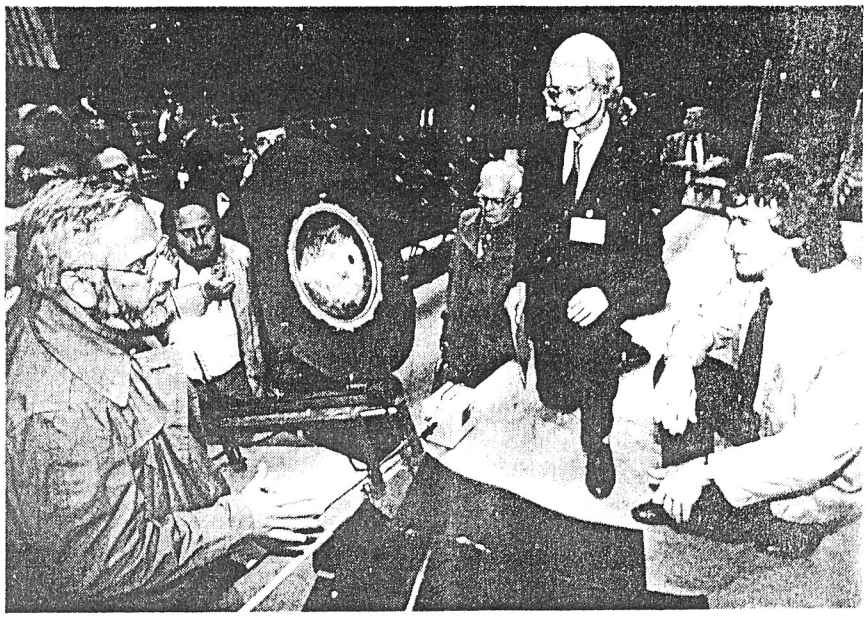
Gravitational lenses explained



Sjur Refsdal and Jean Surdej explain, to an interested audience, how gravitational lenses distort our view of distant objects in the Universe, during their Invited Discourse on Wednesday evening.

Invited Discourse I: *Gravitational lensing*
Wednesday, 24 July, Rooms A + B, at 6.00 p.m. (18.00)

Atmospheric lensing effects distort our view of distant objects. Similarly, without doubt, gravitational lensing distorts our view of the distant universe, and affects our understanding of various classes of extragalactic objects from a physical point of view. During this Invited Discourse we will summarise the theoretical and observational evidence supporting these claims.

After briefly reviewing the history of gravitational lenses, we will discuss the basic principles underlying the formation of gravitationally-lensed images of distant cosmic sources. Numerical simulations, and an optical lens experiment, will be of help to us in presenting these concepts in a simple manner.

Among the astrophysical and cosmological interests of observing and studying gravitational lenses, we will point out the possibility of deriving the value of the Hubble parameter H_o from the measurement of the time-delay, and how to estimate the sizes and structures of distant quasars through observational studies of micro-lensing effects.

Current observations of known gravitational lens systems, obtained with highly sensitive ground-based telescopes, will then be presented. These will include several examples of multipy-lensed QSO images, giant luminous arcs, arclets and radio rings. From models of these enigmatic objetcs, we will show how it has been possible to find out the masses of distant lensing galaxies, to study the distribution of luminous and dark matter in the universe, and to estimate the sizes of absorbing clouds located along the lines of sight to remote quasars. The various optical and radio searches for new gravitational lens systems, now being carried out at major observatories, will also be reviewed.

At the end of our presentation, we will discuss major astrophysical and cosmological aims for the immediate future by setting up, on a site with good atmospheric seeing, a medium-sized (1-2 metre) telescope to be devoted to the photometric monitoring or the multiple images of known and suspected gravitational lens systems.

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