



Novel Biology Research at Paul Scherrer Institute

Since many years imaging methods on all length scales and their development are dominating the progress in life sciences. Atomic structure and dynamics link mechanism, phenotype and diseases to a mechanistic chemical explanation. Only if you reach this level, rational intervention, like needed in drug discovery, is possible. There is an ever increasing need for correlative multi-scale analysis in biology and medicine to capture the intrinsic complexity of life sciences on all time and length scales. There is not a single biophysical method that can address all the needs of life sciences. Only a highly complementary environment can support modern mechanistic understanding of biology or drug discovery. A large facility site that is well integrated with academic research can optimally provide this challenging interdisciplinary culture. Traditionally, X-ray crystallography was dominating the interaction of large facilities with life sciences. Today, there is an evolving need for more imaging methods and for biophysics that cannot be addressed with crystallisation and crystallography. Intrinsically disordered protein mesophases and their regulation are at the center of cellular nano organisation that guide development and cellular dynamics. Biophysical methods that can address cell-cell interactions and study complex cellular assemblies in tissues are the most needed tools for the future understanding of living organisms. Genomics, proteomics and structural biology will play an important role for a long time to come, but they need to be developed further. Atomic resolution in cell structural biology has been demonstrated in recent electron tomography case studies and this development will accelerate. Electron microscopy and X-ray crystallography addressing dynamics on Ångström to nanometer resolution are developing fast. Life sciences are inherently interdisciplinary and their progress depends on novel methods development. Large facilities can play a pivotal role in the future of life sciences because they can provide excellent project stability and they are intrinsically interdisciplinary. Life sciences at large facilities can only be relevant if life science research is closely integrated into the strategy of the large facility. If this is the case, life sciences can be a major driver of the future of large facilities in Europe a

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