ABSTRACTS OF CONTRIBUTED PAPERS

CENTRAL STAR OF NGC 3132: A VISUAL BINARY

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A faint companion to HD 87892 (V=10.07, B-V=+0.09, U-B=+0.10, Sp.A2) has been discovered with the 3.6 m telescope (prime focus) of the European Southern Observatory at La Silla having the following parameters: separation ψ = 1".65, position angle θ = 226°.3. The companion was detected on plates taken in the U system (IIIa-J baked + UG1) and appears to be about $\Delta m_U \simeq 4.5$ mag fainter than the main component; it is almost invisible in the nearly visual system having $\Delta m_{vis} \simeq 4.8$ mag. Contrary to the eccentric position of HD 87892 the companion lies in the axis of symmetry of the nebula. For the given reason the companion can be considered as the actual planetary nucleus. Assuming that its temperature is approximately $T_* \approx 10^5$ °K and the distance of the nebula $d \simeq 0.9$ kpc, the following parameters of the nucleus were estimated: $L_*/L_\odot \simeq 110$, $R_*/R_\odot \simeq 0.035$. The physical association of HD 87892 with its visual companion is probable. (Paper will appear in Astronomy and Astrophysics.)

A SHORTLIVED, DEEP CONVECTIVE ENVELOPE FOR HIGHLY EVOLVED, BLUE STARS?

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An interesting new phenomenon was encountered while evolving a star with a core mass, M_C of 0.8 $M_\odot$ and with a small envelope mass (0.015 $M_\odot$) away from the red giant branch towards the nuclei of planetary nebulae, while taking the helium shell flashes into account. It was found that the top of the intershell carbon pocket (the carbon-enriched region in between the hydrogen- and helium-burning shells left behind by the flash) was expanded outwards and cooled immensely; namely, cooled to near 20,000°K! This means that the intershell carbon pocket was lifted out to near the photosphere, right into the shallow outer convective envelope surrounding the hydrogen- and helium-ionization zones! The carbon opacity at these cool temperatures is great. It seems likely that all the layers from the outer regions of the intershell carbon

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pocket right up to the surface will become convective. This would be a totally new type of deep convective envelope with a vast number of fascinating implications. Careful checks of this new phenomenon are now underway. (Supported in part by the National Aeronautics and Space Administration [NSG 7195].)

DISCUSSION

Stecher: In our analysis of NGC 7662 we found abundances which would be expected for an intermediate object except for carbon which was twice that expected. My question is with your respective mechanisms how much He should we get?

Sackman: You can get many things. You can get carbon rich stars with normal helium or you can get carbon rich, nitrogen rich, helium rich, depending on how many times you allow your flashes to recycle things.

Sugimoto: It depends on the mass contained in the hydrogen rich envelope In the particular case of FG Sagittae, the mass of the envelope is very small and it must be helium rich. Helium is something like 80% of the mass.

HYDROGEN- AND HELIUM-SHELL FLASHES AND FG SAGITTAE PHENOMENON

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Evolution of an electron-degenerate carbon-oxygen star of 1.08 $M_\odot$ was computed assuming that hydrogen-rich gas was accreted at 1.58 x 10^{-7} $M_\odot y^{-1}$. Such a star mimicks the evolution of FG Sge, if a part of the ejected mass accretes back onto the central star. When a hydrogen envelope of 4 x 10^{-6} $M_\odot$ was formed, a hydrogen-shell flash began. Succeeding 300 hydrogen-shell flashes were suppressed artificially to compute the growth of helium zone. After 8100 years of accretion, helium-shell flash began. Helium convection zone was found to reach the bottom of the hydrogen envelope, because the entropy barrier was low for the thin envelope. Protons were mixed into the helium zone, which produced neutrons and s-process elements. The mixing triggered also the hydrogen-shell flash. Hydrogen convection zone reached a mass shell of 10^{-8} $M_\odot$ measured from the surface. After the helium-shell flash ceased, the hydrogen envelope expanded greatly and a deepening surface convection dredged up the s-process elements. (Paper to be submitted to Publ. Astron. Soc. Japan.)