Prof. Dr. Robert Grass

Institut für Chemie- und Bioingenieurwissenschaften (ICB),
ETH Zürich

Title/Abstract:

"Storing a Netflix episode in DNA"

One application of synthetic DNA, which has recently gained research interest, is the storage of digital data. DNA has an extremely large data capacity (theoretically ca. 200 exabytes per gram of DNA), and can be stored for very long time frames.

By itself DNA is a relatively fragile molecule and decays after several months at room temperature. This is in stark contrast to fossil samples, from which intact DNA can be extracted after 700'000 years of storage. So the stability of DNA in these fossils can not only be attributed to the DNA molecule itself, but significant credit should go to the fossil matrixes. While these fossils are usually formed from bone or tooth, we found that DNA encapsulated in synthetic non-porous silica particles resulted in a similar stability against hydrolysis. Further, we were able to show that encapsulating DNA in a glass matrix allows the mixing of DNA with a variety of materials, giving the possibilitiy of embedding digital information into materials (e.g. polymers). This allows for the tracking and tracing of raw materials, but also for the implementation of actual digital data into physical objects. With this we could generate 3D printed objects, which contain the printing blueprint (a .stl file) within the polymer of the final object, as encapsulated DNA.

Most recently, we have also displayed that a full episode of a Netflix episode (Biohackers Ep. 1) can be stored and distributed in the form of DNA. This preliminary use case will allow us to discuss the potential, and also the current limits of DNA as a data storage tool.