THE PRE-MAIN SEQUENCE STELLAR POPULATION IN GALAXIES

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A complete census of the stellar populations in galaxies must include not only the Main Sequence and various post-Main Sequence populations (SGB, RGB, AGB, HB, plus degenerate objects such as WD and NS) but also the pre-Main Sequence (PMS) stellar population.
These young stellar objects, predominantly of low mass ($M<2M_\odot$), derive their luminosity not from nuclear burning but from slow gravitational contraction and in part from the gravitational energy released during accretion of matter from circumstellar disks. However, some deuterium rather than hydrogen burning does occur for a brief period early on in PMS stellar evolution, either in the core for low-mass ($M<2M_\odot$) PMS stars (Mazzitelli & Moretti 1980) or in a shell for intermediate-mass ($2\text{-}8M_\odot$) PMS stars (Palla & Stahler 1990). The more massive young objects ($M>8M_\odot$) may not experience much of a Kelvin-Helmholtz phase and probably ignite core hydrogen burning before the end of their accretional growth.
Although the PMS population may be insignificant or of little importance in many galaxies (especially in old gas-poor systems, i.e. ellipticals), the PMS population may play a non-negligible role for population synthesis in gas-rich starburst systems and/or in very young, i.e. primeval galaxies (ages $<10^7$ yrs). Judging from 2 micron luminosity functions of young OB clusters (such as the Trapezium cluster in Orion) in which bright infrared sources (i.e. massive stars) are typically accompanied by hundreds of low-luminosity PMS members (see Zinnecker, McCaughrean, and Wilking 1991), it appears that about half the integrated 2 micron luminosity of such OB clusters actually comes from the low-mass PMS population. The same may be true for young galaxies. Moreover, the number of PMS stars in the star forming galaxies may be scaled from the estimated number of OB stars (about 1000 PMS stars for each massive ionizing star); for example, our Galaxy should contain a total of about 10^5 low-mass PMS stars younger than 10^7 yrs, assuming that most PMS stars form in OB clusters and that there are $\sim 10^4$ O stars in the Galaxy.

References:
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Palla and Stahler 1990, Ap.J.Lett. 360, L43
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