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Hidden star formation in the early Universe

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Propositions
accompanying the thesis
Hidden star formation
in the early Universe

1. Serendipitously identified $[\text{CII}]_{158\mu\text{m}}$ emitters provide an efficient, SFR-selected probe of obscured star formation at $z > 4$ (*Chapter 2 and 4*).
2. Although the $[\text{OIII}]_{88\mu\text{m}}$ emission line has shown considerable promise as a way to characterize galaxies at $z > 8$ with ALMA, high ISM densities and low ionization parameters can limit its detectability (*Chapter 3*).
3. ALMA remains indispensable for obtaining a complete view of star formation in the early Universe, not only by tracing dust-obscured star formation, but also by securely detecting sources that are otherwise missed by spectroscopic JWST surveys (*Chapter 4*).
4. Star-forming galaxies at $z > 4$ exhibit a wide range of dust-obscured star formation fractions, demonstrating how essential multi-wavelength observations are for characterizing total star formation rates in high-redshift galaxies (*Chapters 2, 3 and 4*).
5. Essential to a robust understanding of obscured star formation are deep, multi-band continuum observations to reduce assumptions about the dust spectral energy distribution.
6. Publications reporting non-detections of galaxies should be regarded as equally valuable as those presenting new detections, as they provide critical constraints on both observational limits and the physical properties of galaxies.
7. Because each PhD trajectory is unique, rigid requirements regarding the number of papers in a doctoral thesis are unjustified.
8. Basic knowledge of objects visible to the naked eye in the night sky is an effective way to demonstrate the relevance and appeal of astrophysics to a broader audience.
9. Communication is an essential tool for deepening understanding and identifying new approaches to existing problems.
10. A person's worth is not determined by their accomplishments, but by how they treat others.
11. Many necessary and desired items can be found in thrift stores, where the effort invested in the search enhances the satisfaction of the purchase.

Ivana Francesca van Leeuwen
Leiden, April 9, 2026