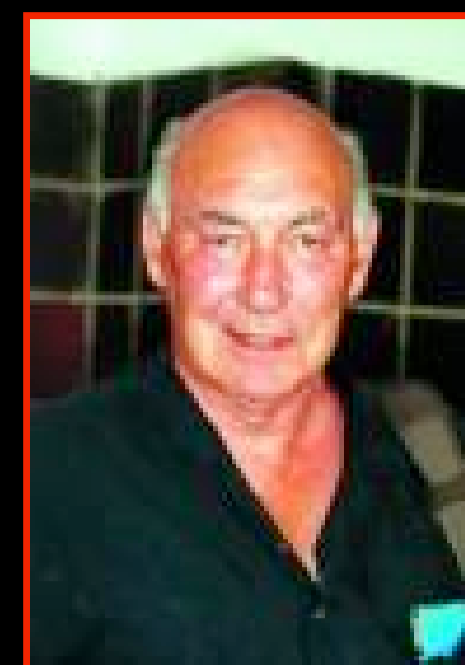
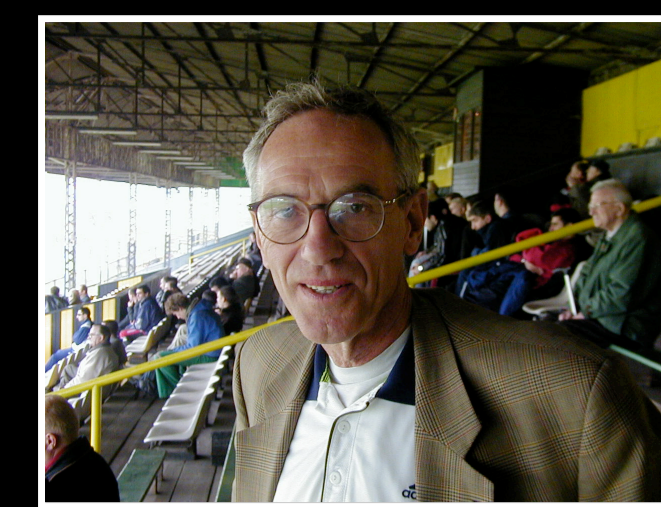
