Selected research topics in Biomedical Engineering:
Medically Relevant Experiments with Synchrotron Radiation
Location: Grosser Hörsaal, ZLF, University Hospital Basel
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Micro- and nanotomography at the ANATOMIX beamline

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Abstract. X-ray microtomography enables us to obtain three-dimensional images of the inside of objects. Based on the principles of computerized tomography (CT), it extends the accessible length scale to microscopy. The characteristics of X rays from synchrotron radiation sources – especially their high intensity and coherence – are particularly important. The advantage is largely due to X-ray phase contrast, which makes use of the refraction of X rays in matter, a phenomenon hardly observable with laboratory X-ray sources and at moderate spatial resolution. Synchrotron phase-contrast micro-tomography has been around for about 25 years and is today a mature method used in many fields of research including tissue and biomaterials imaging. In its most common implementations, it reaches a spatial resolution down to around 0.5 μm. X-ray nanotomography gives access to features of a few tens of nanometers and is a recent development that is only available to a few teams worldwide. At the tomography beamline ANATOMIX of Synchrotron SOLEIL, we have developed and built such an instrument, a full-field transmission X-ray microscope (TXM), on which external users have been conducting their nanotomography projects since December 2019. The instrument complements two microtomography stations on the beamline. In my talk, I will present the principles of micro- and nano-tomography and show recent examples of our research.

Curriculum. Timm Weitkamp studied physics at the University of Hamburg, Germany. In 2002, he obtained a Ph.D. with work on synchrotron imaging and tomography carried out at the European Synchrotron Radiation Facility (ESRF) in Grenoble, France. After a postdoctoral position on the design and manufacturing of X-ray optics and the development of X-ray phase contrast methods, he held scientist positions at several synchrotron beamlines in Europe. In 2010, he joined the French national light source Synchrotron SOLEIL near Paris, where he has been in charge of the design, construction and operation of the tomography beamline ANATOMIX. His research interests are the development and implementation of methods and instrumentation for X-ray imaging in two and three dimensions and their application in multiple areas including energy research, engineering and materials science, as well as health and biology.