What are the heaviest elements that can exist in nature? Does another ‘island of stability’ exist beyond uranium, and where exactly is it located on the chart of atomic nuclei?

Building on a recent proof-of-principle experiment led by Lund University physicists, breakthrough in answering these fundamental questions is expected by close interplay between nuclear structure theory and experiment. New computer-intensive theoretical approaches are proposed, which fully account for time dependency, and hence dynamics. The predictions will guide us towards the most promising experiments, in which a world-leading Swedish ‘spectroscopy station’ will be used. This set-up employs novel concepts and technologies for compact high-resolution germanium detectors with unprecedentedly high detection efficiencies and precision. Our aim is to develop, construct and maintain the world’s best decay spectroscopy set-up to herald a new era of direct access to the nuclear structure of the heaviest man-made atomic nuclei on Earth, as well as fingerprinting their atomic number. The experimental findings will be fed back to the theory, which will ultimately define the location of the island of stability as well as the lifetimes of the atomic nuclei forming the island.

The international scene for this project will be set spring 2016 at the Nobel Symposium on the *Chemistry and Physics of Heavy and Superheavy Elements*. The Symposium has recently been approved by The Nobel Foundation, Stockholm, Sweden, and will be held in Scania, southern Sweden. The Symposium is co-financed by the Wallenberg foundation, and it is being managed by the principle investigator of this Wallenberg project application LUNDIUM.