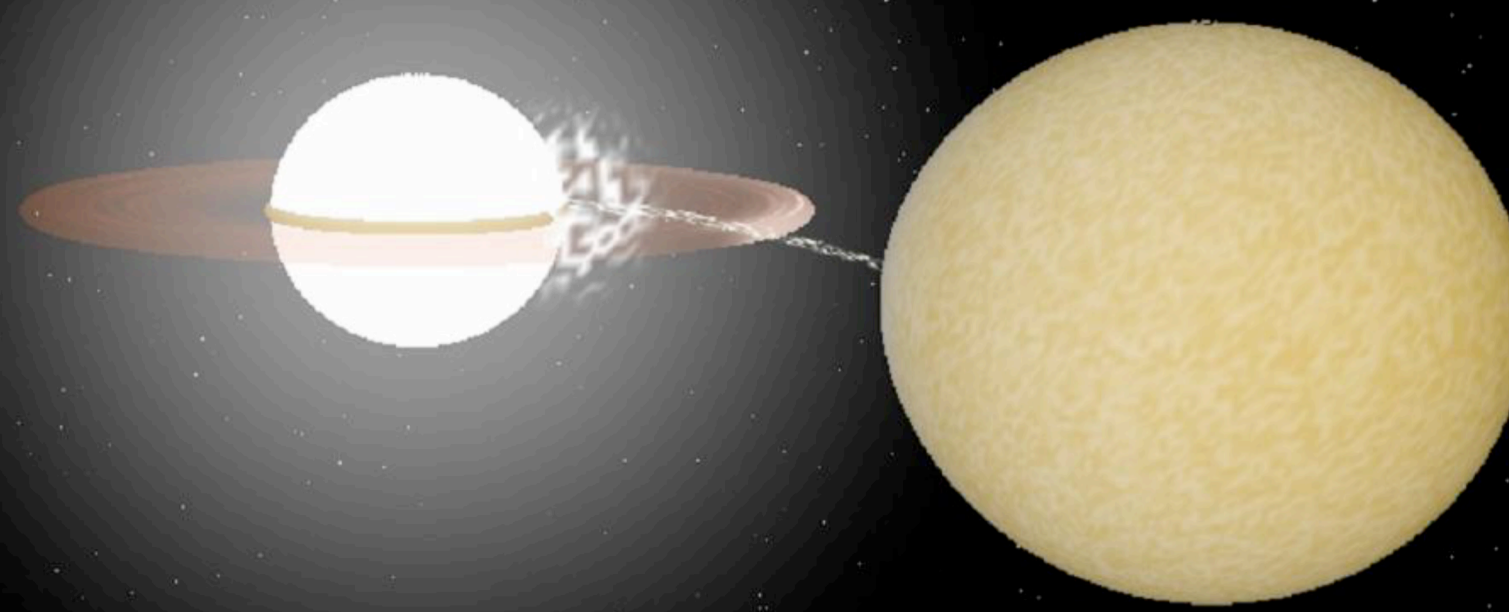




