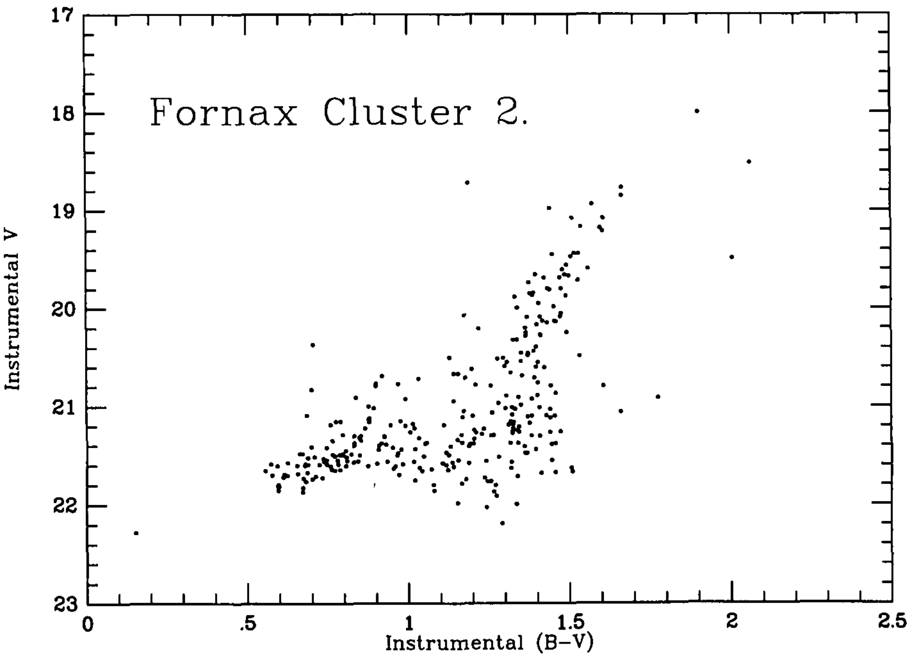

Figure 3: *Instrumental V vs B-V colour-magnitude diagram of Fornax globular cluster No. 2.*

Verner, G., Demers, S., Hardy, E., and Kunkel, W.E., 1981, *Astron. Astrophys.*, **86**, 357.
Hodge, P.W., 1961, *A.J.*, **66**, 83.
Zinn, R., and Persson, S.E., 1981, *Ap.J.*, **247**, 849.

Preparing for Comet Austin

Professional and amateur astronomers all over the world are excited about the prospects of seeing a really bright comet during the coming months. A newly discovered comet, known by the name of the amateur who first saw it, is now getting brighter each day. Observations are made almost every night at the ESO La Silla Observatory and elsewhere in order to follow the development of the comet and also to try to predict the maximum brightness which the comet will reach by mid-April this year.

Comet Austin – a Very Large Comet

When Comet Austin was discovered by New Zealand amateur Rodney R.D. Austin on December 6, 1989, it was already obvious that it must be an unusually large object. At that time the comet was still more than 350 million kilometres from the Sun and yet it was so bright that it was seen as an 11th magnitude object (that is, 100 times fainter than what can be perceived with the unaided eye).

More observations were soon made, establishing the comet's orbit and it was found that it will pass through its perihelion (the point of its orbit where it is closest to the Sun) on April 9, at a distance of about 53 million kilometres, inside the orbit of Mercury, the planet closest to the Sun.

Thereafter it will move outwards again and, by good luck, it will come within 36 million kilometres of the Earth on May 25. It will be well situated in the sky for observation from the northern hemisphere after April 20, when it can be seen low above the north-west horizon, just after sunset, and even better above the north-east horizon, shortly before sunrise. It is expected that Comet Austin will then have developed a tail which should be easily observable and provide spectators with a grand celestial view.

How Bright Will Austin Become?

One important question worries the astronomers. How bright will Austin actually become? Will it – according to the most optimistic predictions – become as bright as the brightest stars in the sky? Or will it "stall", much short of this goal, like the ill-famed Kohoutek comet in 1974?

At the centre of a comet is a "nucleus", a big chunk of ice and dust, with a diameter from a few hundred metres to several tens of kilometres. The diameter of the nucleus of Comet Halley was about 15 kilometres and that of Austin appears to be even larger. When cometary nuclei come close to the Sun, their surface ices evaporate due to the intense solar light. A surrounding cloud is formed – it is known as the "coma" – and also a tail that points away from the Sun.

