Ph.D. Supervisor: C.S.I. Dr. Habil. Vlad Cojocaru

Admission exam topics (for the 1st PhD position with governmental fellowship):

- 1. The principles governing the structures of biomolecules (proteins, nucleic acids, lipids, carbohydrates)
- 2. Experimental and theoretical methods for determining the structures of biomolecules
- 3. Basic concepts of Immunology
- 4. Antibodies and antigens
- 5. Basic concepts in Linux and programming
- 6. Basic concepts in Molecular Modeling

Bibiography:

- Stryer, L., et al. (2019): *Biochemistry*. 9th Edition
- Punt, J. et. al (2018): *Kuby Immunology.* Freeman.
- Stigliano A.F. (2020): Biomolecular Interfaces. Springer Verlag
- Leach, A. R. (2001): *Molecular Modeling: Principles and Applications. (2nd or 3rd edition)*
- Schlick, T. (2013): Molecular Modeling and Simulation: An Interdisciplinary Guide
- Dettmer, P. (2021): Immune. Hodder & Stoughton
- Yi, Q. (2015): Structural biology of innate immunity, Annual Rev Immunol (doi: https://doi.org/10.1146/annurev-immunol-032414-112258
- Gao, M. (2024): Improved deep learning prediction of antigen-antibody interactions; PNAS (<u>https://doi.org/10.1073/pnas.2410529121</u>

Recommended software tutorials:

VMD (https://www.ks.uiuc.edu/Research/vmd/)

Amber (www.ambermd.org)

Haddock (https://www.bonvinlab.org/software/)

Chimera (https://www.cgl.ucsf.edu/chimera/)

Pymol (https://github.com/schrodinger/pymol-open-source)

Ph.D. Supervisor: C.S.I. Dr. Habil. Vlad Cojocaru

Admission exam topics (for the 2nd PhD position with governmental fellowship):

- 1. The principles governing the structures of biomolecules (proteins, nucleic acids, lipids, carbohydrates)
- 2. Experimental and theoretical methods for determining the structures of biomolecules
- 3. Elements of glycobiology: glycation and glycosylation of proteins;
- 4. Oxidative and glycative stress and the activity of matrix metalloproteinases
- 5. Methods for investigating ligand-protein interactions: UV-vis, Raman, IR, FPLC, electrophoresis, dichroism
- 6. Basic concepts in Linux and programming
- 7. Basic concepts in Molecular Modeling

Bibiography:

- Stryer, L., et al. (2019): *Biochemistry*. 9th Edition
- Stigliano A.F. (2020): Biomolecular Interfaces. Springer Verlag
- Leach, A. R. (2001): *Molecular Modeling: Principles and Applications. (2nd or 3rd edition)*
- Schlick, T. (2013): Molecular Modeling and Simulation: An Interdisciplinary Guide
- Martin, M.S. (2024): The Chemical Language of Protein Glycation. Nature Chemical Biology. doi: <u>10.1038/s41589-024-01644-y</u>
- Christopher A Ross & Michelle A Poirier (2004). Protein aggregation and neurodegenerative disease. Nature Medicine. doi:10.1038/nm1066
- Farzadfard A. (2021). Glycation modulates alpha-synuclein fibrillization kinetics: A sweet spot for inhibition. Journal of Biological Chemistry. doi: 10.1016/j.jbc.2022.101848

Recommended software tutorials:

VMD (https://www.ks.uiuc.edu/Research/vmd/)

Amber (www.ambermd.org)

Haddock (https://www.bonvinlab.org/software/)

Chimera (https://www.cgl.ucsf.edu/chimera/)

Pymol (https://github.com/schrodinger/pymol-open-source)