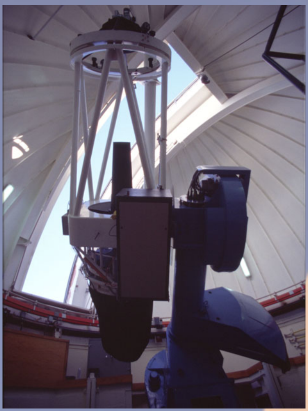
JACOBUS KAPTEYN TELESCOPE



THE ISAAC NEWTON GROUP OF TELESCOPES (ING) CONSISTS OF THE WILLIAM HERSCHEL TELESCOPE (WHT), THE ISAAC NEWTON TELESCOPE (INT) AND THE JACOBUS KAPTEYN TELESCOPE (JKT). THE ING IS OWNED AND OPERATED JOINTLY BY THE PARTICLE PHYSICS AND ASTRONOMY RESEARCH COUNCIL (PPARC) OF THE UNITED KINGDOM, THE NEDERLANDSE ORGANISATIE VOOR WETENSCHAPPELIJK ONDERZOEK (NWO) OF THE NETHERLANDS AND THE INSTITUTO DE ASTROFÍSICA DE CANARIAS (IAC) OF SPAIN. THE TELESCOPES ARE LOCATED IN THE SPANISH OBSERVATORIO DEL ROQUE DE LOS MUCHACHOS ON LA PALMA, CANARY ISLANDS WHICH IS OPERATED BY THE INSTITUTO DE ASTROFÍSICA DE CANARIAS (IAC).

THE JKT HAS A PARABOLIC PRIMARY MIRROR OF DIAMETER 1.0 M. IT IS EQUATORIALLY MOUNTED, ON A CROSS-AXIS MOUNT AND INSTRUMENTS CAN BE MOUNTED AT THE F/15 CASSEGRAIN FOCUS. THE ROLE OF THE TELESCOPE IS AS A FACILITY FOR CCD IMAGING.

SCIENTIFIC HIGHLIGHTS

Cosmic flow of galaxies across one billion years of the universe. According to the 'cosmological principle', the large-scale universe should be smooth and well behaved. Distant galaxies ought to be evenly distributed in space, and their motions should correspond to a pure 'Hubble flow', a uniform expansion of space in all directions. In other words, the universe, in some average sense, is homogeneous and isotropic. But galaxies have other peculiar velocities, over and above the general cosmic expansion.

All galaxies execute some kind of peculiar motion as a consequence of the gravitational influence of the lumpy distribution of material around them. In 1988, a study of streaming motions in a sample of elliptical galaxies revealed evidence for a systematic flow, simple modelling of which suggested that it could be explained by a hypothetical object about 60 megaparsecs away from the Milky Way, which became known as the 'Great Attractor'.

Later the Streaming Motions of Abell Clusters Collaboration using the JKT and other telescopes were able to go far beyond the proposed location of the Great Attractor and they still saw outward motion of galaxies beyond it. The reported bulk flow is of amplitude 630±200 km/s with respect to the cosmic microwave background.

Comet LINEAR blows up in full view of the JKT. For the first time, the JKT followed up the complete disruption of the nucleus of a comet, comet LINEAR, the brightest comet of 2000. Comet LINEAR did not appear to have broken into individual fragments in the way that Comet Shoemaker-Levy 9 did in 1993. Instead, it completely blew apart. Further observations with the Isaac Newton Telescope confirmed the initial discovery and provided new insight into what the reason for the comet disruption could be: the evaporation of all the ice in the nucleus.

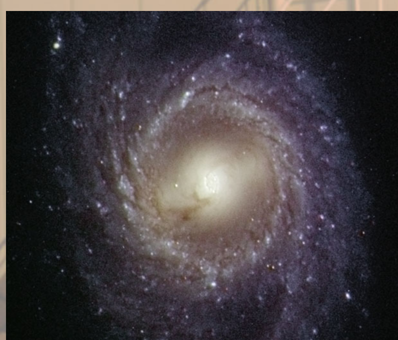
First detection of gravitational microlensing. One of the most dramatic manifestations of gravitational lensing is exhibited by the quasar 2237+0305, which has a redshift of 1.70. The quasar is located exactly behind the centre of a bright spiral galaxy with a redshift of only 0.04, and the quasar image is split into four separate components separated from each other by less than 2 arcseconds. The light paths through the galaxy to each of the images may pass close to other stars or other compact objects in the galaxy, producing gravitational lensing effects manifested as brightness changes in the images. Such effects are termed "microlensing" events.

