Minutes of the Ordinary General Meeting of the Cape Centre of the Astronomical Society of Southern Africa held at the South African Astronomical Society, Observatory at 8 p.m on Wednesday July 11th, 1973.

As the Chairman, Mr Grimwood, was overseas, and the Secretary, Mr Molyneaux, was ill, Mr Turk took the chair and Mr Rochford acted as Secretary. 24 members and 4 visitors attended.

Apologies were received from Messers. Hurley, ~~Mr~~ Molyneaux and Grimwood.

Minutes of the previous meeting were read, and accepted on a motion proposed by Mr Larmouth and seconded by Mr Simonhof.

The acting chairman, Mr Turk, announced that the next meeting would be the Annual General Meeting, and he urged members to come forward with nominations for the Committee well in advance of August 8th.

He extended the congratulations of the Society to Mr Harding on the award of an honorary M.Sc. degree to him by the University of Cape Town. The meeting warmly applauded him.

Mr Turk then introduced the evening's guest speaker, Mr A.J. Penny, who spoke on Electronographic Photography of the Magellanic

Clouds.

Mr Penny's address commenced with a study of a photograph of the Larger Magellanic Cloud, 6° across. He pointed out that the large central bar and arms of stars in the Cloud, and concluded that the Larger Magellanic Cloud is a barred spiral galaxy. Similarly the Smaller Cloud was shown to be a spiral, but with more whispy arms. The globular cluster which appears near the Smaller Cloud of Magellan is in fact is quite separate from it. The important thing, however, is the fact that these clouds are distinct galaxies, similar to our own, but smaller and close in distance: about 180 000 light years away (compared with a the distance across our own galaxy of 100 000 light years). As the Andromeda Galaxy is about 1½ million light years away, our Magellanic Clouds are ten times closer and therefore a hundred times brighter.

Stars ~~in~~ making up the Clouds of Magellan may have had a different history from those comprising our own galaxy, therefore any difference between the Milky Way and the Clouds indicates a difference in the universe. A study of the Clouds may thus provide support for, or refutation of, the Big Bang Theory, i.e. did our own galaxy go for its own evolution, or not?.

Our sun consists of about 70% H, 29% He and 1% other elements. The figure of 29% He is unexpectedly high unless ~~it~~ some of it was created initially from H_2 at the moment of the hypothetical Big Bang. As there is no known process that naturally destroys He, it would be most interesting from a point of view of the Big Bang Theory to study the Clouds of Magellan and see if they contain about 29% He, i.e have all stars in the universe got similar compositions to our sun?

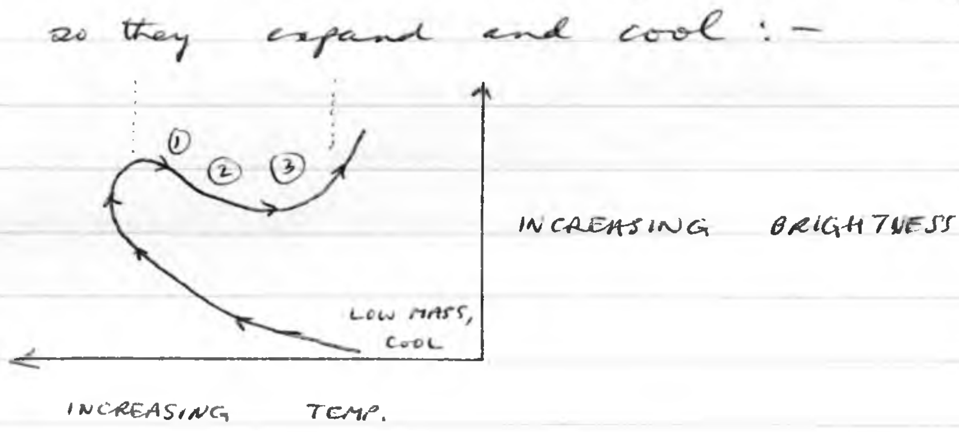
Our observations of the Magellanic Clouds reveal that they are composed of about 90% old stars, i.e. older than our sun, and approx 8 B (billions) years in age. Like the Milky Way, the Magellanic Clouds contain a bar and halo of old stars, but we can also see bright young blue stars, concentrated in patches in the nucleus of the galaxy.

Now unfortunately spectroscopic analysis tells us the % of C, O, N etc in the stars, but tells us little about their H and He compositions. However, the % of C, O, N etc in the Clouds is similar to that of the Milky Way. These elements are believed to have been "cooked up" inside stars from H, He, etc and later spewed out in supernovae to start new stars, etc. in a cycle, so these %ages will stay the same. Stars are made out of stars like people are made out of people: dead human body → worms → ducks → human

To find out whether the % of He in a total stellar mass is 29%, we may study He spectral lines formed when a young star ejects He then heats and illuminates it in the form of a halo around the star. Unfortunately, other stars use up He so fast that it lasts only a couple of million years, so the counter argument is that you are looking at bright young stars only, so this may not indicate the true % of He in the total mass.

Therefore we study old stars with a low mass made at the proposed start or big bang of the universe. To do this we look at the old globular clusters in the Magellanic Clouds, typical star magnitude 16, (compared with mag. 9,2 for the brightest star in the Greater Cloud).

How can we determine the % of He in an old star in a globular cluster? Studies of the stars in our own globulars reveal that as their temperature increases so does their brightness until a point is reached at which the stars begin converting H to He so they expand and cool:—



In this unstable region of crossing over, pulsating stars result, and their positions on the above diagram e.g. ① ② or ③ depend on whether they contain a lot of helium or a medium amount or a little. The vibrating stars are RR Lyrae's.

From a practical point of view the difficulty is how to measure accurately the brightness of an individual star approx mag 19 in the middle of a globular cluster! Also we must be able to measure the colour of the star accurately, without colour interference from its neighbours, in order to determine its temperature. It turns out that photography is not nearly good enough as a photographic plate registers only about one photon of light in 1000 that strikes it.

Thus we use a photoelectric cell in which one photon in 5 causes an electron to be emitted and subsequently detected by avalanche in the cell. Thus it is 200 times more efficient than our best commercially produced photographic plates.

In place of the photographic plate a scintillation screen is used, and in the electronograph electrons are focussed by means of magnetic fields, and the ~~length of the~~ tube is adjusted in the manufacturing process to be an integral number of electron path loops in length irrespective of the angle of emission of an electron caused by the impinging photon.

Mr Orpen suitably thanked Mr Penny, and the meeting adjourned at 9.45 pm.