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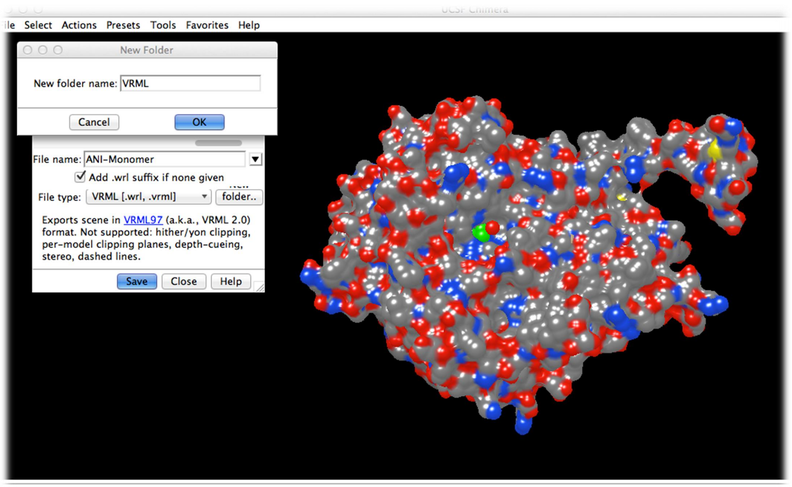
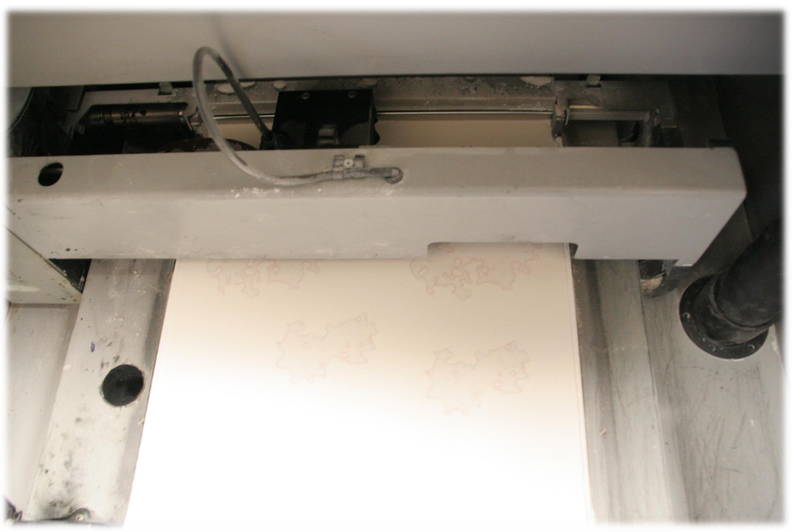
Vanadium-dependent haloperoxidase from Ascophyllum nodosum

Touchable 3D-models - from x-ray-crystallography to 3D-Print

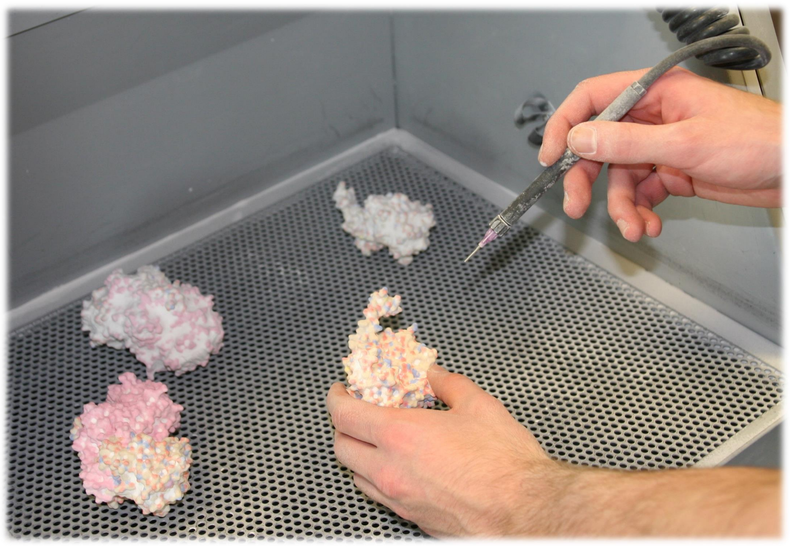
In 1984 the first report of a vanadium-dependent haloperoxidase (1) appeared, describing a new type of oxidative enzymes, detected in the seaweed *Ascophyllum nodosum (Phaeophyceae, Fucales, Fucaceae)*. Today haloperoxidases are known to be common in algae and have furthermore been detected in fungi and lichen. There are reports from several cDNA-sequencing projects that sequences are very common, which may code for vanadium-dependent haloperoxidases



The homo-dimeric structure of a vanadium-dependent haloperoxidase (V-BPO) from the brown alga A. nodosum has been solved at 2.0 A resolution (2) (PDB accession code 1QI9). We build a the three dimensional model starting from this data as input for VRML-models using Chimera (3).



The VRML-models were used to print touchable 3D-models on a 3D Printer. 3D Printing is an additive manufacturing process and actually one of the fastest growing industry segments in digital manufacturing. These models were processed and printed in the Laboratory for digital product development and manufacturing at Trier University of Applied Sciences (4) on a ZPrinter 450.
In a preprocessing step the software digitally slices the uploaded VRML-Model into thousands of horizontal layers. The printer then makes thousands of passes across the powder and prints each cross section by depositing a liquid binder and optionally colored ink onto the powder. Where the binder hits, the powder quickly solidifies. Printing at an approximate rate of one vertical inch an hour, the machine deposits layer upon layer of material to create a model embedded in the composite powder. In the post processing step the printed models are depowdered and strengthened by infiltration with epoxy. The models are useful to encourage discussion by haptic stimulation.



References:
(1) Vilter, H. Phytochemistry 1984, 23,7, 1387–1390
(2) Weyand, M., Hecht, H., Kiess, M., Liaud, M., Vilter, H., Schomburg, D. J. Mol. Biol. 1999 293, 595-611 - http://www.rcsb.org/pdb/explore/explore.do?structureId=1QI9
(3) https://www.cgl.ucsf.edu/chimera/
(4) http://3DPrint.hochschule-trier.de/