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Transformation and sublimation of interstellar ices: insights from laboratory experiments and astronomical observations

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Propositions

accompanying the thesis

Transformation and sublimation of interstellar ices

Insights from laboratory experiments and astronomical observations

1. Interstellar ice formation does not always follow intuitive pathways (Chapter 2).
2. HS radicals are powerful triggers of a rich sulfur ice chemistry (Chapters 4, 6 & 7).
3. Accurate snowline predictions require accounting for both diffusion and desorption (Chapter 5).
4. Gas-phase observations of sublimated ices can reveal both the presence of less abundant species and help trace their formation histories (Chapter 8).
5. Operating ultrahigh vacuum systems is largely about opening and closing valves in the correct sequence—the true challenge lies in the design and interpretation, not in the experiment itself.
6. Astrochemistry demands fluency in both astronomy and chemistry; focusing on one while neglecting the other limits one's habilities to conduct meaningful research.
7. The laboratory pursuit to produce ever-more complex molecules *ad infinitum* in prestellar ices may be fueled more by wishful thinking than empirical value—and risks veering into scientific complacency.
8. Unequivocally detecting biosignatures in exoplanet atmospheres and confidently interpreting them as evidence of life likely remains beyond the reach of current technical capabilities.
9. Respect begins within; waiting for others to grant it only cedes them control.
10. To be just is to uphold merit as the highest ideal, while recognizing that true meritocracy is an illusion.
11. A scientist who does not apply critical thinking beyond their own research is unfit to bear the responsibilities of the profession.
12. Patience and Time may be the strongest warriors, but only when fueled by a tenacious heart can they triumph.

Julia Santos
Leiden, 2 July 2025