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Biology in four dimensions –the contribution from modern synchrotrons

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In biology one of the greatest scientific challenge comes from the need to study and model extremely complex systems that are constantly evolving at different time and length scales, particularly in a way that is computationally affordable. Even just a slightly improved ability to predict the fait of biological processes in time and/or space would have a tremendous impact on many areas of life science, for example medicine. It is widely appreciated that modelling of biological processes, as well as the underlying chemistry, has to build on robust and relevant experimental data. There is also a need to constantly re-validate and revise these models as our understanding and the quality of the data improves.

Synchrotrons are extremely versatile research tools that are particularly well suited to experimentally study multi scale phenomena, including the often complex and hierarchical structures found in living organisms. Recent developments in synchrotron radiation technology, detectors systems and computational methods/power have allowed many of the existing experimental techniques to be refined and completely new ones to be developed. Together they now constitute a platform of different techniques, from imaging to spectroscopy, which can be study biology at different length and time scales

In my talk I will use the synchrotrons MAX IV, that is currently under construction outside Lund in Sweden, and its emerging life science platform of techniques "MAX IV LIFE"as an example how these next generation facilities can play a leading role in increasing our understanding of complex biology. I will present a range of techniques and associated scientific examples to illustrate how we will be able to study biology from the anatomic to the anatomic length scale.

The MAX IV storage ring project J. Synchrotron Rad., 21, 862-877 (2014) P.F. Tavares, S.C. Leemann, M. Sjöström, Å. Andersson

https://www.maxlab.lu.se/maxiv

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