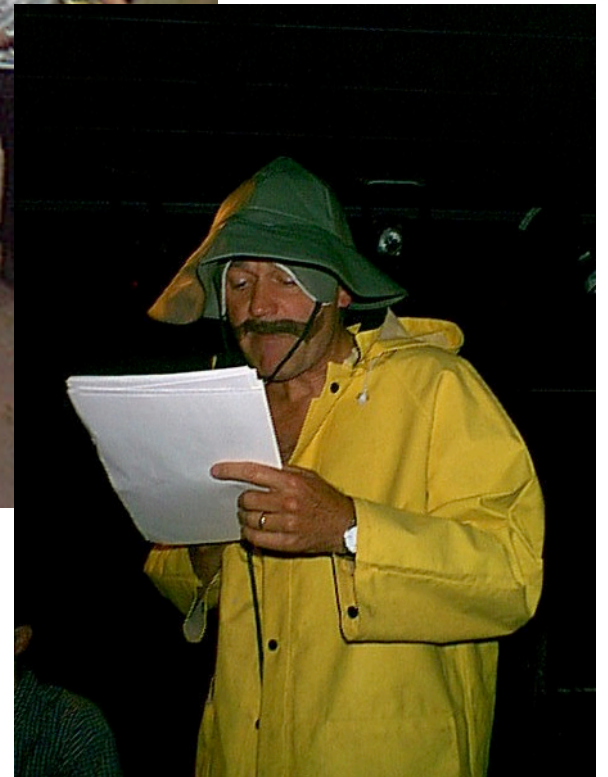
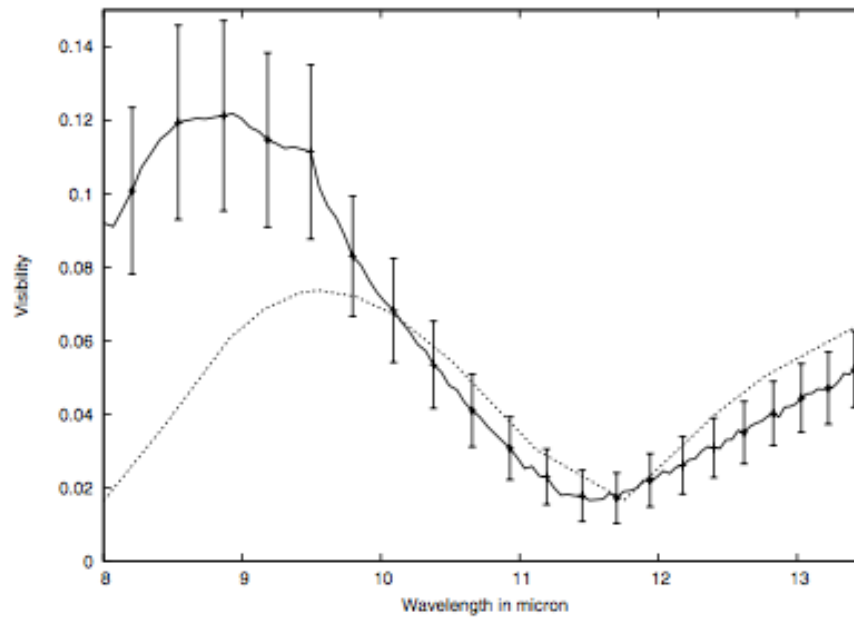


Olivier's conference: summary

Orsola De Marco
Macquarie University
Sydney



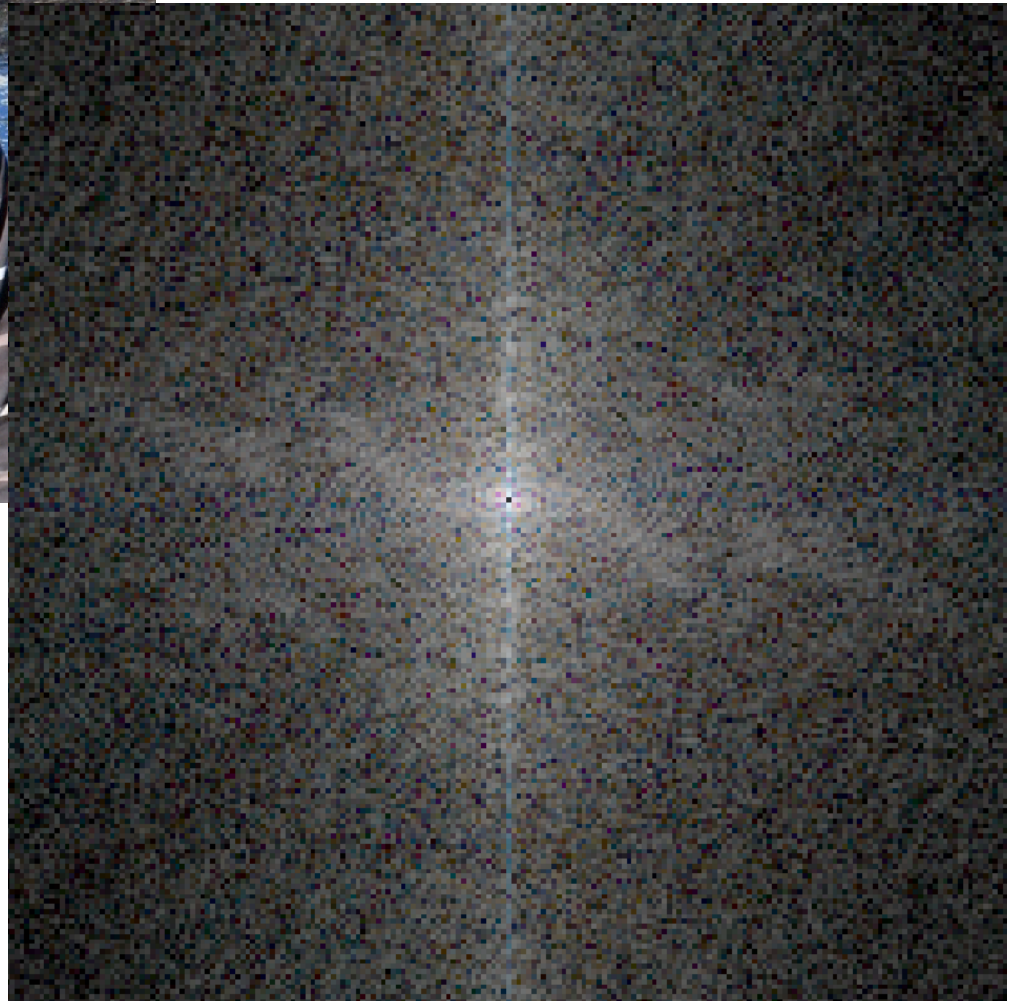




Ceci est un de mes étoiles préférées comme ils sont
vus par un télescope qui rend l'interférométrie



