To select the winner of the 2023 Kluyver Prize, the committee had the opportunity to review 18 theses and, in particular, their English-language summaries.

The Nikhef programme covers a wide range of scientific research, from experiment to theory, from the development of advanced instrumentation to its applications.

For example, precision instrumentation and theory are being developed for the determination of the electric dipole moment of the electron. The focus is on the tiny value predicted by the Standard Model - a measurement higher than this would shed new light on the violation of time reversal invariance and point the way to extensions of the same Standard Model. Two PhD theses describe research in this area.

In gravitational wave research, major advances are being made both theoretically - characterising the sources based on the structure of the waves - and experimentally - increasing the sensitivity and developing new instruments, such as the Einstein telescope - following their discovery in 2015 by LIGO and Virgo, in which Nikhef is a major participant. Two of last year's theses bear witness to this.

The mystery of dark matter in the universe continues to challenge experimental astroparticle physics. The XENONnT detector is pushing the limits of sensitivity. No signal has yet been found, but the experimental possibilities are certainly not exhausted, as described in one of the theses.

On the instrumental side, the Medipix chip is now being used for beam monitoring and tumour imaging in hadron therapy. This chip not only measures photons with high spatial precision, but now also distinguishes the energy of these photons. These two properties lead to highly accurate and information-rich imaging, as shown in one of the theses.

For the experiments at the LHC, new tracking detectors are being developed to cope with higher luminosity, increasing sensitivity to levels unimaginable when the first generation of detectors came into operation. LHCb's scintillating fibre tracker is one example, as is the development of hybrid silicon pixel detectors that measure both the position and time of a passing particle with unprecedented precision. This will make it possible to disentangle overlapping events at the high-luminosity LHC. Two PhD theses dealt with these topics.

The heavy ion programme ALICE is revealing more and more of the secrets of the quark-gluon plasma, an almost ideal liquid, and its evolution over time. The flow of the plasma as a function of the degree of overlap of the colliding lead nuclei and the influence of the plasma on the formation of jets ('quenching', extinction) are being measured and are highly relevant for refining the theoretical description of the plasma using QCD. This research resulted in two PhD theses last year.

Hard proton-proton collisions as recorded by the ATLAS detector, among others, are also described by highly non-trivial QCD-based calculations, with the unavoidable non-perturbative effects being increasingly well controlled. As part of a theoretical study of strong CP violation, effective field theories are being developed to quantify effects that cannot be calculated via 'first principles'. This research is described in two dissertations.

One of the central themes, if not the central theme of the LHC programme is research on the Higgs sector. This research began with the discovery of the Standard Model Higgs boson in 2012 and is now concentrating on the search for other 'heavy' Higgs bosons 'beyond the Standard Model', on measurements of the Higgs boson itself, such as its lifetime and on its characteristic self-couplings. Ingenious analytical techniques, some of them developed only in recent years, are becoming powerful enough, especially with the additional data to be collected in the coming years, to measure the Higgs boson's lifetime and its self-couplings to confirm the internal consistency of the Standard Model or, more interestingly of course, to expose its incompleteness. This research was the subject of three PhD theses.

Another important research direction, also focused on the internal consistency of the Standard Model, involves the measurement of the 'suppressed' elements of the CKM matrix. LHCb is making unique contributions to this as recorded in one of last year's theses.

While high-energy physics traditionally uses accelerators, cosmic accelerators are also attracting increasing attention. The most energetic cosmic rays are measured by Auger, and the detector now offers the possibility of determining the identity of the primary particles, as one of the theses shows: important knowledge for tracing the origin of these cosmic rays.

Cosmic neutrinos identify themselves by the way they are measured in large undersea detectors. KM3NeT is the next-generation large-scale undersea neutrino telescope that, not yet at full power, is now starting to yield results. The design, layout, operation and first results of this imaginative project were described and very appealingly summarised in the thesis: *Getting to the point - First cosmic neutrino source search with the KM3NeT/ARCA detector*, written by Rasa Muller: she is the winner of the 2023 Kluyver Prize!