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Enhanced Low-temperature Triple-alpha and Helium-accreting White Dwarfs RYAN CONNOLLY, EDWARD BROWN, Michigan State Univ — The triple-alpha reaction is of critical importance to a variety of astrophysical phenomena. Despite this relevance, the non-resonant contribution to the reaction rate at temperatures below 10^8 K remains uncertain, with calculations by different groups spanning over 20 orders of magnitude around 10^7 K Recently, Nguyen et al. (2012) showed that their calculation of the reaction rate, although enhanced at low temperatures compared to the standard NACRE rate, remains consistent with post-main-sequence evolution and the well-observed red giant branch. Nevertheless, there are other astrophysical scenarios where an enhancement of the triple-alpha rate at low temperatures may have observable consequences. One example is AM CVn systems, in which a white dwarf accretes helium-rich material from a low-mass companion in a tight binary. As the white dwarf accretes, runaway helium burning may ignite at the base of the envelope, resulting in a "helium nova." Using the MESA stellar evolution code, we find that for the most energetic outbursts the new triple-alpha rate increases both the time delay and mass of the helium envelope at ignition by a factor of two or more, which may affect the observable frequency and energetics of these explosive events in future surveys.

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