Minutes of the Ordinary Monthly Meeting of the Cape Centre of the Astronomical Society of Southern Africa held at the Observatory, Cape Town on Wednesday 13th February, 1974.

Chairman Mr Molyneux opened the meeting at 8 p.m. and welcomed the 40 people present.

Apologies were received from Dr Thomas Messers Simonloff, Hurley, Russo.

The minutes were read, accepted and signed.

Matters arising: Comet Kohoutek was not a success.

Mr Larmuth reported that the Ron Atkins dome was being renovated by a working group each Saturday afternoon, and was now three quarters covered with aluminium sheeting. It was the original intention to merely cover the existing masonite with fibre glass for about R60. However, the masonite was in such poor condition that it was decided to strip it off and replace it with aluminium at a cost of about R100. In answering a question from the floor Mr Larmuth said that about 63 kg of aluminium was involved, so pulling the dome round by hand would not be difficult.

Mr Molyneux then mentioned to the meeting that the observatory staff were not keen to find cigarette butts on the floor, and requested members to kindly use an ashtray or saucer. Mr Turk commented that he had donated more than a dozen ashtrays to the meeting room recently, but that these had apparently disappeared.

In SAAO tea room!

Mr Molyneux then said that the Cape Technical College had contacted him in connection with a series of lectures by Prof. Cilliers of Stellenbosch, commencing on 8th May and running for seven Wednesdays thereafter. The lecture fee for the course will be R14, and further information may be obtained from Room 209 at the Technical College. The lecture series will trace the development of astronomy from earliest times through to modern developments. Mr Molyneux said he may be able to obtain pamphlets for the course. As the lecture series runs over two of our future meetings, members were asked to consider whether the Cape Centre should arrange for one or two of our regular meetings to be held at the Technical College at the appropriate time. A decision would be taken at the March meeting of the Centre.

Mr Molyneux then introduced Mr Hawkins from Cambridge University who spoke on "Observing Radio Galaxies with Photo Image Tubes."

Mr Hawkins began by saying that radio emission comes from all galaxies. Individual stars emit radio waves (in fact waves at all frequencies just because they are hot. In fact we can detect radio waves from our sun because it is close. The individual star Algol emits radio waves, but this is a special case.

Turning to the galaxies, M31 emits very weak radio radiation, but it is close to us and is therefore just detectable.

Radio galaxies may be divided into two classes :-

1) Those with the source in their nucleus, usually unresolved eg. ~~Cepheid~~ Seyfert galaxies such as NGC 4151. The central region is very much disturbed and the arms outside are therefore disturbed. The centre lacks any real structure, and the very high energy is believed to be associated with relativistic electrons spiralling in a magnetic field to produce synchrotron radiation.

2) The second type of radio galaxy appears like a dumbell, the radio lobes forming a double source, and the optical galaxy lying at the centre of gravity of the radio galaxy.

Theory set forward to explain radio galaxies ~~a~~ assumes an explosion inside them, but how does this happen?

Often the radio lobes are found to have streamers going into the galaxy itself, and these may be quite irregular. These are areas in the sky from which radio emission comes, but in which no real optical object has been detected. M82 is a radio source, and on a slide appears as a violent galaxy which seems to be exploding, or at least something within it seems explosive.

Three classes of theory have been advanced in an attempt to explain the radio lobes:-

(i) The three body theory. Aggregations of matter form the equivalent of a million suns. It is quite natural that two of these will become stably rotating round each other. If, now, a third body enters the picture, gravitational attraction upsets the balance. One body will be expelled in one direction, and the other two in the other direction. This explains the lobes: radio waves are formed if these are hot, and under certain other conditions. One difficulty with this explanation is that the million suns may have to be cold for it to work.

(ii) Assume there is an explosion in a galaxy. Gas emitted from this galaxy and touching a neighboring galaxy may be sufficient to hold a tube of matter, giving rise to a tunnelling or burrowing effect in the gas. Low frequency waves should be produced in the galaxy itself, ~~to~~ travel along the tunnel ~~and~~ react with gas at the other end to be re-emitted at higher frequency.

(iii) Radio astronomers at Cambridge are advancing a theory to explain the swirls, etc in the radio emission. They postulate that lumps of very hot matter are formed in the galaxy, and these float like a bubble so that hot masses of ~~very~~ plasma literally float out, leaving a trail behind them. This ~~Th~~ explanation accounts for most details, but one difficulty is to explain how the balls are kept hot enough for long enough.

These controversial theories are by no means resolved, and no-one has the last word.

Support for the Cambridge theory may be seen in a photograph of M87 in Virgo. A jet of matter is located along the radio axis, so there appears to be a connection. Then again a photograph of 3C273 reveals that its radio lobes correspond to its optical properties.

Evidence by photograph, however, is scanty because the jet is always very faint. If it is synchroton radiation, this suits theories (ii) and (iii), and we expect the light to be polarized, as in Virgo A. However, should the jet consist of a stream of stars dragged out, this fits theory (i).

Mr Hawkins then went on to mention details of the spectrocon, very similar to the electronograph described in the summary of the July 1973 meeting. He pointed out the advantages of this over the conventional photograph — no spreading overexposure image of bright stars, and electric current intensity uniformly proportional to the intensity of the incident radiation.

Indicating some of the practical difficulties of a spectrocon, Mr Hawkins said it required a very high vacuum, so should the film be put inside the vacuum tube or left outside? In practice a sliver of mica 4 μ thick is transparent to electrons at 40 000 electron volts, so the photographic plate can be mounted outside this.

Using the spectrocon, the faint jet can be photographed because firstly almost every incident photon of light it registered electronically then photographed (not so with conventional photographic paper which requires a certain minimum intensity to register), and secondly "spreading" from a nearby bright source is eliminated. Furthermore, computer calculations can be used to restore & improve the image distorted by earth's atmosphere. In addition, photographs can be taken of the same object night after night, and spurious readings cancel out.

Mr Turk suitably thanked the guest speaker for a most interesting talk, and the meeting adjourned for tea at 9.15 p.m.