynein adapter BicD2. **Life Sci Alliance** 7. doi: 10.26508/lsa.202302430. PMID: 38719748; PMCID: PMC11077774.
   d. Putta S, Rodriguez Castro ED, Ali MY, Garcia Martin JM, Zhao X, Sylvain S, Trybus KM*, **Solmaz, SR*** (2025). Cargo recognition of Nesprin-2 by the dynein adapter Bicaudal D2 for a nuclear positioning pathway that is important for neuronal migration. **Preprint, BioRxiv**, available from: https://doi.org/10.1101/2025.05.18.654709.

2. **A coiled-coil registry shift may activate the dynein adapter Bicaudal D2 for dynein binding.** 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. Based on our data we propose that cargo binding induces a registry shift in BicD2, *i.e*. a vertical displacement of the helices of the homo-dimeric coiled-coil against each other, which activates it for dynein recruitment.
   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. 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.
   *Corresponding author.
   c. Yi J, Zhao X, Noell CR, Helmer P, **Solmaz SR***, Vallee RB* (2023). Role of Nesprin-2 and RanBP2 in BICD2-associated brain developmental disorders. **PLoS Genet** 19: e1010642. doi: 10.1371/journal.pgen.1010642.
   *Corresponding author

3. **We have established cell cycle-specific regulatory mechanisms for two nuclear positioning pathways**, the Nup358/BicD2 and Nup133/CENP-F pathways, which serve to recruit dynein to the nuclear envelope in G2 phase of the cell cycle. The motility of the Nup358/BicD2/dynein pathway is also regulated

by kinesin-1, a motor with opposite polarity compared to dynein. Both pathways are essential for differentiation of radial glial progenitors, which give rise to the majority of neurons and glia cells in the neocortex.

a. 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.
b. 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.
c. 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.
d. 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.

4. **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. The hallmark of our Ring Cycle 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 dilated and constricted 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.

5. **Structure of an electron transfer complex and additional publications in structural biology**. In the mitochondrial respiratory chain, which is important to generate energy equivalents, cytochrome *c* transfers electrons from Complex III to Complex IV. 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.
d. 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.

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