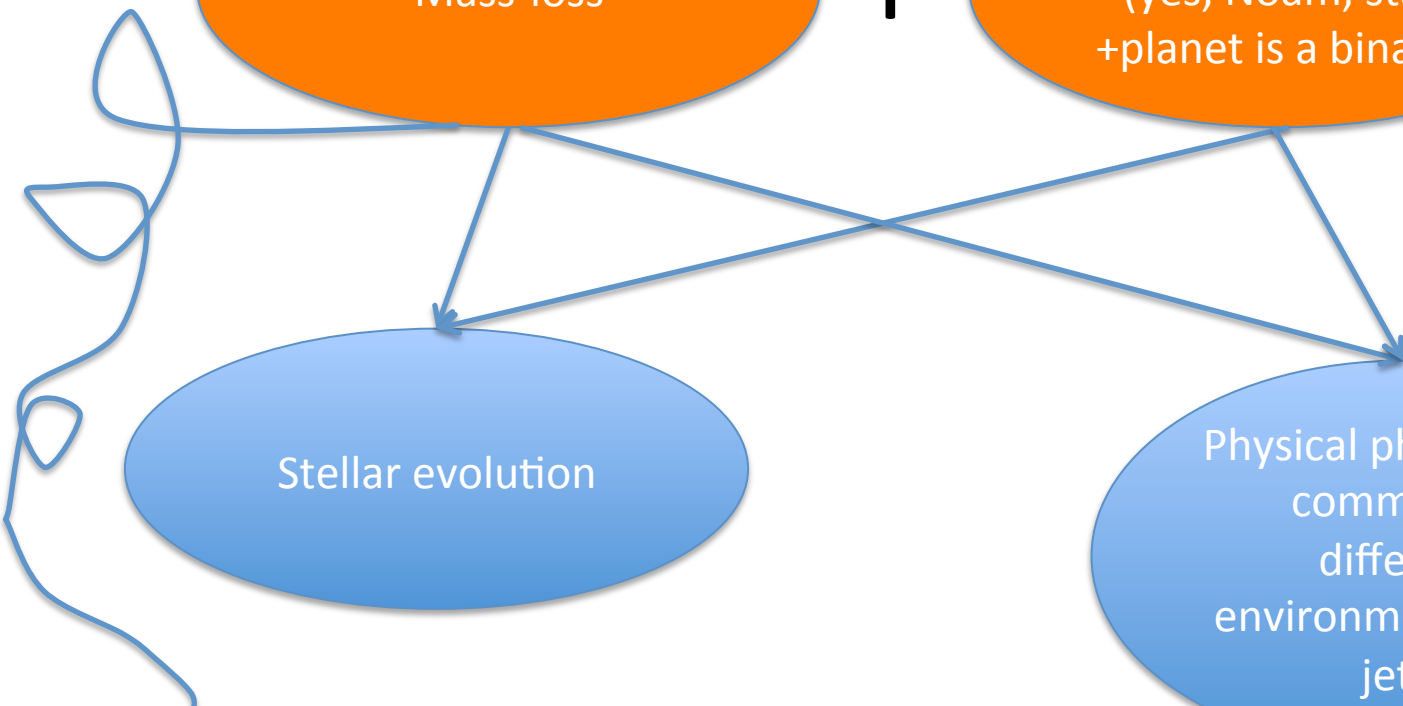
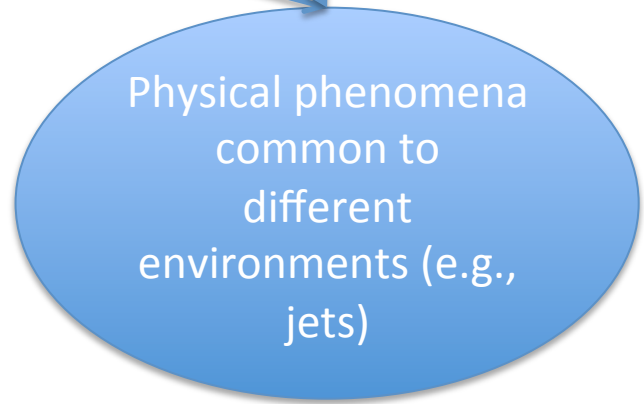
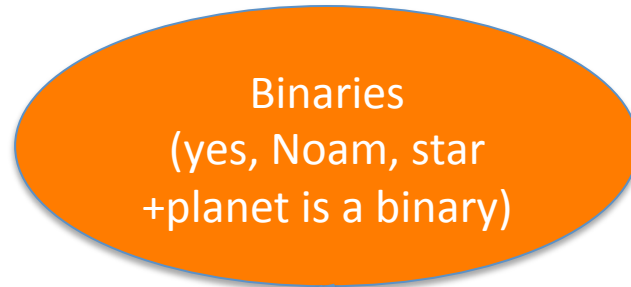
Fourier transform of Olivier



Two themes



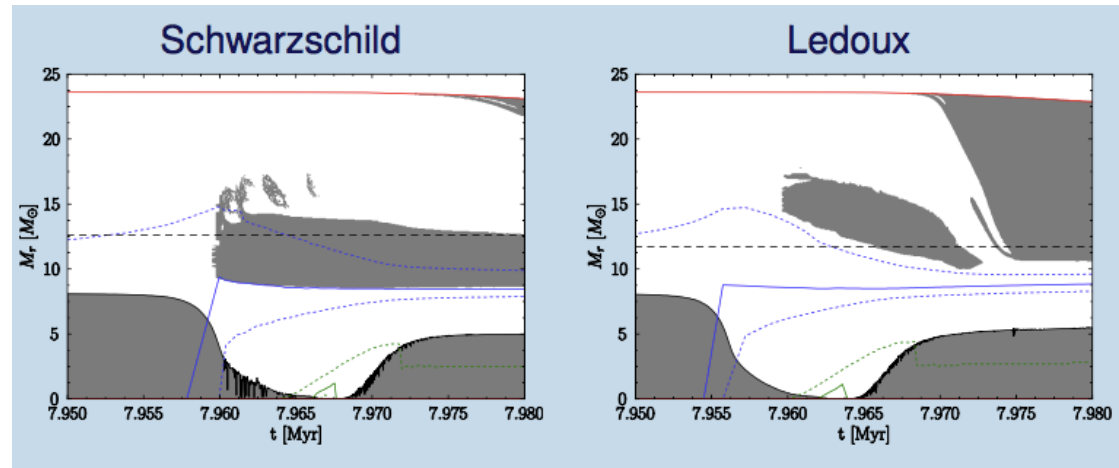
+



Mass-loss mechanisms & rates

Ne comprennent toujours pas la perte de masse des étoiles

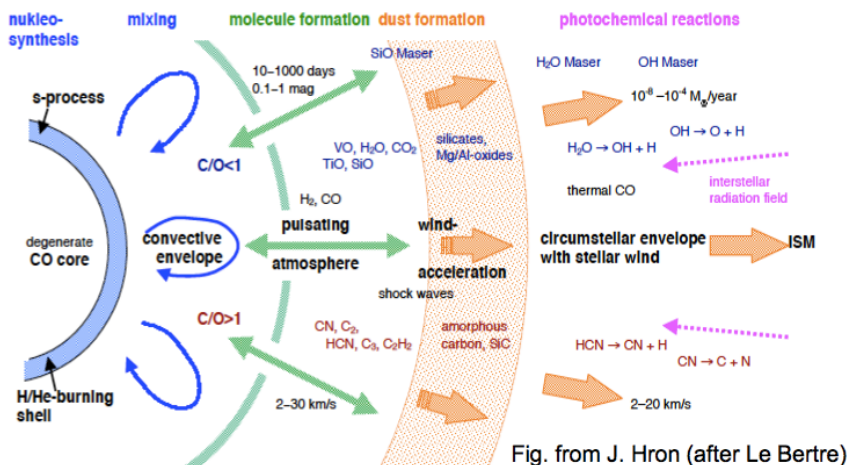
- No dependence on metallicity? (Matsuura, Agliozzo)
- Mass-loss rate in symbiotic giants is high, but not always (Skopal, Jurikc)
- RGS mass loss from theory, OK, but for BSG, AAAHHHH! Ledoux vs. Schwarzschild criterion for convection? Surely not! (Georgy)



- Short duration of AGB super-wind clear, but unclear! (Lombaert)

Mass-loss mechanisms & rates

- Measuring/observing/quantifying molecular layers in AGB and RSG (Wittkowski)
- Nucleation models of dust in AGB winds remains mostly unconstrained (Gobrecht).
- Short duration of AGB super-wind clear, but unclear! (Lombaert)

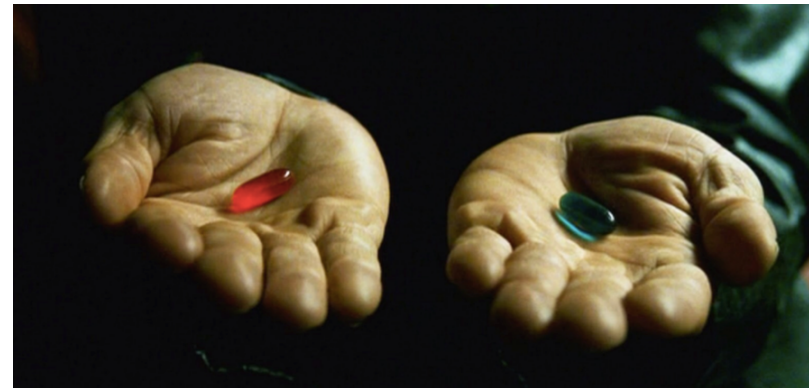


Les étoiles qui perdent tellement de masse, ils sont stratifiées

Asymmetry in mass-loss

- Asymmetries seen in the continuum of super-windy stars and the super-wind is too short lived! (Lombaert, Chesneau+ 2005)
- Asymmetric shapes of the line emission regions in Miras (Fabas)
- Funny asymmetry in Beetlejuice with single dish + PIONIER Montarges (*l'étoile Beetlejuice est fou et incompréhensible, Olivier l'avait prédit!!*)
- Disks in AGB stars (Lykou)

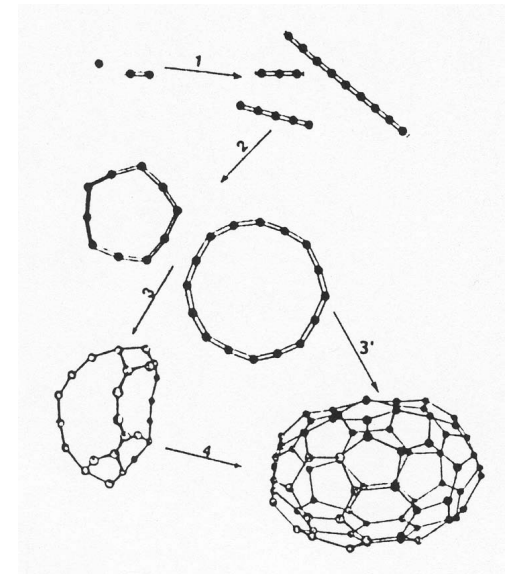
Les étoiles qui perdent tellement de masse sont souvent non sphérique



