Radiation Hydrodynamics

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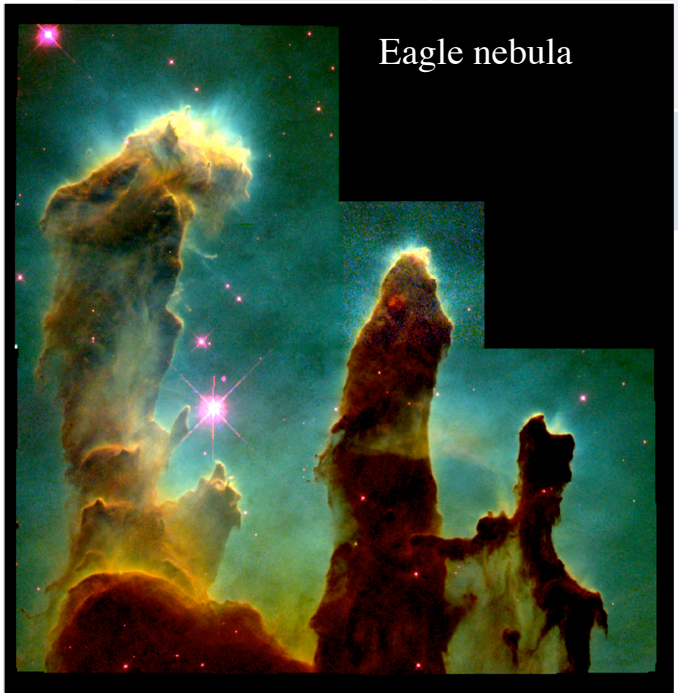
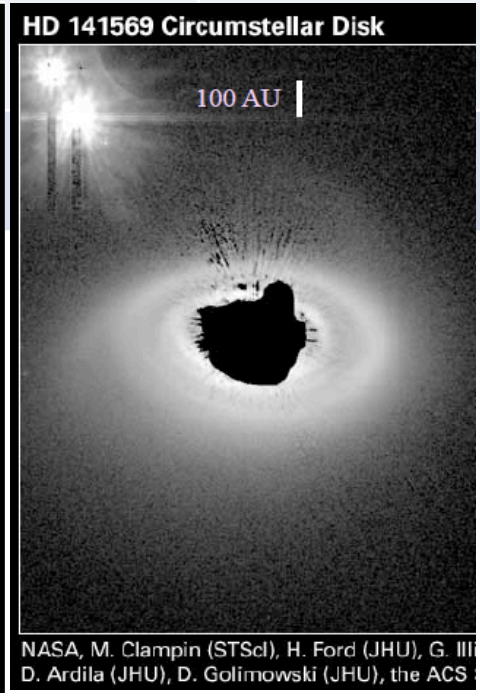
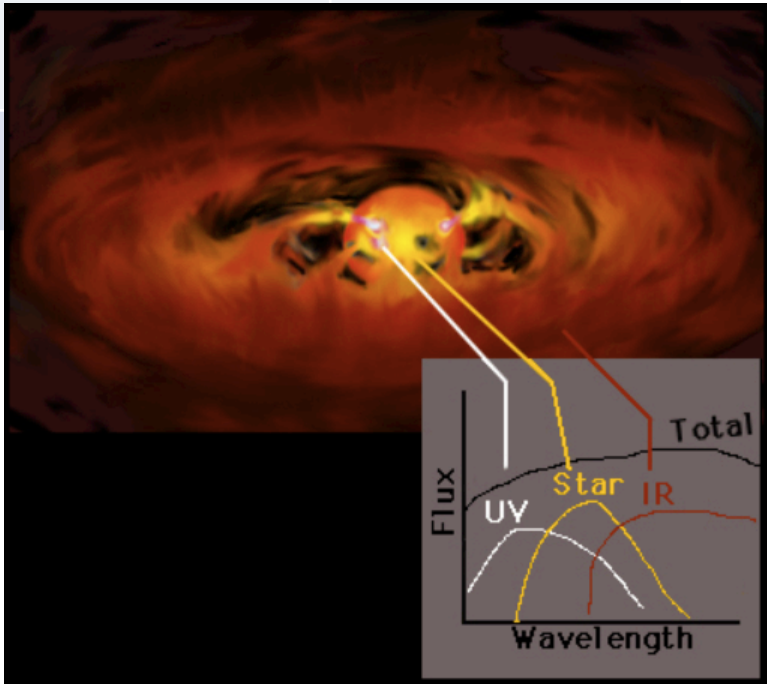
Radiation hydrodynamics