J-P. De Greve



C. De Loore



W. Van Rensbergen

Algols contribute to the Interstellar Mass

Binary evolution

¿ Without (**conservative**) or with (**liberal**) mass loss from the system ?

Liberal scenario

1. Gainer spins up when hit by RLOF-material from loser
2. Gainer spins down due to tidal friction
3. Gainer's critical velocity is reduced by push of its nuclear & accretion luminosity
4. As long as v_{eq} is below v_{crit} RLOF occurs conservatively ($\beta = 1$)
5. At high \dot{M}_{donor} we have $v_{eq} \approx v_{crit}$
6. All matter lost by the donor at higher rates leaves the system, blown away by the gainer as wind ($\beta < 1$)
7. Mass lost by the system typically adds up to 10% of the mass lost by the loser

Compare

Observations of ALGOLS

Orbital periods very accurate
Mass ratios "rather accurate"

With

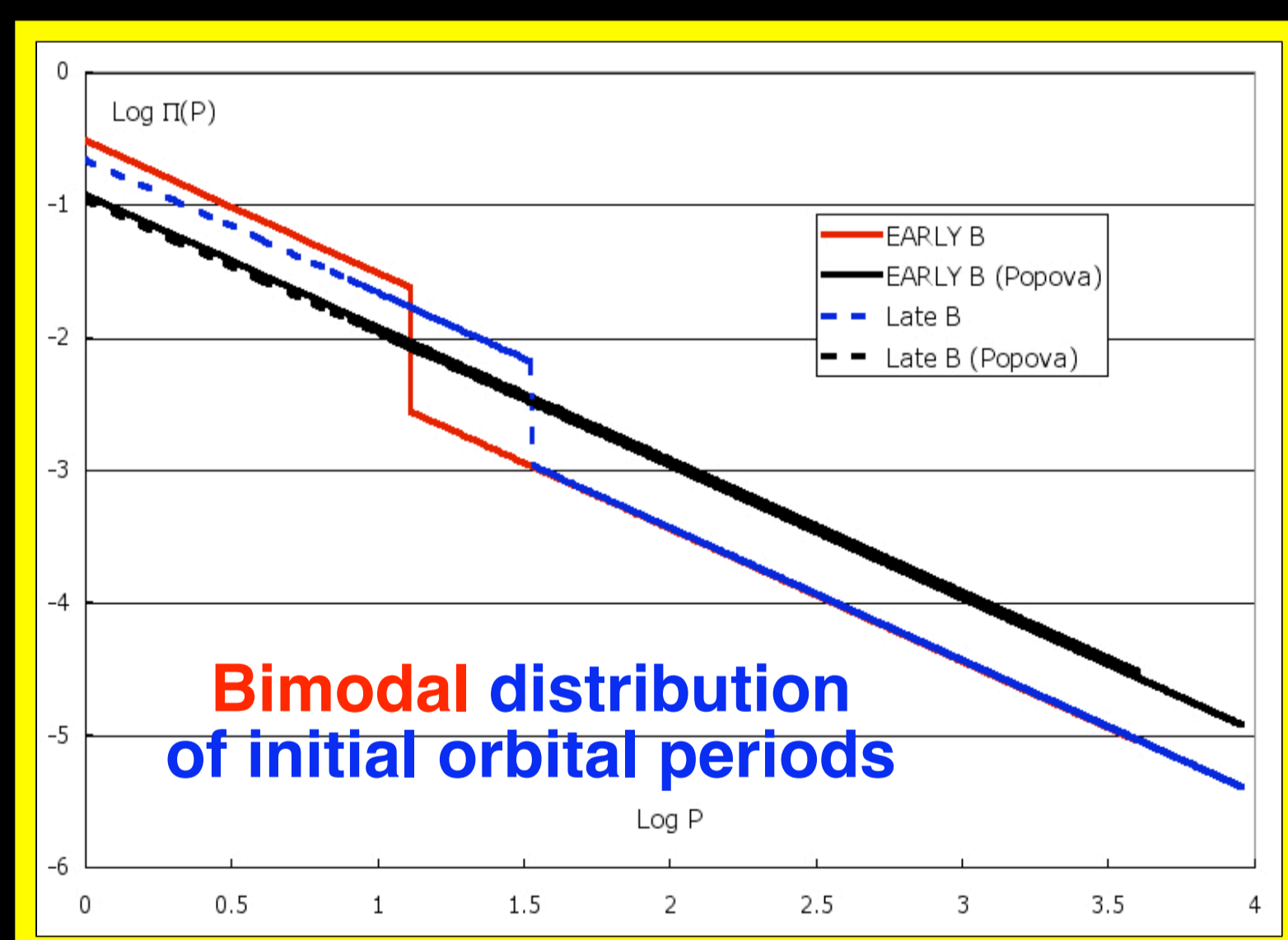
Theory

The "Brussels" binary evolutionary library
(<http://www.vub.ac.be/astrofys>)
traces binary evolution from birth through various ALGOL stages

