AGE DETERMINATION IN CW Eri = BV 1000

H.Mauder

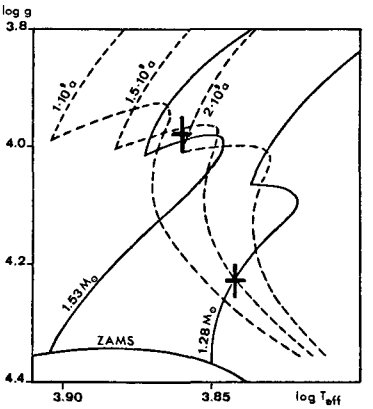
Astronomisches Institut
Universität Tübingen

CW Eri is a double lined spectroscopic binary star. Since the two components are well detached, it is possible to derive absolute elements with high accuracy. The photometric elements are based on observations obtained at Boyden observatory in 1971/72, see Mauder and Ammann,1976. The spectroscopic data are taken from Popper,1980. In the following table the system parameters are given.

Spectra	F2 + F2	
Period	$2^d.728373$	
M_1 =	1.52 $M_\odot$	$\pm$ 0.015
M_2 =	1.28 $M_\odot$	$\pm$ 0.010
R_1 =	2.10 $R_\odot$	$\pm$ 0.05
R_2 =	1.44 $R_\odot$	$\pm$ 0.05
i =	$86^\circ.7$	$\pm$ 0.1
$\log T_{e,1}$ =	3.860	(assumed)
$\log T_{e,2}$ =	3.843	$\pm$ 0.01

Hejlesen, 1980, has calculated evolutionary tracks for stars of different chemical composition. In his log g - log T_e - graphs isochronic lines are given which allow for an age determination of binary stars. In the figure, the two components of CW Eri are given as crosses, indicating the uncertainty of the elements. It is evident, that the components are lying on the respective evolutionary tracks according to their masses and that the isochronic line for $1.5 \cdot 10^9$ years fits both stars.
The log g - log T_e - diagram used is for a chemical composition of X = 0.70 and Z = 0.02. The ratio of mixing length over pressure scale height l/H_p = 2 was used. For l/H_p = 1.5 no consistent solution is possible. It is interesting to note, that the respective values of the sun, drawn into the Hejlesen graphs, yield an age of about $4 \cdot 10^9$ years for the sun, if l/H_p = 2 is used and an age of

Z. Kopal and J. Rahe (eds.), Binary and Multiple Stars as Tracers of Stellar Evolution, 217–218.



Evolutionary tracks (full) and isochronic lines (broken) according to Hejlesen (1980). The two components of CW Eri are shown as crosses, indicating the uncertainty of the elements.

about $1 \cdot 10^9$ years if $l/H_p = 1.5$ is adopted. There are two parameters which might be altered for CW Eri. First, the chemical composition could be different. Since, however, the two components must be lying on their respective evolutionary tracks according to their masses, a consistent solution is possible only if $X = 0.70 \pm 0.02$ and $Z = 0.020 \pm 0.002$. The second parameter is the effective temperature of the primary component. The temperature difference $T_{e,1} - T_{e,2}$ is known very accurately from the photometric solution. However, $T_{e,1}$ was adopted according to the spectral type F2. The consequence of a change in $T_{e,1}$ would be a change in the chemical composition. For this case, however, it is very difficult to fulfil the condition of both stars lying on a single isochronic line. An independent determination of the chemical composition of CW Eri would be most interesting with respect to the temperature calibration.

References:

P.M.Hejlesen,1980,Astr.&Astrophys.Suppl.39,347
H.Mauder,M.Ammann,1976, Mitt.Astr.Ges.38,231
D.M.Popper,1980,Ann.Rev.Astron.Astrophys.18,115

https://doi.org/10.1017/S0252921100100545 Published online by Cambridge University Press