Challenge	Existing Research Capabilities	Gaps	Opportunities
How are the largest stars formed?	HST; 3D-radhydro; 3D-MHD; exprmntl platforms for radhydro	3D rad-MHD w/ r, e, i, neutrals, dust; molecular cloud (LED) to burning massive star (HED) model; validated understanding of line-driven winds; exprmtl V&V for rad-MHD, precision opacities, radiation-dust interaction data; Pr > Pe,i conditions; diagnostics	JWST, SOFIA, LMT, ALMA; NIF, ZR, Omega-EP, Vulcan, FIREX, Magpie; synergy w/ the other panels







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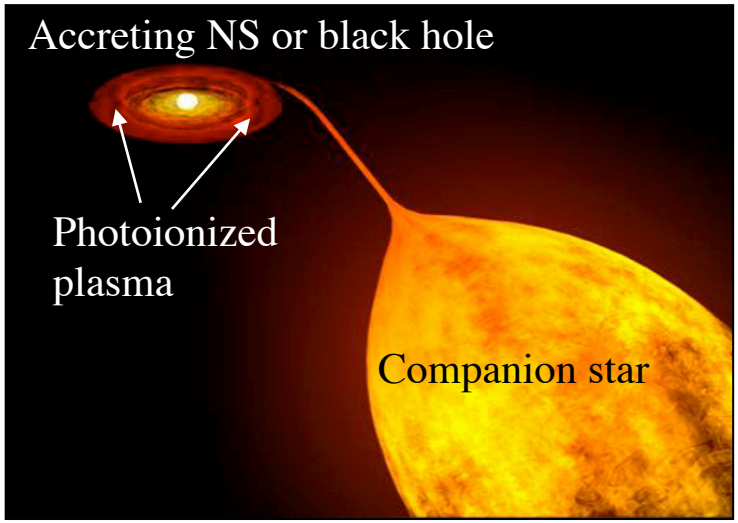
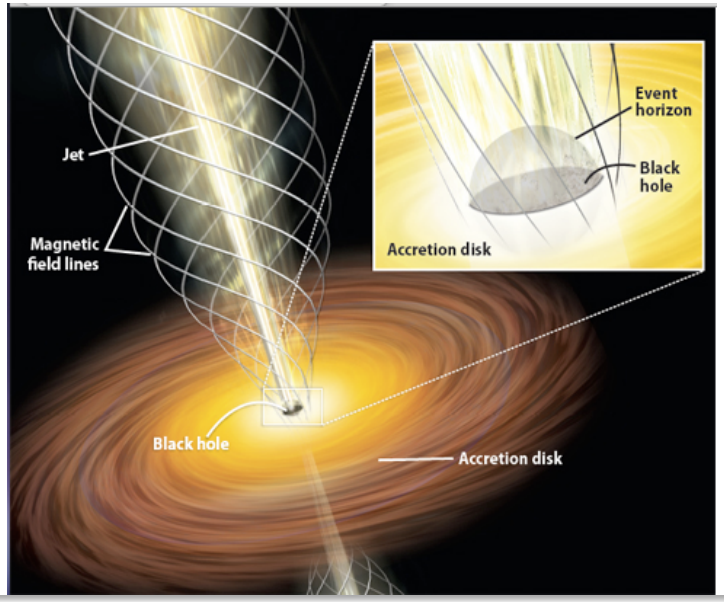
How do massive black holes form and grow?	HST; Chandra; XMM; 3D-radhydro; 3D-MHD; exprmntl platforms for radhydro	3D rad-MHD w/ e, i, r, neutrals, dust; radiative-MRI; exprmtl V&V of rad-MHD, precision opacities and photoionized plasma rates; radiation-dust interaction data; validated understanding of line-driven winds; understanding of Pr>Pe,i turbulent hydro (super-Eddington accretion); diagnostics	JWST, SOFIA, LMT, ALMA; NIF, ZR, Omega-EP, Vulcan, FIREX, Magpie; synergy w/ the other panels





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How does intense stellar radiation and plasma winds affect exoplanet atmospheres?	HST; Spitzer; 3D-radhydro; 3D-MHD; exprmntl platforms for radhydro, plasma-dust interactions	3D rad-MHD w/ e, i, r, neutrals, dust, planetary atmosphere; exprmtl V&V platforms for rad-MHD (LED-HED), precision UV opacities, radiation-plasma-dust interaction data; exoplanet atmosphere data; diagnostics	JWST, VLT, Kepler; NIF, ZR, Omega-EP, Vulcan, FIREX, Magpie