A comet's brightness is determined by the amount of gas and dust in this cloud which in turn depends on the rate of evaporation from the nucleus. This rate is very unpredictable and accordingly, so is the comet's brightness. When theoretical predictions are uncertain, only observations can (perhaps) yield an answer.

Observations at ESO

For this reason, observations of Comet Austin have been carried out by ESO staff astronomers at the La Silla Observatory during the past months.

In concordance with observations elsewhere, a preliminary conclusion is that Comet Austin does have a good potential to become bright, but also that its current brightening, as it comes closer to the Sun, is "running slightly behind schedule". This is based on accurate photometric observations, carried out with the automatic Danish-SAT 50-cm telescope, accurately measuring the rate of brightening from night to night (see the article on page 55).

On the other hand, spectra of Comet Austin, obtained with the 1.52-m spectrographic telescope at ESO in mid-February, already show the strong emission of many different gas molecules in the coma cloud around the nucleus. Direct images from the 3.5-m New Technology Telescope in late January also showed a strong jet of dust particles, emanating from the nucleus. These observations clearly indicate that the evaporation process is well under way.

Finally, and rather significant, is the recent detection of a long tail of ions (electrically charged atoms) stretching more than 2 degrees in the direction away from the Sun. It was first seen on a photographic plate obtained with the ESO 1-m Schmidt telescope on February 25 under difficult observing conditions in the evening twilight, low above the horizon. A reproduction of this plate is shown on page 56.

However, another Schmidt photograph, obtained the day after, showed a much shorter tail. Thus the one seen on the photo was of brief duration and was probably caused by momentary interaction with a burst of rapid particles in the solar wind, not unusual at this time of maximum solar activity.

Predictions

The orbital computations indicate that Comet Austin appears to be a "new" comet, now approaching the Sun for the first time ever. The behaviour of "new" comets is much more difficult to predict than that of "periodic" comets who move in closed orbits and regularly pass near the Sun, like Comet Halley.

It is believed that new comets are covered by a thin layer of ices which begins to evaporate, already at a large distance from the Sun. Some of them may therefore be rather bright while still far from the Sun. However, when the deposit of ice is all gone, the brightness stalls; this is the most likely explanation for Comet Kohoutek's performance.

It remains to be seen how comet Austin will behave. In the best case it could reach magnitude −1 to −2 and rival the last bright comet, Comet West in 1976. It is perhaps more likely that it will reach magnitude 0, that is the same brightness as the brightest stars. In late April, when it is best visible from the northern hemisphere, it would then have magnitude 2, about as bright as the Polar Star. Presently, the most pessimistic predictions would put it at magnitude 2 at maximum, and 3.5 in late April.

This photographic image of comet Austin was obtained with the 40-cm double astrograph (GPO) at La Silla on February 26.0 UT. The 12-minute guided exposure shows the diffuse central area in which the cometary nucleus is surrounded by a dense dust and gas cloud. A diffuse dust tail points towards southeast (left, downwards) and the beginning of an ion tail can be discerned above it. Observers: H. Debehogne and R.M. West.

The best guess, based on the recent ESO observations, is the middle way. If that holds true, Comet Austin will indeed become a grand spectacle with a fine tail on the morning sky in late April. Since it approaches the Earth it will only fade slowly and we should be able to enjoy it all through the month of May.

But, of course, comets are notoriously unpredictable . . .!

(From ESO Press Release 04/90, issued on March 2, 1990.)

A Dust Jet From Comet Austin

On January 23, the ESO NTT was used during a short period of mediocre seeing (1.2 arcsec) to image Comet Austin. The direct, isophotal picture is shown on page 19 in this *Messenger* (where the image data are also given).

Image processing with the IHAP system at ESO Headquarters removed the symmetrical component of the cometary coma by means of the so-called radial renormalization method. The residual image, that is the asymmetrical component, clearly shows the presence of a comparatively bright, anticlockwise jet, emanating from the overexposed nucleus. It begins on the side which is facing the Sun and consists of dust particles which are released from the surface of the nucleus into space due to the heating effect of the Sun. The dust jet reflects the sunlight and can therefore be seen. On the date of exposure, the comet had not yet developed a real tail.

At this time, the comet was nearly 300 million kilometres from the Earth and at heliocentric distance 1.71 A.U. (255 million kilometres). The total magnitude was about 9.

Discrete structures have been observed in several comets at comparable or even greater heliocentric distances,