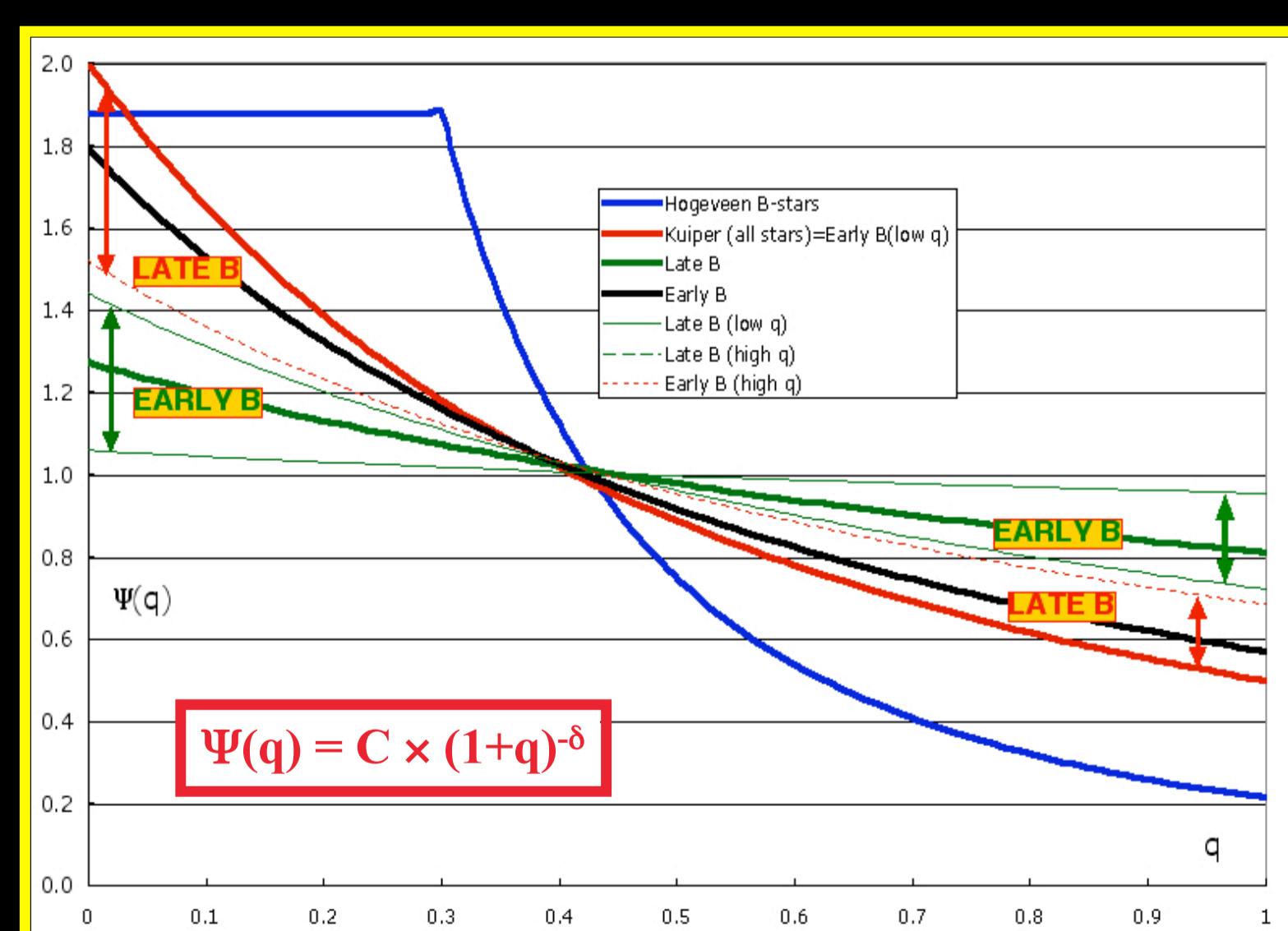
Conservative simulation

starting from:

Initial distributions of orbital periods and mass ratios of non-evolved binaries with a B-type primary are fitted to the catalogue of spectroscopic binaries (<http://sb9.astro.ulb.ac.be>)