From stellar evolution to central questions in adjacent fields

- The generation of interstellar dust from “dustars” (1Mo per 10 Myr) (Moffat)
- The formation of dust in Novae
- FS CMa make dust, maybe important for dust budget?? (Miroshnichenko)

Toutes les stars produisent de la poussière,
certains plus que d'autres

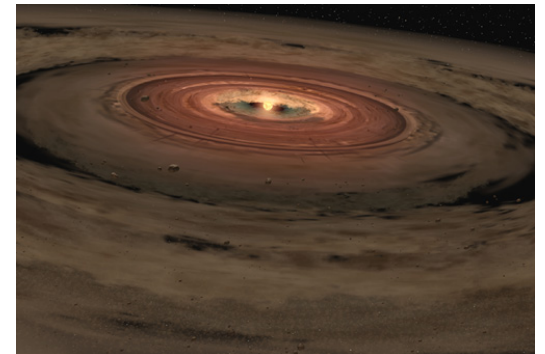


From stellar evolution to central questions in adjacent fields

- The generation of organics happens everywhere, in PPN stars and novae and very fast (Kwok)
- More and more information from proto-planetary disks will tie to stellar yields.
- Constraining nucleosynthesis by measuring unpronounceable elements (van Eck)



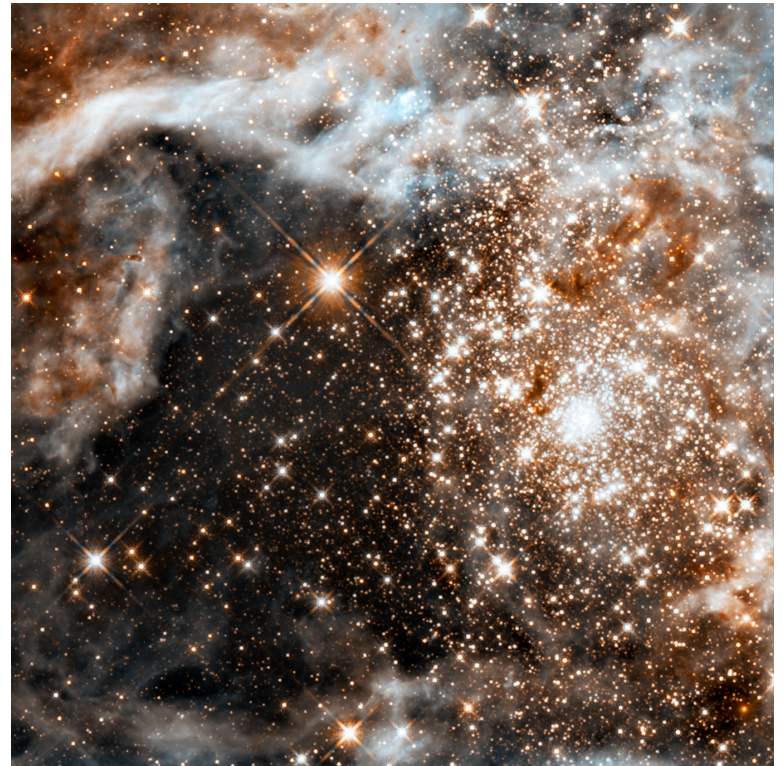
Les molécules organiques
provenant des étoiles évoluées
vont aux disques pré-
planétaires



Stellar evolution by population (Khorrami)

Impressive combination of HST imaging/
photometry, stellar atmosphere and structure
modelling, single+binary population synthesis
and N-body.

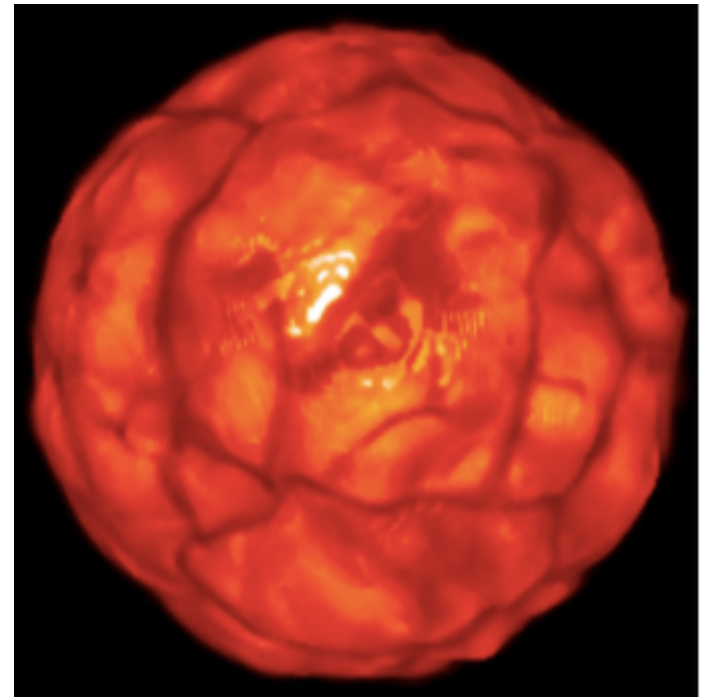
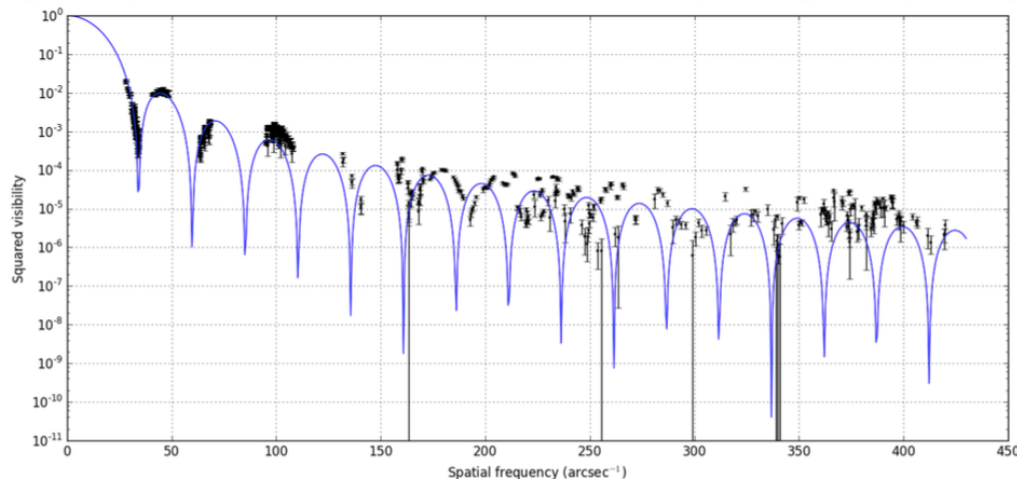
What you could do with HST, you can now do
with SPHERE (compare: \$100,000/90 min vs.
\$50,000/night)



R136

Fundamental Stellar Parameters

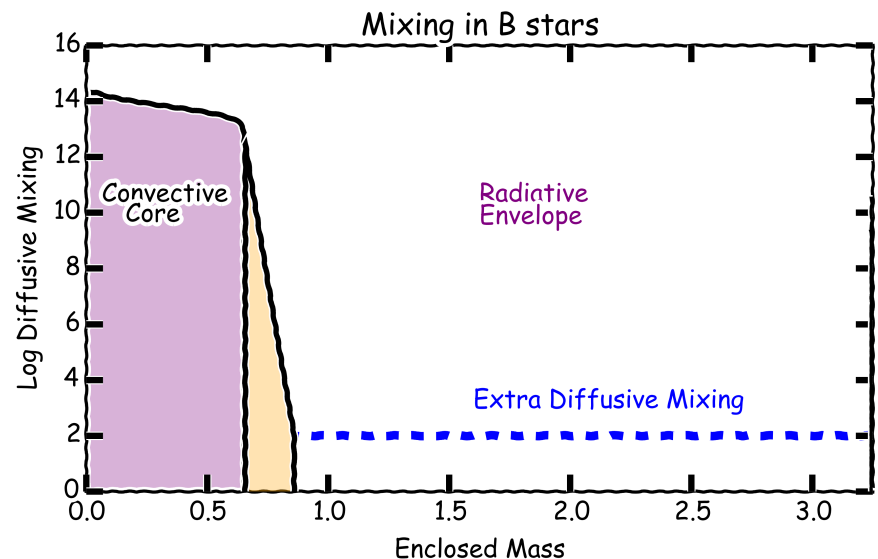
- We can see the convection plumes in Antares with SPHERE (Montargès, Chiavassa)



Olivier m'a fait realiser comment le graphique ci-dessus est incroyable!)

Fundamental Stellar Parameters

- Constraints on overshooting layer using asteroseismology for B-type main sequence stars: smooth convective boundary (Moravveji)



Binary types

Certains types d'étoiles binaires. Il y en a tellement!

