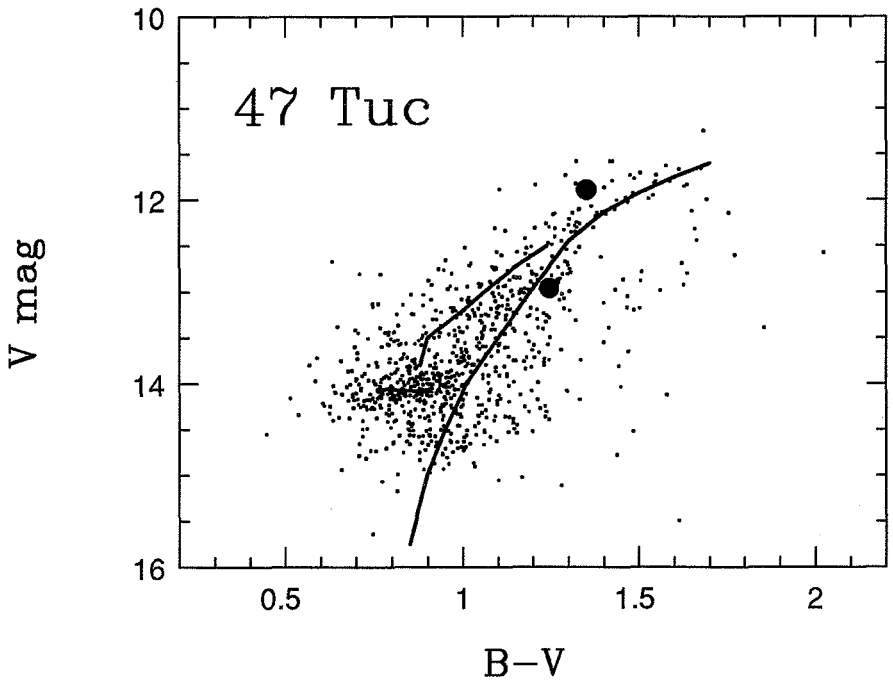

Figure 4: *Colour-magnitude diagram of the centre of 47 Tucanae, from two CCD images obtained at the ESO/MPI 2.2-m telescope at La Silla. The solid lines are the fiducial lines (Hesser et al., 1987,* P.A.S.P. ***99****, 739) for the RGB, HB, and AGB. The two stars (large dots) have positions on the red giant branch and asymptotic giant branch which tend to confirm their membership.*

displayed in Figure 4. The two stars have positions on the red giant branch and asymptotic giant branch which tend to confirm their membership. However, foreground dwarf stars cannot be ruled out since dwarfs at a distance of about 100 pc may appear superposed on the giant branch of 47 Tuc.

Because of its rather high galactic latitude (b = −44°), 47 Tuc does not suffer too strong a galactic pollution by field stars. Ratnatunga and Bahcall (1985) give estimates of the number of field stars per square arcminute toward galactic globular clusters. For 47 Tuc, taking into account a colour range, their estimates give about 1.8 10^{-2} stars per square arcminute. Therefore, the probability to find two such stars inside the central 40″ of 47 Tuc is very low.

From the above considerations there is no reason to disregard these two high-velocity stars; there is no indication that they are not members of the cluster. The ultimate proof of their membership will be obtained if spectroscopy shows that they are giants.

In this context, it is also worth mentioning that Gunn and Griffin (1979, *A.J.* **84,** 752) in their seminal study of the globular cluster M3 (≡ NGC 5272), find two similar high-velocity stars very close to the cluster centre. Their interlopers have velocities at 4.5 and 3.5 sigmas from the mean. In this case, however, the membership of these stars is quasi certain because of the high radial velocity of M3 (about −146 kms^{-1}).

VI. Ejected Out of the Core of 47 Tuc?

The main mechanism which may be called upon for explaining these two interlopers is the ejection out of the core by stellar encounters between a single star and a binary, or between two binary stars. Numerical scattering experiments (see, e.g., Leonard, 1991, *A.J.* **1991,** 562) show that gravitational interactions can eject stars at very high velocity. The presence of binaries (the required on-site gunners!) is now confirmed in globular clusters through different kind of observations. Apart from a few binary candidates from variable radial velocity, the core of 47 Tuc contains one low-mass X-ray binary, about ten pulsars and a very high density of centrally clustered blue stragglers recently observed by HST (Paresce et al., ibid.).

Nevertheless, there is a serious shortcoming with the binary interpretation: calculations mentioned above are valid only for ejection of main-sequence stars. So far no study has simulated the ejection of stars with larger radii. Because of their large size, giants cannot be members of close binaries. Their large radii imply larger impact parameters. Therefore, it is not known if the most energetic interactions can involve giant stars, it is not known if such interactions can accelerate giant stars sufficiently to produce such high velocities as observed in 47 Tuc and M3.

Before discussing more accurately the interpretations of these observations and their implications on various possible detailed ejection scenarios, the still tiny but remaining doubt concerning the membership of these high-velocity stars has to be definitely eliminated. The simplest way consists of obtaining spectroscopic observations, and deducing the luminosity classes of the two stars. If they are giants, their apparent magnitudes put them at about the distance of 47 Tuc, where field pollution is absolutely negligible, given the rather high galactic latitude (b = −44°): their membership will be certain. Observing time has been requested in order to get such valuable spectroscopic data. We hope that by the end of the year confirmation of the membership of these two stars will prove that two cannonballs have really been shot out from the core of 47 Tucanae!

STAFF MOVEMENTS

Arrivals

Europe:

ANSORGE, Wolfgang (D), Product Assurance Manager
BEUZIT, Jean-Luc (F), Associate
IWERT, Olaf (D), Electronics Engineer
LATSCH, Hedwig (D), Accounts Clerk
MICHOLD, Uta (D), Librarian
REYES, Vicente (E), Remote Control Operator
URBAN, Ullrich (D), Administrative Assistant, General Services
WIEDEMANN, Günter (D), Infrared Instrumentation Scientist
ZOLVER, Marc (F), Coopérant

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