On the initial construction and violent eventual death of high-mass stars: insights from the physics of gravitation.

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High-mass stars present interesting problems at both ends of their lives. I will show that by tackling their formation in the face of radiation pressure (RP) we have a tool that throws light on the supernova process. Although high-mass stars range up to >100M_{sun} they are evidently shedding up to 90% of their mass at very high rates. This is commonly attributed to RP. But thermonuclear light-up occurs at well below a solar mass, so why hasn't RP inhibited growth to high mass in the first place? ALMA, peering into dust clouds at mm wavelengths, has recently found that the star's Newtonian gravitational attraction does indeed prevail. My recent work on the physics of gravitation [e..g. 1], has shown the benefit of taking up the 1860s ideas of Thomson and Maxwell. The surprising outcome is that a corresponding positive-body-repelling radial electric field, the G-E field, inevitably permeates and surrounds every gravitationally retained assemblage. (Observation yields ~1 V/m for the Earth). So neutral infall is unaffected, the G-E field only acting close-in to the star, which ionizes it; so the Newtonian column force wins and accretion proceeds. On emergence from the dust cloud this neutral jacket is lost; the G-E field then drives the mass loss, helped by RP. Inside stars, the G-E field provides additional overburden support, so white dwarfs, as observed, may attain twice the Chandrasekhar limit, before collapsing. Finally, when degeneracy, by whatever route, yields a neutron core, the G-E field at its boundary may even exceed 10 exp 11 volts/m, expelling the ionized overburden as a supernova 'explosion'.

[1] Osmaston, MF (2012), How stars grow massive despite radiation pressure…ISM1, NAM2012, Manchester:- — (2013) EPSC Abstracts 8, EPSC2013-249, 2013.