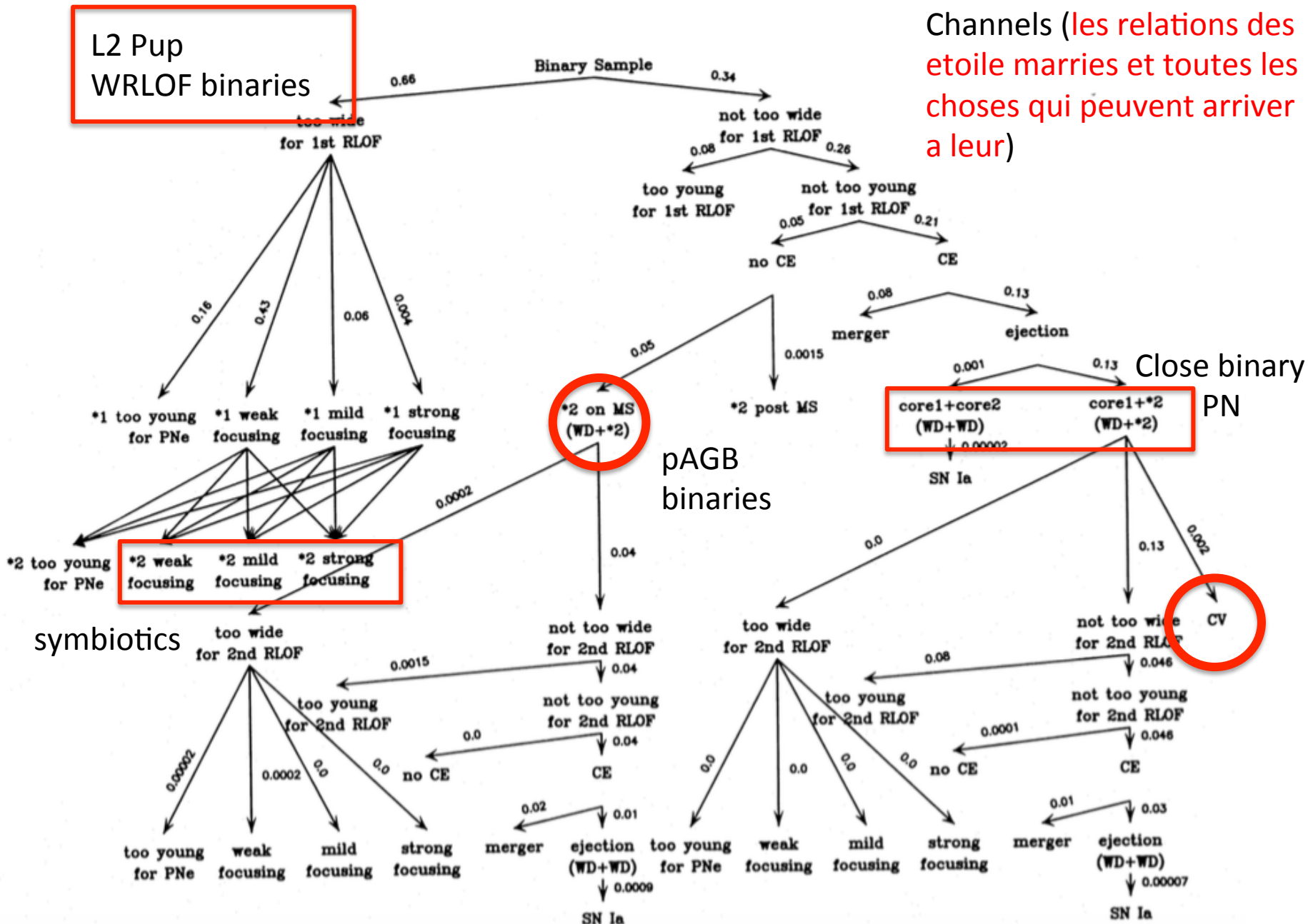
- Novae (Evans, Gherz)
- Symbiotics (Mikolajewska)
- Algols (beta Lyrae; Nemaravova)
- FS CMa (Miroshnichenko)
- Post-CE CSPN (Miskawlski, Jones)
- postAGB and postRGB close-ish binaires (van Winckle, Kamath, Vos, Hillen...)
- WR+O pinwheel (Moffat)
- LBV binaries (Hamaguchi)
- Individuals: L2 Pup (Kervella), CW Leo (Decin)

Binary Zoo

From Han et al. (1995)

Example of binary

Channels (les relations des étoile marries et toutes les choses qui peuvent arriver a leur)





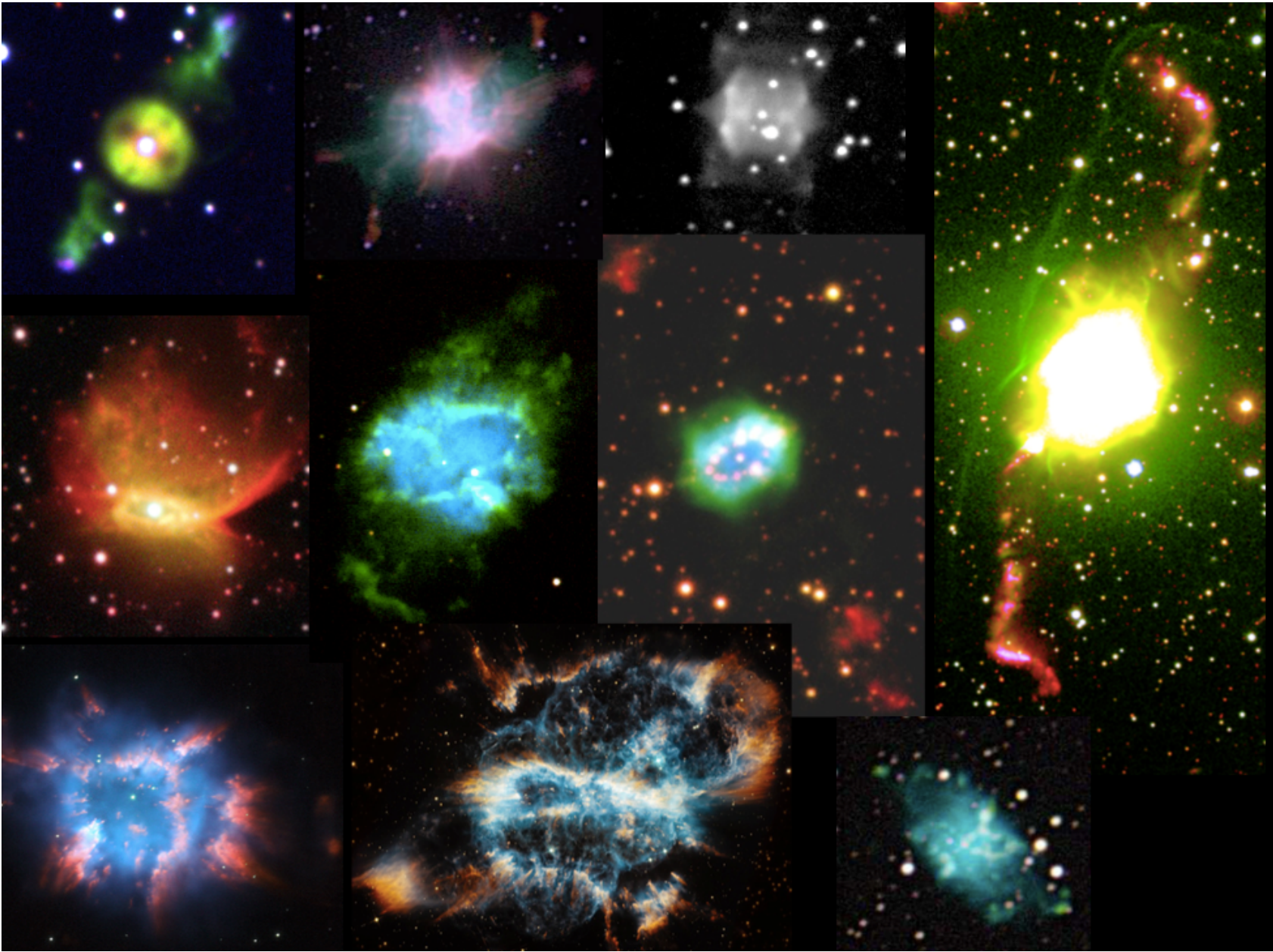
PN

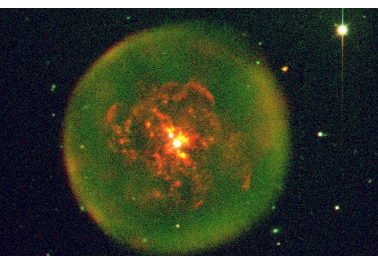
(Miszalski, Jones, van Winckel ...)

