

Selected research topics in Biomedical Engineering: Developments in Dental Research

Location: DBE Hörsaal, 14.03.002, Gewerbestrasse 14, Allschwil

Date and time: Thursday, April 18, 2019, 12:00-13:30

Bio-inspired structures from 500 million years of human tooth evolution

Paul Zaslansky

*Institut für Zahn-, Mund- und Kieferheilkunde, Charité - Universitätsmedizin Berlin,
Germany*

Abstract. Teeth are mechanically loaded biological structures, that operate under variable pH, temperature and hydration conditions [1]. Teeth are nanocomposites of minerals, organic molecules and water. The enamel layer hardness is needed to break down food. The dentine layer supports the enamel, enduring decades of cyclic loading and reliably transmitting forces applied to the jaws. Whereas all dental tissues possess toughening properties, it is mainly the dentine that makes teeth resilient. Dentine resembles bone, as it is a nano-composite of collagen (protein) fibers (about 30 %), nanoparticles of carbonated hydroxyapatite (about 50 %) and water. Dentine in teeth is thus interesting from an engineering point of view, since all teeth form relatively light-weight, sturdy structures, *designed* by nature to endure decades of function. Importantly, unlike bones, dentine lacks mechanisms of healing. In this presentation, key structural motifs and design principles of human dentine will be surveyed, as revealed by the combination of two- and three-dimensional characterization, i.e. ptychography [2], small-angle X-ray scattering [3,4], diffraction mapping [6] and hard X-ray tomography [6,7]. nanoCT [5], micro-tomography [7] as well as other lab-based microscopies.

Curriculum. Dr. Paul Zaslansky graduated as Doctor of Medical Dentistry (DMD), combined with a Bachelor of Medical Sciences, from the Hebrew University Hadassah, Israel. In 2005, he obtained his PhD at the Weizmann Institute of Science, Israel. Since 2011 Dr. Zaslansky has been a staff scientist at the Julius Wolff Institute (JWI) in Berlin, Germany. In 2016, he joined the department of Operative and Preventive Dentistry at the Charité in Berlin, Germany.

References. [1] Bioinspiration&Biomimetics 11 (2016) 051003. [2] Scientific Reports 5 (2015) 9210. [3] Biomaterials 31 (2010):5479. [4] Nature; 527 (2015) 353. [5] Chemistry Materials 28 (2016). [6] Nano Letters 15 (2015) 3729. [7] Dental Materials 26 (2010) e1.