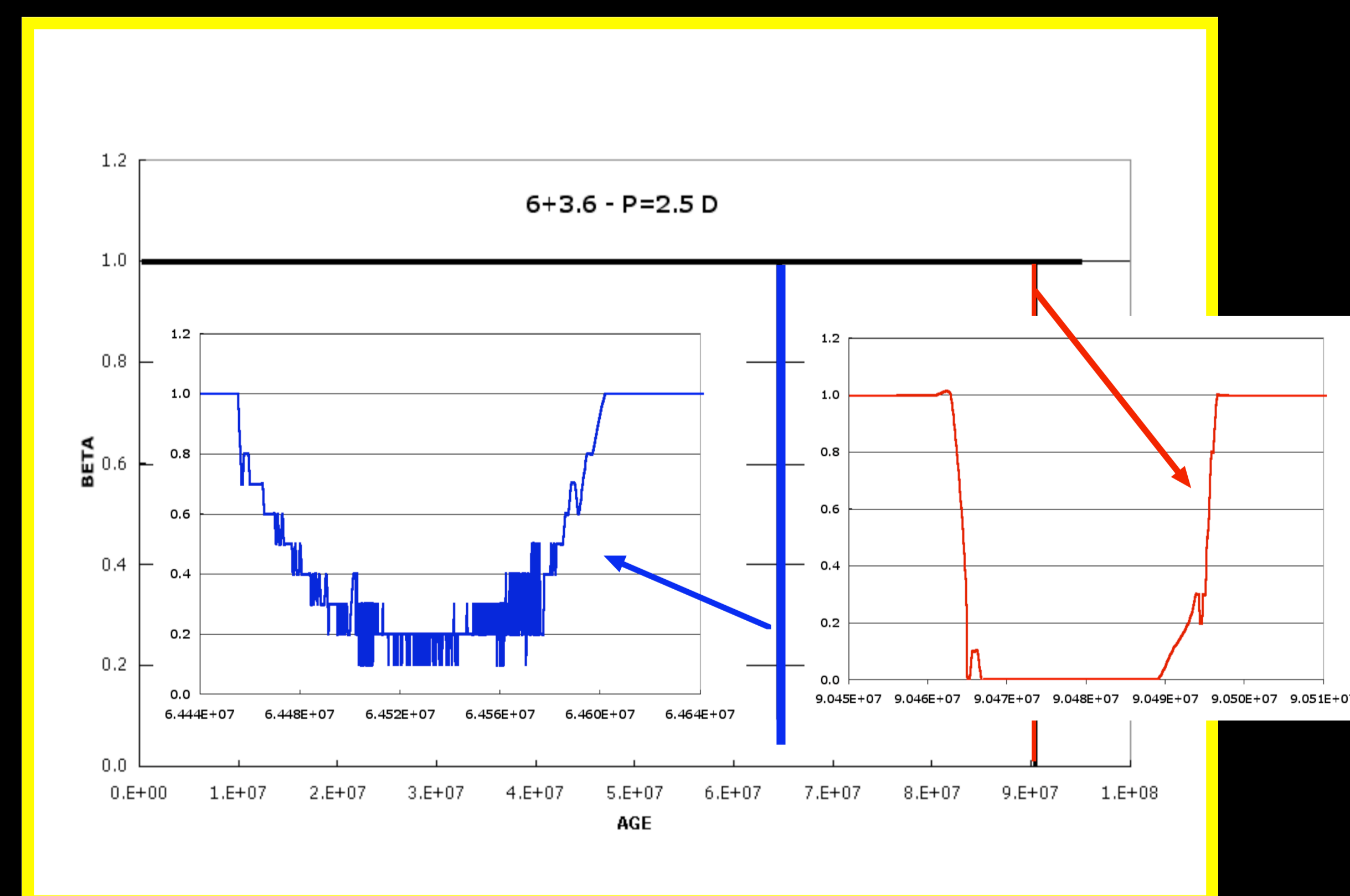
Kuiper-like distribution of initial mass ratios



Conclusion: "parameter beta"

$$\dot{M}_{gainer} = -\beta \dot{M}_{donor} ; 0 \leq \beta \leq 1$$

is time-dependent and determined self-consistently



Conservative evolution:
Case B produces much more long periods than observed:

Far more ALGOL A than ALGOL B cases

More than 70% ALGOLS have mass ratios above $q = 0.4$:
Conservative evolution produces too many ALGOLS with small q:

Conservative evolution can not always be the case

Example: Evolution of a (6+3.6) M_{\odot} - binary with initial period $P = 2.5$ d:
Almost always conservative ($\beta = 1$). Only during $\approx 150,000$ years of early RLOF A- evolution $\approx 1 M_{\odot}$ is lost by the system (**blue insert**)

Later $\approx 0.05 M_{\odot}$ is lost during $\approx 30,000$ years of RLOF B-evolution (**red insert**)

The ALGOL lives now longer at higher mass ratios:
meeting the observations

without changing much its orbital period:
good agreement between theory and observations remains