- Plausible that $>50\%$ are from binary interactions (shapes)
- $>\sim 20\%$ are close binaries and come from common envelope interactions
- Their shapes are “bitty” but no common morphology.
- Post AGB binaries will not make PN (van Winckel)

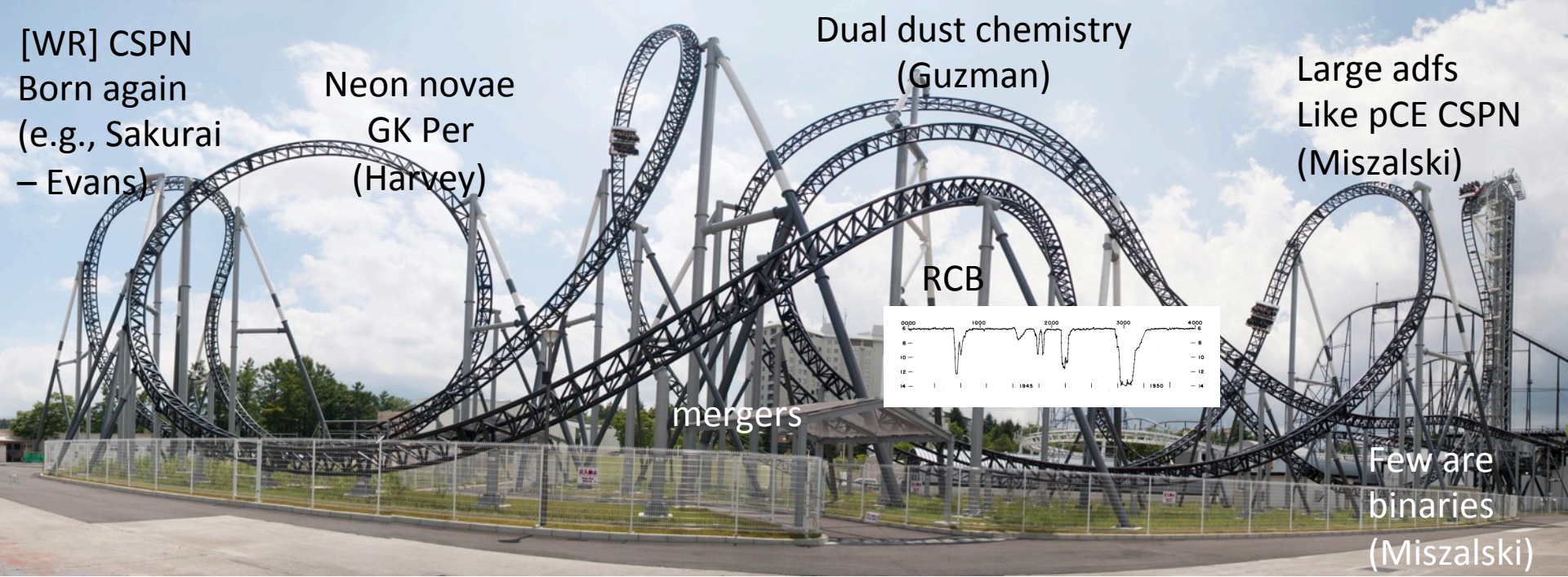
Les formes des nébuleuses planétaires sont peut-être souvent due à l'interaction de deux étoiles







[WR] central stars of PN



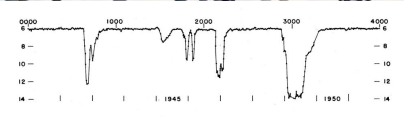
[WR] CSPN
Born again
(e.g., Sakurai
– Evans)

Neon novae
GK Per
(Harvey)

Dual dust chemistry
(Guzman)

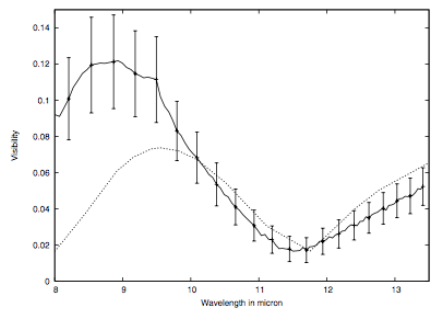
Large adfs
Like pCE CSPN
(Miszalski)

RCB



mergers

Few are
binaries
(Miszalski)

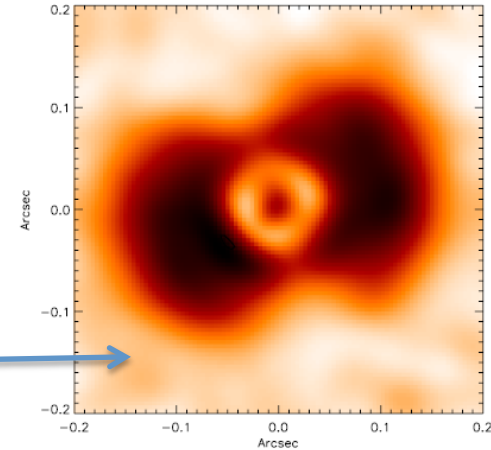


Chesneau et al. 2006 ont trouve un disque dans la nebuleuse planetaire de une etoile [WR]

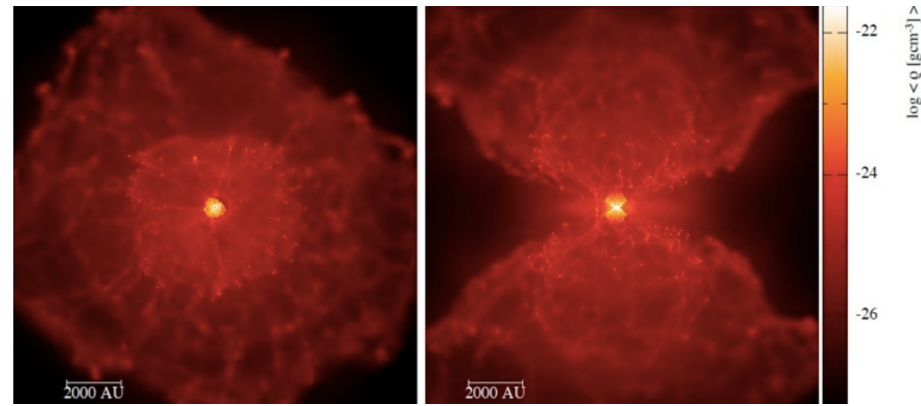
Novae

(Gehrz, Ribeiro, Harvey)

- It is really complicated.
- Olivier a observee les puvres qui se forme apres de l'explosion de une nova



- Multiple dust compositions (both C and O rich, Gehrz), similar to what happens in many PN (Guzman)
- Models of nova ejecta (Mohamed)



Novae

(Gehrz, Ribeiro, Harvey)

- Novae became suddenly even cooler!
- New: gamma ray novae
- You just do
than observ

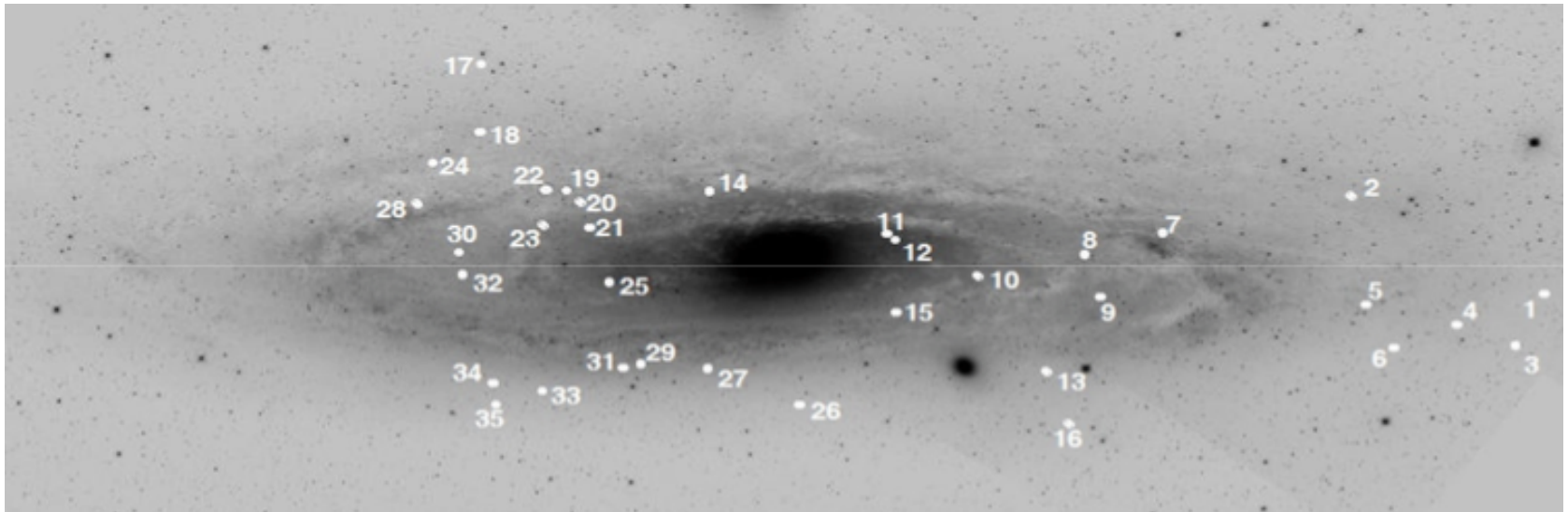


Un télescope sur un avion!!

