

ICB PhD public presentations

INFORMATION AND ENTROPY IN SYNTHETIC DNA: APPLICATIONS IN TRACING AND CRYPTOGRAPHY

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ETH Hönggerberg, HCI H2.1 and on Zoom
(<https://ethz.zoom.us/j/61181213693>)

Project Summary: With the rising demand for new information technologies, synthetic DNA has caught attention beyond the biological sciences. Notably, DNA's unique properties are of interest for information storage, data processing and computation, with applications ranging from barcode-like tagging to random number generation. Part of this project was the development of a platform to trace aerosol dynamics in real-world scenarios. By tagging aerosols with silica-encapsulated DNA barcodes we were able to trace complex distribution behaviors of micro-scaled aerosols in a chemistry laboratory environment. In parallel, we used large random DNA pools as chemical iterations of unclonable functions. These perform chemical operations to compute a specific and reproducible readout from an input, but the function's output cannot be inferred from the input and vice versa. Thereby these DNA pools can be applied similar to mathematical one-way functions used in cryptography. Thus, we show that chemical entropy can be channeled into a computational platform, for which we additionally present a use case for counterfeit-secure product tagging.

CV. Anne holds a B.Sc. and M.Sc. degree in Interdisciplinary Sciences from ETH Zurich. Following her studies, she worked for MSD until 2019. She then joined the Functional Materials Laboratory and Prof. Robert Grass for a Ph.D., which she interrupted for 6 months to support the COVID19 vaccine production at Lonza in 2021.