

## Appendix A

# THE ISAAC NEWTON GROUP OF TELESCOPES

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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 WHT, with its 4.2m diameter primary mirror, is the largest in Western Europe. It was first operational in August 1987. It is a general purpose telescope equipped with instruments for a wide range of astronomical observations. The INT was originally used at Herstmonceux in the United Kingdom, but was moved to La Palma in 1979 and rebuilt with a new mirror and new instrumentation. It has a 2.54m diameter primary mirror and is mostly used for wide-field imaging and spectroscopy. The JKT has a primary mirror of 1.0m diameter and it was mainly used for observing relatively bright objects. Both the INT and the JKT were first operational in May 1984. The JKT ceased science observations in August 2003 and now it is regularly being used for measuring the atmospheric turbulence profile above the observatory.

The WHT has an altazimuth mount with a  $f/2.5$  parabolic primary mirror. The WHT is of classical Cassegrain optical configuration. The paraboloidal primary mirror is made of a glass-ceramic material (Cervit) having near-zero coefficient of expansion over the operating temperature range. Instruments can be mounted at the corrected  $f/2.81$  prime focus,  $f/11$  Cassegrain focus, or either of two  $f/11$  Nasmyth foci. The primary mirror is made of a glass-ceramic material (Cervit) having near-zero coefficient of expansion over the operating temperature range, and it weighs 16.5 tonnes. When not operating at prime focus, a convex hyperboloidal secondary mirror, made of Zerodur, 1.0m in diameter, directs the light through a central hole in the primary mirror to the main instrumentation mounted at the Cassegrain focus beneath the primary mirror cell. The telescope also incorporates a third main mirror, a flat, angled at 45 degrees, which can be motor-driven into position at the intersection of the axes, above the primary mirror, so that the light from the secondary is diverted sideways through one of the altitude bearings to the Nasmyth platforms.

The INT has a primary mirror with a focal ratio of  $f/2.94$ . It uses a polar-disc/fork type of equatorial mount. Instruments can be mounted at the corrected  $f/3.29$  prime or  $f/15$  Cassegrain foci. The optical system of the INT is a conventional Cassegrain with a paraboloidal primary mirror and a hyperboloidal secondary. It weighs 4.4 tonnes and it is made of Zerodur.

The JKT has a parabolic primary mirror of diameter 1.0m and a focal length of 4.596m. It weighs 215kg. It is equatorially mounted, on a cross-axis mount. The JKT has two optical configurations: Harmer-Wynne and Cassegrain. The former uses a  $f/8$  spherical secondary and the latter a  $f/15$  hyperbolic secondary. The two optical systems share the same parabolic primary mirror. At present only the Cassegrain configuration is available and instruments mount at the Cassegrain focus.

The following table shows each telescope's location:

	Latitude	Longitude	Ground floor height
WHT	28° 45' 38.3" N	17° 52' 53.9" W	2332m
INT	28° 45' 43.4" N	17° 52' 39.5" W	2336m
JKT	28° 45' 40.1" N	17° 52' 41.2" W	2364m

The ING operates the three telescopes on behalf of the Science and Technology Research Council (STFC) 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 ING is located at the Observatorio del Roque de los Muchachos (ORM), on the island of La Palma, Canary Islands, Spain. The ORM, which is the principal European northern hemisphere observatory, is owned by the Instituto de Astrofísica de Canarias. The operation of the site is overseen by an International Scientific Committee, or Comité Científico Internacional (CCI). Financial and operational matters of common interest are dealt with by appropriate subcommittees.

The observatory also includes the 3.6m Telescopio Nazionale Galileo, the 2.5m Nordic Optical Telescope, the 2.0m Liverpool Telescope, the 1.2m Mercator Telescope, the 60cm telescope of the Swedish Royal Academy of Sciences, the wide-field imaging facility SuperWasp, the Automatic Transit Circle, the 0.97cm New Swedish Solar Telescope, the 45cm Dutch Open Solar Telescope, and the atmospheric imaging Cherenkov 17m Magic Telescopes. Under construction are a twin to the 17m Cherenkov telescope, MAGIC-2, and the 10.4m Gran Telescopio Canarias.

The observatory occupies an area of 1.89 square kilometres approximately 2350m above sea level on the highest peak of the Caldera de Taburiente National Park, in the Palmeran district of Garafia. La Palma is one of the westerly islands of the Canarian archipelago.

The site was chosen after an extensive search for a location with clear, dark skies all the year round. All tests proved that the Roque de Los Muchachos is one of the best astronomical sites in the world. The remoteness of the island and its lack of urban development ensure that the night sky at the observatory is free from artificial light pollution. The continued quality of the night sky is protected by law. The mountain-top site has a remarkably stable atmosphere, owing to the local topography. The mountain has a smooth convex contour facing the prevailing northerly wind and the air-flow is comparatively undisturbed, allowing sharp and stable images of the night sky.