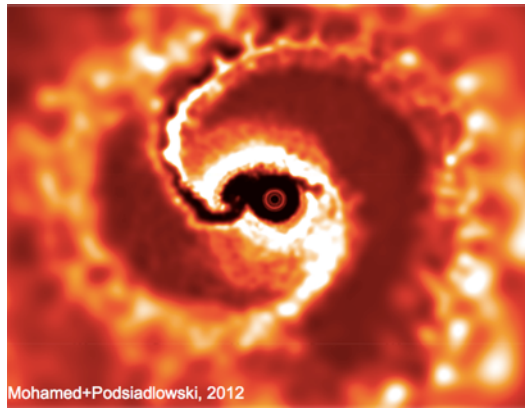
Symbiotic binaries

- Too complicated!
- Local group census, birthrates, luminosities! (Mikolajewska)
- Dust from D-types: models + mass-loss rates for Miras (Jurkic)

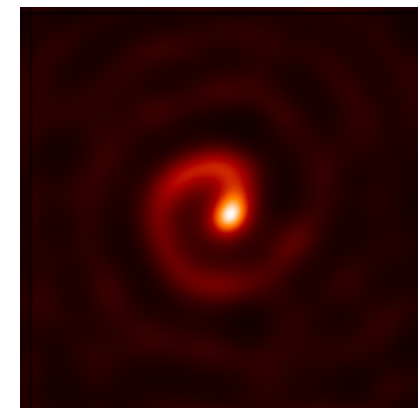
Les étoiles symbiotiques sont des géants qui transfèrent à très petites naines blanches de masse, et les conséquences sont incroyables, Olivier a écrit 4 articles sur ces étoiles



L'interaction de deux étoiles massives



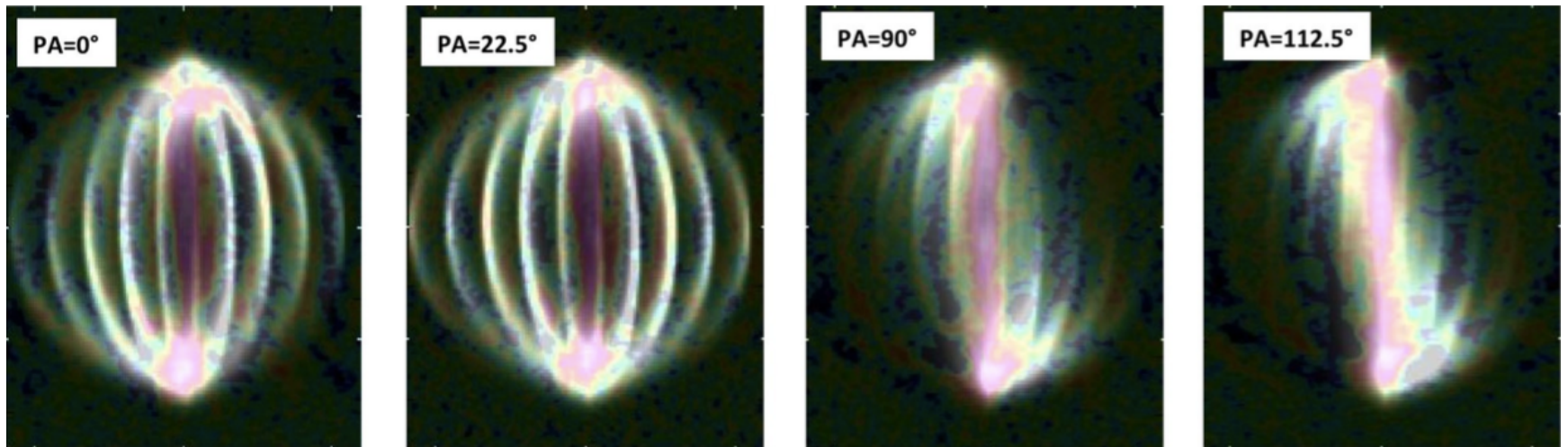
Mohamed+Podsiadlowski, 2012



Binary Interactions

- Wind-wind interactions in massive systems, e.g., WR+O stars making the pinwheel phenomenon (Moffat).
- Spectro-polarimetry can help map the interaction region of wind-wind collision objects (Hoffman)
- Wind Roche lobe overflow (Mohamed)
- CW Leo, spiral sideways (Decin)
- And all those planets that form around stars (Milli) will interact with the star one day. Who cares about the planet! But what will the planet do to the star that created it??

And the Turner Prize 2015 goes to...



CW Leonis!

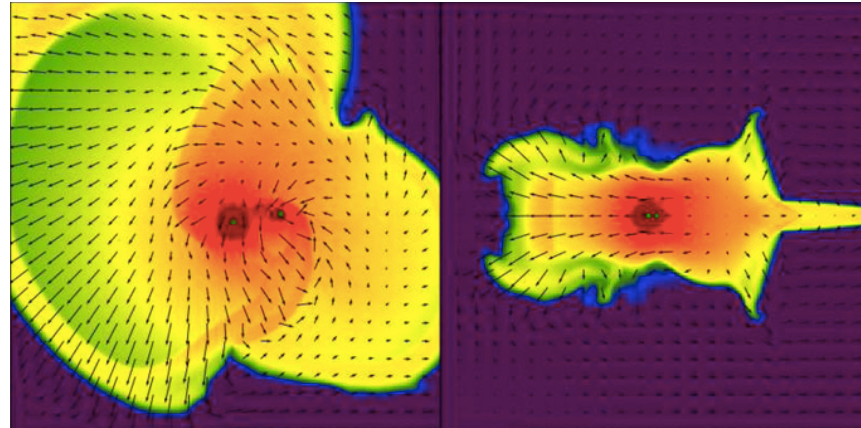
Il est agréable, même si nous ne savons pas ce qu'il est!

Jets

- Jets here, jets there, jets everywhere! (Noam)
- Possible formation of an explosive jet (Suarez).
- Common envelope jets (Jones)
- Tenuous jets in pAGB binaries (van Winckel)
- No jet in GK Per (Harvey)

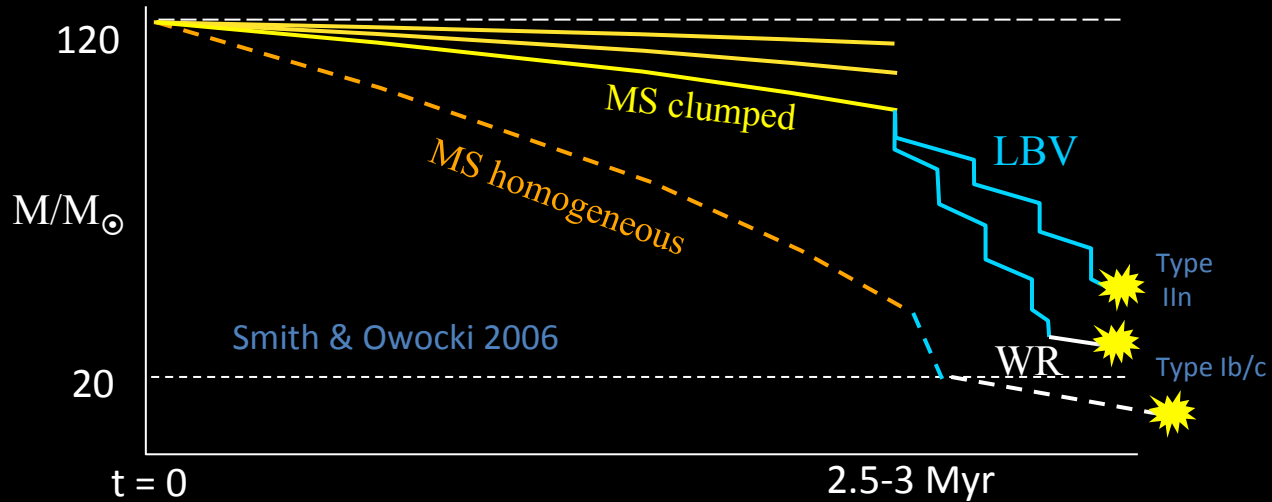


Common envelope interactions



- Close binaries in PN are clear cut (Jones, Miszalski)
- pRGB, pAGB binaries too close to have avoided CE, too separated to be classic CE – grazing CE?
- Algols (Nemravova) may have gone through a phase of CE, but...
- Theory is not even a 10th of the way to explaining the observations.

Massive star paths



Quelques mots sur la façon dont les étoiles massives vivent leur vie

Les supernovae sont des explosions violentes des étoiles massives, mais ne sait toujours pas ce que esattement explosent

Massive stars

Binary companion

Needed?

