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Meeting of the Royal Astronomical Society

Friday, 1972 February 11 at 16^h 30^m

in the Scientific Societies' Lecture Theatre, Savile Row

Sir Fred Hoyle, President
in the Chair

Secretaries: D. McNally
R. J. Tayler

The Minutes of the meeting of 1972 January 14 were read, approved and signed.

The President. I am pleased to announce that at its meeting today Council elected three new Associates of the Society. They are Dr. Robert Henry Dicke of the U. S. A., Dr. Bruno Benedetto Rossi of the U. S. A. and Academician Yakob Borisovich Zel'dovich of the U. S. S. R.

I shall now read the Addresses on the presentation of the Society's medals.

The President. A Gold Medal is awarded to **Professor Fritz Zwicky** for his distinguished contributions to astronomy and cosmology.

Fritz Zwicky has worked for essentially the whole of his scientific career at the California Institute of Technology, first as Professor of Physics and later as Professor of Astrophysics. He was impressed early in his career by the work of Lundmark, especially in its relation to supernovae and to extragalactic astronomy. Two revolutionary lines were in rapid development among Pasadena astronomers in the 1930s, work on red-shifts of galaxies and on the expansion of the Universe by Hubble and Humason, and work on supernovae by Baade, Minkowski and Zwicky.

To the outsider it is difficult to distinguish the relative contributions of colleagues working together in the same institution, and it is usually profitless to attempt to do so. The case of Fritz Zwicky has presented even greater difficulty than is normally the case because of the many controversies which later developed between Zwicky and other members of the Pasadena group. Yet as the dust of these verbal storms has gradually cleared it has become possible to see Zwicky's contributions in increasingly clear focus.

The early suggestion, as long ago as 1934, that neutron stars were associated with supernovae and with the production of cosmic rays was an inspired suggestion which bears the same stamp of originality as many of Zwicky's later ideas.

Zwicky has always shown a flair for seizing on significant problems. Zwicky and Sinclair Smith were the first astronomers to realize that something was amiss with the application of the virial theorem to clusters of galaxies. The dynamical energy of the galaxies is too large unless hidden mass is somehow present within the clusters. This difficulty has not gone away with the passage of time. Quite the contrary. Many clusters must be unbound unless hidden mass exists in great quantity in some as yet unrecognized form. This skeleton in the astronomers' cupboard rattles ever more loudly as the years pass by.

Two key ideas, pursued relentlessly by Zwicky, seem to me of especial relevance to modern astronomy. First, the concept that matter exists outside the apparent optical limits of the galaxies. It is now commonplace to think in terms of bridges between galaxies and of galaxies being connected to the outside world by arms and jets, but when Zwicky first described his results on these matters the ideas were found strange, and were thought peripheral to astronomy. Yet today the current of discovery lies in this direction.

The second key step lay in Zwicky's early search for small galaxies. At first, small galaxies were thought of as being small not only in size but also in luminosity and mass. But a search for galaxies of small size has led to galaxies that are by no means small in luminosity. Again quite the contrary. If we accept red-shifts as determining distance, some of Zwicky's compact galaxies turn out to be one to two magnitudes brighter than the most luminous distended galaxies. Zwicky himself would see the quasi-stellar objects as the end of a road directed towards increasing compactness, and this is an entirely natural supposition.

It is as well to notice that for most of his working life Zwicky has had access to a telescope no larger than the 18-inch Schmidt which he himself built.

There is a deep and important lesson here for all British astronomers. Access to a very large telescope, although desirable, is not absolutely essential. What is essential, absolutely, is access to a telescope in a good sky.