Many of the state-of-the-art telescope and instrument components are custom-built. New instruments are designed and built by technology groups mainly in the United Kingdom, the Netherlands, and Spain, with whom the ING maintains close links, and by astronomers and engineers working at ING.

## THE INTERNATIONAL AGREEMENTS

The international agreements by which the Roque de Los Muchachos and the Teide Observatories were brought into existence were signed on La Palma on 26 May 1979. The participant nations at that time were Spain, the United Kingdom, Sweden and Denmark. Later other European countries also signed the agreements. Infrastructural services including roads, communications, power supplies, as well as meals and accommodation facilities, have been provided by the Spanish side. In return for the use of the observatory and its facilities, all foreign user institutions make 20 per cent of time on their telescopes available to Spanish observers. Representatives of the participant institutions meet together as the International Scientific Committee, or Comité Científico Internacional (CCI).

The inauguration of the Canary Islands observatories took place on 29 June 1985 in the presence of the monarchs and members of the Royal Families of five European countries, and the Presidents of another two.

## THE ING BOARD AND THE DIRECTOR'S ADVISORY COMMITTEE

The PPARC, the NWO and the IAC have entered into collaborative agreements for the operation of, and the sharing of, observing time on the ING telescopes. The ING Board was set up to oversee the operation of this agreement, to foster and develop collaboration between astronomers of the United Kingdom, the Netherlands and Spain, and to ensure that the telescope installations are maintained in the forefront of world astronomy. In particular, the ING Board oversees the programme of instrumentation development, determines the programme of operation and maintenance of the installations, approves annual budgets and forward estimates and determines the arrangements for the allocation of observing time.

The Director's Advisory Committee (DAC) assists the observatory in defining the strategic direction for operation and development of the telescopes. It also provides an international perspective and acts as an independent contact point for the community to present its ideas.

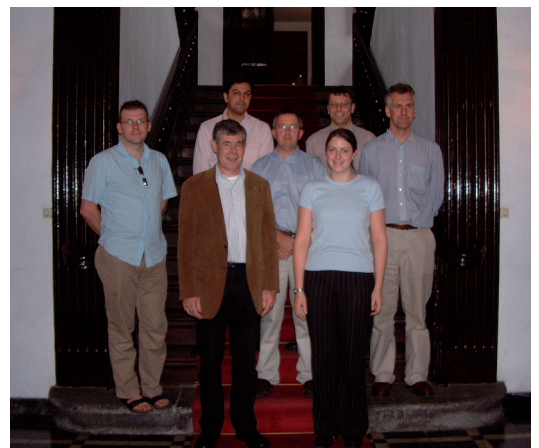


Figure 66. Members of the ING Board (2006).

## TELESCOPE TIME AND DATA OWNERSHIP

The construction, operation, and development of the ING telescopes are the result of a collaboration between the United Kingdom, the Netherlands and Spain. The site is provided by Spain, and in return Spanish astronomers receive 20 per cent of the observing time on the telescopes. A further 75 per cent is shared by the United Kingdom, the Netherlands and the IAC. The remaining 5 per cent is reserved for large scientific projects to promote international collaboration between institutions of the CCI member countries. It is intended that this time be used for the study of one, or a few, broad topics each year by several telescopes. This time is allocated by the CCI.

It is the responsibility of the IAC to make the Spanish time available to Spanish institutions and others, via the Comité para la Asignación de Tiempos (CAT). The ING Board has delegated the task of time allocation to British and Dutch astronomers to the PPARC Panel for the Allocation of Telescope Time (PATT) and the NFRA Programme Committee (PC) respectively. All the above agreements envisage that observing time shall be distributed equitably over the different seasons of the year and phases of the moon.

Notwithstanding the above, any astronomer, irrespective of nationality or affiliation, may apply for observing time on the ING. Astronomers who are working at an institute in one of the partner countries should apply through the route appropriate to their nationality or the nationality of their institute.

Time is allocated in two semesters, from 1 February to 31 July (semester A) and from 1 August to 31 January (semester B). Decisions on time allocations are made on the basis of scientific merit and technical feasibility of the proposed observations.

ING policy is that data belong exclusively to those who collected them for a period of one year, after which they are available in a common archive for all astronomers (<http://archive.ast.cam.ac.uk/ingarch/>). It may be used at any time for engineering or instrumental investigations in approved programmes carried out to improve facilities provided at the observatory.

Service observations which are made by Support Astronomers at the request of others are similarly treated. However, calibration data may well be used for more than one observation and may therefore be available for several groups. It may happen that identical or similar service observations are requested by two or more groups. Requests which are approved before the data are taken may be satisfied by requiring the data to be held in common by the several groups. It is up to them how they organise themselves to process it, analyse it, relate it to other work, and eventually publish it.

Requests for observations from programmes already executed on the telescopes should be made to the ING Archive. This is the policy whether or not the data were obtained under UK, Dutch, Spanish or International Time, or by service requests.