Close binary strips primary of H via RLOF

LBV

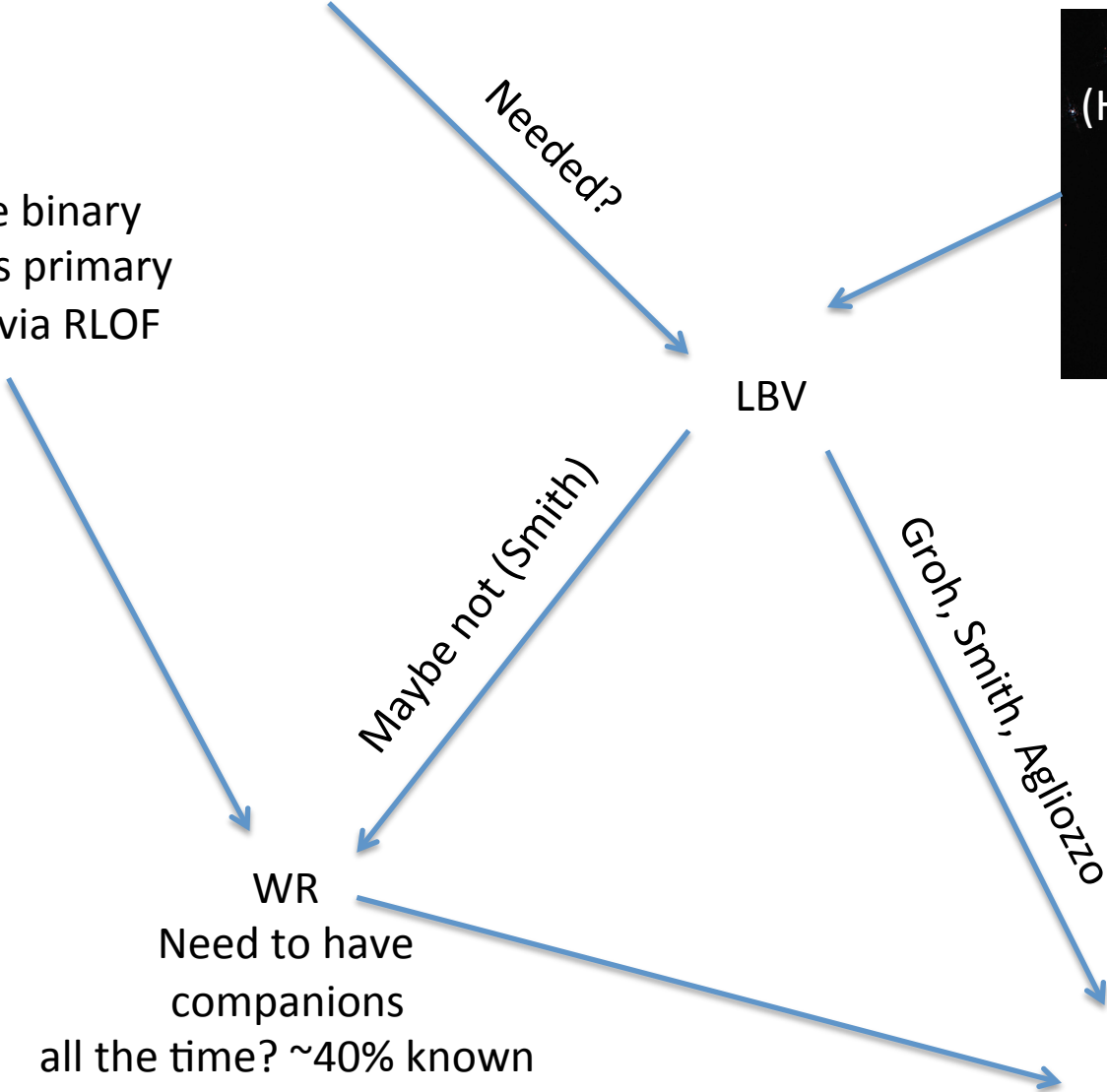
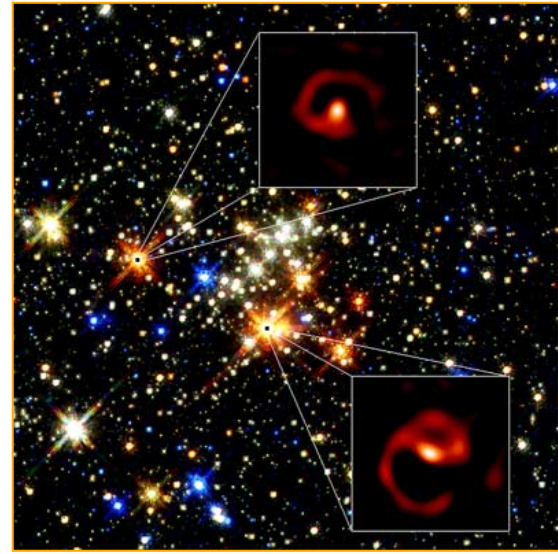
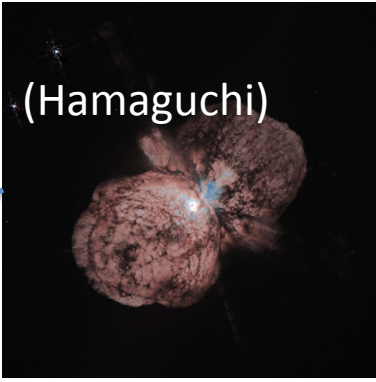
Maybe not (Smith)

Groh, Smith, Agliozzo

WR

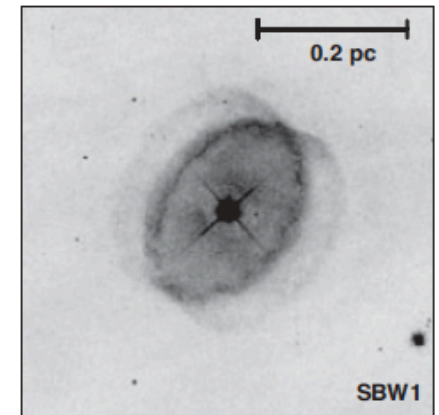
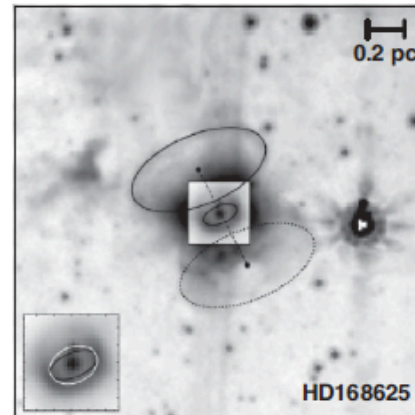
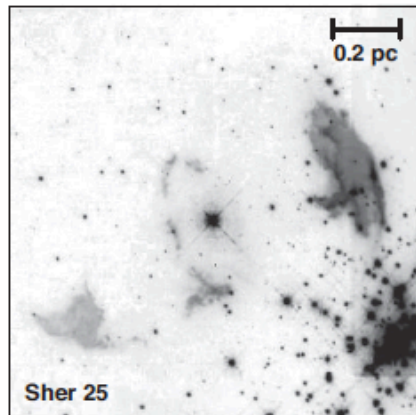
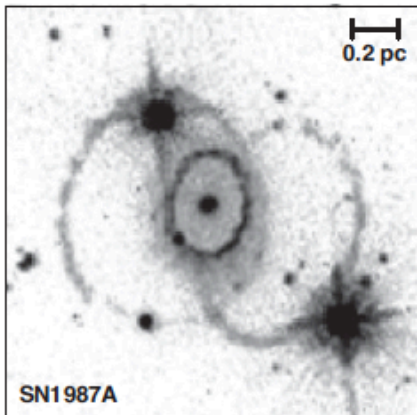
Need to have companions all the time? ~40% known

SN II/Ib,c



Massive main sequence binaries: singles or binary

- Four RLOF massive binaries (Smith)
- Algol system beta Lyrae (Nemravova)
- Eta car could be the secondary, while the companion is the stripped primary.
- Maybe all WR stars are such stripped stars.
- Ring systems with BSG but no binary in the middle!

