On the Distribution of Dust in the "Born-again" Planetary Nebula A 30

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The planetary nebula (PN) A 30 consists of two nebular shells, one old, spherical, hydrogen-rich PN and a second, younger, H-poor, and dust-rich nebula which is the result of a very late thermal pulse (VLTP), a helium shell flash that occurred long after the central star (CS) had left the asymptotic giant branch (AGB). During the VLTP the CS returned to the AGB and became a "born-again" giant for a few years. During this extremely fast episode of stellar evolution a final mass-loss phase created the second, dusty PN a few thousand years ago. Such a VLTP should occur in 20% of all post-AGB stars according to theory but only a handful of "born-again" PNe are known, a discrepancy that remains unexplained so far. Moreover, the knots in A 30 have been reported to be O-rich in clear disagreement with the C-rich composition predicted for a VLTP. In the case of A 30 the "born-again" PN is highly filamentary and the individual knots clearly show signs of erosion from the fast wind of the – yet again – hot CS, such as "cometary" tails. While optical imaging (gas emission) obtained with the HST has provided excellent spatial resolution, near infrared imaging (dust emission) had been very limited in resolution so far. Our new PANIC/Magellan[1] data quite literally shows the other side of the coin and as a consequence, for the first time we are able to shed light on the complex interplay between gas and dust in this PN. A 30 forms an evolutionary sequence with V4334 Sgr (10 yrs after the flash) and V605 Aql (100 yrs) and, hence, provides valuable insight into the physics of the still poorly understood "born-again" PNe.

[1]This paper includes data gathered with the 6.5 meter Magellan Telescopes located at Las Campanas Observatory, Chile.