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The intricate nebular architecture of The Rotten Egg disclosed by ALMA.

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Abstract

In only a few years of operations, ALMA is revolutionising the field of AGB-to-PN research by providing unprecedented detailed information on the complex nebular architecture, dynamics and chemistry of the envelopes of low-to-intermediate mass stars in their late stages of the evolution. We report continuum and molecular line mapping studies with ALMA of OH 231.8+4.2 (also known as *The Rotten Egg*), a pre-Planetary Nebula (pPN) candidate that is key to understand the complex PN-shaping process. The high angular resolution (0.2-0.3 arcsec) and sensitivity of our ALMA maps provide the most detailed and accurate description of the overall nebular structure and kinematics of this object to date. We have identified a number of outflow components previously unknown. Species studied in this work include ^{12}CO, ^{13}CO, CS, SO, SO_2, OCS, SiO, SiS, H_3O^+, Na^{37}Cl and CH_3OH. The molecules Na^{37}Cl and CH_3OH are first detections in OH 231.8+4.2, with CH_3OH being also a first detection in an AGB star. Our ALMA maps bring to light the totally unexpected position of the mass-lossing AGB star relative to the large-scale outflow and disclose a compact bipolar outflow that emerges from QXPup's vicinity (amongst other puzzling discoveries). The presence of bipolar ejections less than ∼80 yr old indicate that the collimated fast wind engine is still active at the core of this outstanding object. (See poster).