The Crescent Moon

Messier 57 Planetary Nebula

Messier 64 Galaxy

NGC 7331 Galaxy



Messier 95 Galaxy

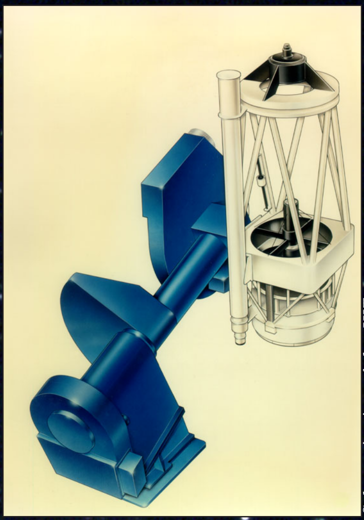
Working with images from the WHT, the researchers made the first detection of a gravitational microlensing event. The group found that the brightest of the four images had increased in brightness by 0.5 magnitudes over a period of less than a year and possibly on a timescale of only a month. The team followed up the detection with a monitoring campaign on the JKT.

Technical Description

The optics and the mounting. The Jacobus Kapteyn Telescope has a parabolic primary mirror of diameter 1.0 m with two interchangeable secondaries. The f/8.06 Harmer–Wynne system uses a spherical secondary and a doublet corrector to give a field of 90 arcmin diameter. The other secondary is a hyperboloid, which gives a conventional f/15 Cassegrain focus. The JKT normally operates in f/15 mode.

It is equatorially mounted, on a cross-axis mount, which allows operation east or west of the pier. Normally it is east of the pier. Total weight of the telescope is about 40 tonnes.

The instrumentation. As of 1998 the JKT is a single-instrument telescope, that can only be used for CCD imaging. The JKT is operated with the JKT Acquisition and Guiding unit (JAG) mounted at Cassegrain. The JAG holds the autoguider, the acquisition TV, the CCD shutter, and the filter wheel with 6 slots for 50×50mm filters. The CCD cryostat is mounted under the JAG. Currently, the default detector is SITe2, a device with 2048×2048 24 micron pixels. For SITe2 the image scale is 0.33 arcsec/ pixel, giving an unvignetted field of view of about 10×10 arcmin.



Schematic view of the JKT

At present time the JKT is being used to study the behaviour of the atmosphere above the Roque de Los Muchachos Observatory.

The JKT and the INT starting observations

The JKT and the Milky Way

The JKT dome and building

Los inicios del telescopio Jacobus Kapteyn

Al comienzo de los años 60 existía una floreciente escuela de astrometría fotográfica en el Royal Greenwich Observatory (RGO). Se sabía que era posible calcular movimientos propios de objetos celestes con mucha precisión comparando placas obtenidas con 50 años de separación. Por lo tanto, se decidió diseñar un telescopio astrofotográfico que incorporase la última tecnología, particularmente en el campo del diseño óptico.

La justificación científica del Northern Hemisphere Observatory (NHO) de 1973 justificaba la presencia de tres telescopios, el más pequeño de 1 metro. Los astrónomos trabajaron en el diseño del telescopio teniendo en cuenta la reducción de las aberraciones ópticas, el ajuste del seeing local al grano de la película fotográfica disponible en aquel tiempo y el aplanamiento del campo de visión.

El diseño definitivo del telescopio se acordó en 1977 con bastante anterioridad a la decisión del Science and Engineering Research Council (SERC) de apoyar el proyecto del NHO o de situar el observatorio en La Palma. El JKT fue instalado en la cúpula ya vacía del INT en Herstmonceux (Reino Unido) en 1982 y conectado a los ordenadores de control. Fue embarcado para La Palma en el verano de 1983. Su placa base sirvió como plataforma de aterrizaje para un Harrier de la Marina Real británica a bordo del barco *Alraigo* después de perder su carga.

El JKT se instaló dentro de su cúpula en octubre de 1983 y el edificio fue entregado en enero de 1984. La primera placa fotográfica fue tomada el 23 de marzo de 1984 y el primer astrónomo visitante utilizó el telescopio el 29 de mayo del mismo año.

Desde el principio se solicitó que el telescopio tuviera un horizonte ininterrumpido en todas las direcciones permitiendo que al menos un telescopio de La Palma pudiera observar cualquier evento transitorio como una supernova o un cometa. Por esta razón el JKT se situó al sur del INT y a 22 metros por encima de él, cerca del borde del Parque Nacional de la Caldera de Taburiente. No se situó en el mismo borde ya que existía la limitación por parte de ICONA de que ningún telescopio fuera visible desde la Cumbrecita, la pared opuesta de la Caldera, con el objeto de no perturbar la belleza natural del parque nacional. Por otro lado, se escogió una montura ecuatorial de ejes cruzados para permitir la observación de cualquier objeto en el cielo independientemente de su posición (el telescopio puede ser situado por encima de la intersección de los ejes).