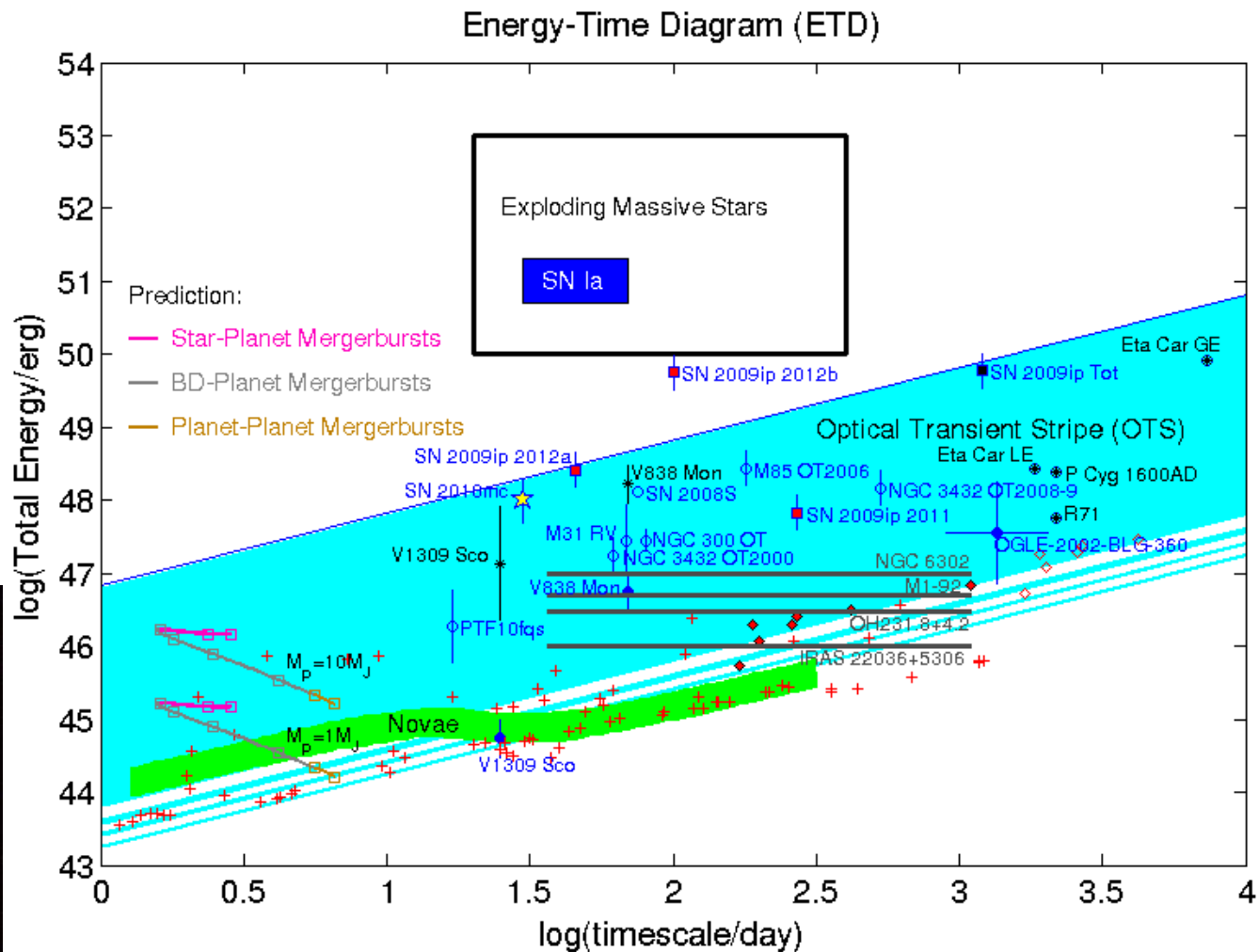
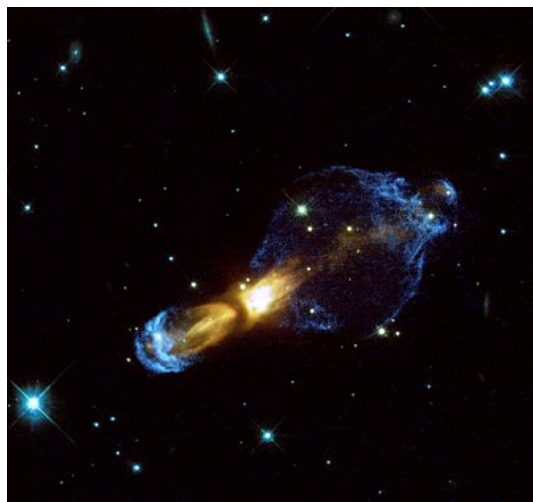
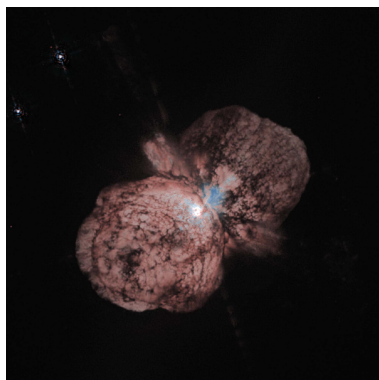


A passion for stars: make connections not apologies

- Type Ia connection to cosmology is feeble at best.
- Type Ia are interesting because they are stars.
- Stars gain added relevance because of the interest in finding and characterising planets.
- Many real connections there.

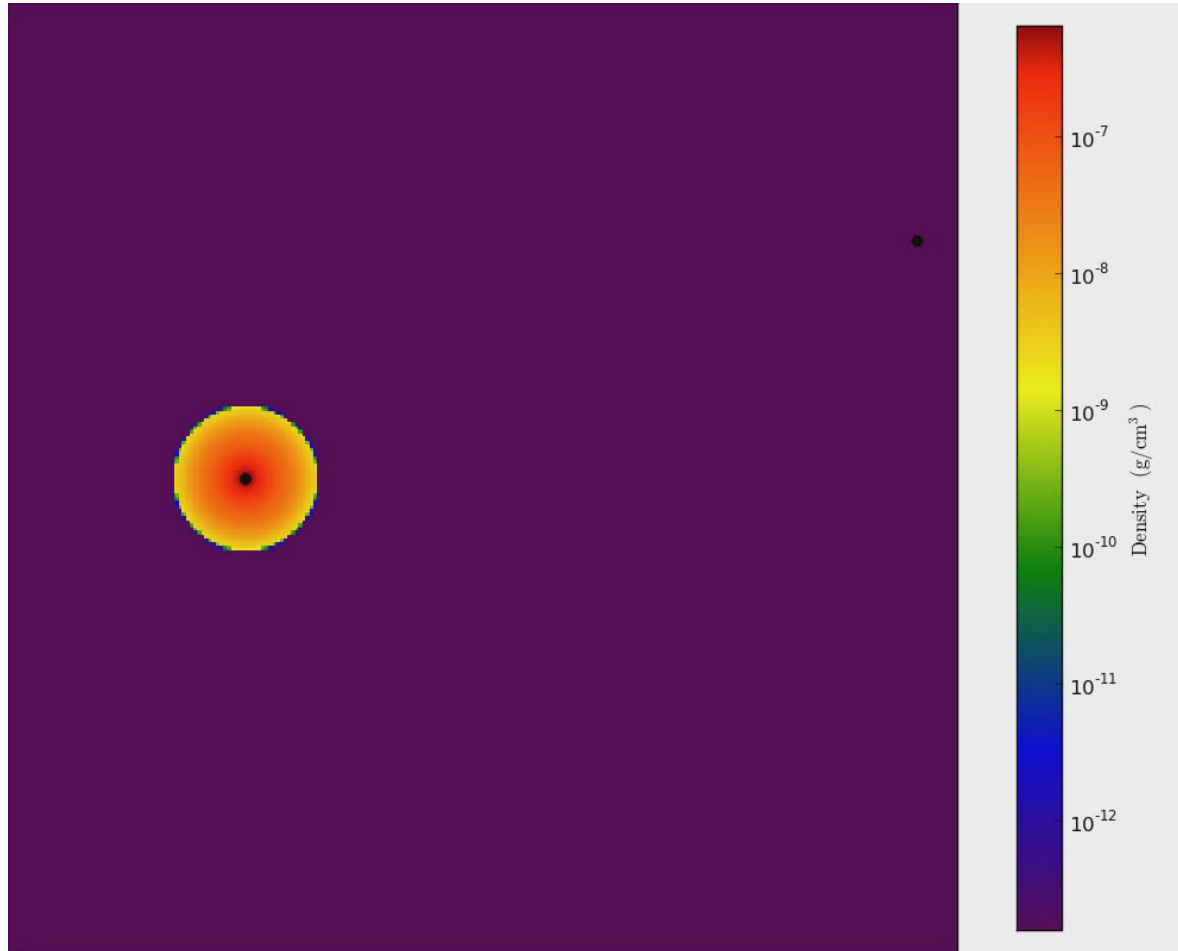
Stars: a new frontier

When you want to know how something works, break it!



(Soker)

Eccentric interaction between 3Mo AGB star
and 2Mo companion $P=30$ years, $e=0.6$
(Staff, De Marco, et al., submitted)







- And now for something completely different.

Can we have your talks?

- Kenji
- Cyrill
- Olga
- Eamonn
- Anatoly
- Joanna
- Martin
- Pierre
- Claire
- Nathan
- Miguel

Binary discussion

- How often is **mass-loss caused** or enhanced **by a** (often unseen) binary **companion**?
- We need to **tidy up** binaries:
 - When do massive binary phenomena appear in lower mass stars?
 - Can the # Symbiotics constrain the number of giants with close binaries?
 - Can Beta Lyrae constrain common envelope accretion mechanisms?

Binary discussion

- Binaries as individual fields (eg. CVs) cannot remain isolated. Connections need to be made in two ways:
 - 1) to those communities who thought they were working on single stars.
 - 2) To those communities who have been looking for explanations of common phenomena (e.g., accretion, jets).

Is it viable to EVER not include the possible presence of a binary companion in any stellar study? As we add the next decimal place on our measurements binary effects will be increasingly evident.

How often is mass-loss in a star caused or enhanced by a (often unseen) binary companion.