WHAT AND WHY?
There has been tremendous progress in the field of two-dimensional materials (e.g. graphene) throughout the value chain: synthesis, characterization, device fabrication and, finally, applications. The next hot topic in this field is the development of bottom-up synthesis strategies for atomically precise nanomaterials and to use them in electronic devices.

HOW AND WITH WHOM?
We have used chemical reactions (so-called on-surface synthesis) to fabricate atomically well-defined quantum materials. The experiments have been carried out in collaboration with groups from Utrecht University (the Netherlands) and Swiss Federal Laboratory for Materials Science and Technology (EMPA). Theoretical calculations on these novel materials have been carried out by our colleagues at Aalto University (Profs. Foster and Rinke).

RESULTS, IMPACT AND RECOMMENDATIONS
We have fabricated graphene nanoribbon (GNR) heterostructures which are relevant for new types of diodes and transistors, and act as a first step toward complete electronic devices built into a single graphene nanoribbon. In another study, we have also made metal-organic frameworks (MOFs) that have been theoretically proposed as a flexible material platform for realizing exotic quantum materials. Our results open the experimental path towards MOF-based designer quantum materials which could be transferred into device structures for potential applications.

What next?
These ideas will be brought forward during the ERC Advanced Grant "E-DESIGN" (ERC-2017-AdG no. 788185) and Academy Professorship "ADaM" (no. 318995) focussing on artificial designer materials.