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ENGINEERING DNA DATA STORAGE VIA LOW-COST DNA SYNTHESIS AND AN AUTOMATED STORAGE ARCHITECTURE

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Project Summary: In the wake of increasing amounts of data, DNA has been proposed as the digital data storage medium of the future due to its outstanding information density and data stability. On the path to a scalable and robust storage solution, several problems need to be addressed. These include the cost and speed of DNA writing as well as the actual physical storage architecture used for data containing DNA pools. In order to tackle prohibitively high data writing expenses, we have developed a low-cost, photolithographic synthesis method. This was coupled with a digital data read-out pipeline optimized for DNA with relatively high error rates. Thereby we employ advanced information reconstruction methods to compensate for the errors induced with the cost-cutting synthesis approach. In a separate aspect, and to achieve long-term stable and automated storage, we engineered nanoparticles to encapsulate DNA encoded files. Subsequently we demonstrated the feasibility of automated deposition and recovery of DNA pools on a 2D storage architecture using an electro-wetting based digital microfluidics device. Lastly, in search for a bio-inspired DNA storage format we investigated the effect of calcium phosphate formation processes and the resulting particle crystallinity on the stability of encapsulated DNA.

CV. Philipp attained his BSc. and MSc. in Chemical and Bioengineering from ETH Zurich. After conducting research at MIT, he joined the Functional Materials Laboratory in 2018 to work on DNA-based data storage in cooperation with Microsoft Research.

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