NUS National University of Singapore | Department of Biological Sciences, Faculty of Science

ON-SITE BIOLOGY COLLOQUIUM

Friday, 31 Jan 2025 | 4 pm | S3 05-02 Conference Room 1

Hosted by Assist. Prof Tan Yongzi

Map to Block S3

Structure of the II2-III2-IV2 mitochondrial supercomplex from a parasite reveals a protein inhibitor of complex III

By **Alexey Amunts**

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We report a new type of II2-III2-IV2 supercomplex in Apicomplexa-related parasites. The 1.8 megadalton supercomplex comprises 104 proteins and 114 lipids. The 2.1-Å resolution structure represents the first observation of CII in this type of supercomplex, and activity assays confirmed the presence of a complete electron transfer from succinate to molecular oxygen utilising CII. The distinctive feature is achieved via an apicomplexan subunit, which bridges two copies of CII with CIII dimer and CIV. The second finding is the identification of a negative regulator at the conserved site on CIII. We identified a heterodimer that is a protein binder locking the Rieske Iron-Sulfur Protein head in the c1 state, effectively inactivating electron transfer. Its C-terminus stabilizes the mobile head, while the N-terminus associates the heterodimer in the binding site of the universal electron carrier Cyt c. From an evolutionary perspective, the structure reveals a programmed +2 frameshifts, which illuminate evolutionary adaptations at the gene expression level.

About the Speaker

Alexey Amunts earned his PhD from Tel Aviv University for his work on plant Photosystem I in the laboratory of Nathan Nelson in 2010. He did a postdoc at the MRC Laboratory of Molecular Biology in Cambridge, focusing on cryo-EM studies of the mitoribosome with Venki Ramakrishnan. In 2016, he established an independent group at Stockholm University, focusing on mechanisms of mitochondrial translation and bioenergetics. The group investigates protein synthesis and energy production at the molecular and cellular level, examining how these fundamental processes are affected by natural selection and disease. He has been awarded the EMBO Young Investigator Award and ERC grant. Currently, Alexey Amunts serves as a Humboldt Fellow at the Max Planck Institute for Molecular Physiology in Dortmund.