

# Decoding beauty

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Propositions accompanying the dissertation

# Decoding beauty

Lex Marinus Greeven

1. The study of beauty baryon decays provides complimentary information to the more commonly studied beauty meson decays, and is essential for a complete understanding of the Standard Model of particle physics.
2. Due to their small Standard Model branching fraction, the rare  $\Lambda_b^0 \rightarrow \Lambda \ell^+ \ell^-$  decays are excellent probes for indirectly searching for New Physics contributions at high energy scales.
3. The measurement of  $\Lambda_b^0 \rightarrow \Lambda \ell^+ \ell^-$  decays is not possible without correcting the available simulation to match the data, which is a complicated and error-prone process.
4. The use of branching fraction single- and double ratios using the resonant  $\Lambda_b^0 \rightarrow J/\psi \Lambda$  and  $\Lambda_b^0 \rightarrow \psi(2S) \Lambda$  decay channels is a powerful tool to verify the analysis methods and highlight potential issues.
5. The commissioning and calibration of a new detector is a long, arduous, and often overlooked process, but it is essential for the success of any detector.
6. Performing independent analyses measuring the same quantity is a powerful cross-check of the analysis methods and results, and allows for finding and correcting mistakes.
7. When trying to understand an issue, it is preferable to start by testing low-level quantities than to start by checking the applied high-level methods.
8. "Science is a way of thinking much more than it is a body of knowledge."

- Carl Sagan

9. "All we have to decide is what to do with the time that is given us."

- J.R.R. Tolkien