Q. Jl R. astr. Soc. (1986) **27**, 432–434

The Isaac Newton Telescope*

B.E.J.Pagel
Royal Greenwich Observatory, Herstmonceux, East Sussex, BN27 1RP

(Received 1986 January 10)

SUMMARY

First conceived in 1946, the INT operated at Herstmonceux from 1968 to 1979 and produced some significant scientific successes despite a disappointing overall output due to poor climate and the increasing availability of other, more exciting facilities such as the Anglo-Australian Telescope after 1974. In that year the decision was taken to move it to the new Northern Hemisphere Observatory site and, after refurbishing, it was moved to La Palma and received first light in 1984. Scheduled observations since 1984 May have shown the telescope, in its new site, to be competitive with larger telescopes in less favoured sites.

The history of the Isaac Newton Telescope has been described by Smith & Dudley (1982) and the background of the move to La Palma by Smith (1981). Although funds for a national 'Isaac Newton Observatory', with a reflector and a Schmidt at Herstmonceux and a Schmidt in the Southern Hemisphere, were allocated by the Treasury in 1946, there were lengthy delays due to lack of unanimity among astronomers as to what was wanted, and the technical difficulties raised by the dual-purpose telescope that was the preferred option until 1955. Sir Richard Woolley, who succeeded Sir Harold Spencer Jones as Astronomer Royal in 1956, persuaded the Board of Management to adopt a conventional paraboloid instead, using the mirror blank presented in 1948 by the University of Michigan, with an aperture of 98 inches.

After further delays partly caused by a national financial crisis in 1958, an order was placed with Grubb Parsons in 1959 and the telescope installed in 1967; it was opened by HM the Queen on 1967 December 1. Instrumentation was gradually added, notably an image tube spectrograph in 1970 and a coudé spectrograph with a long-focus camera in 1971. The latter never worked satisfactorily owing to thermal shifts in the south-facing coudé room; by the time a cure was worked out, the decision had been taken to move the telescope so that the cure was never implemented.

Regular use of the INT between 1968 October and 1979 March produced an average of about 10 scientific papers per year, a disappointing output that can be attributed to poor climate and the more exciting opportunities offered by overseas facilities such as the Anglo-Australian Telescope from 1974 onwards. Despite this it did achieve a number of significant scientific successes which helped to put British optical astronomy on the map and paved the way for subsequent triumphs, in particular the identification of Cygnus X-1 as the first stellar-sized black-hole candidate (Webster &

*Based on a talk given at the RAS Specialist Discussion on Astronomy in Britain since the Second World War, 1986 January 10.

Murdin 1972), identification of new spectral features in Seyfert galaxies using the Spectracon (Netzer 1974) and in Seyfert galaxies and 3C273 using the UCL Image Photon Counting System (e.g. Boksenberg *et al.* 1975), the first identification of a Seyfert galaxy from its X-ray emission (Ward *et al.* 1977), discovery of short time-scale photometric and polarimetric variability in AM Herculis (Bailey *et al.* 1978), recognition of 'explosive' conical ejection in a filament of M82 (Axon & Taylor 1978) and the resolution of hyperfine structure in interstellar sodium lines (Blades, Wynne-Jones & Wayte 1980).

In 1974, the SRC made the decision to move the INT and La Palma was chosen as the new location after extensive site testing. Planning of the new site, refurbishment of the telescope (with a new 100-inch mirror of zerodur, a remote-controlled prime focus and a horizontal coudé room) and international negotiations took place under the leadership of Sir Francis Graham Smith who took over as Director of the Royal Greenwich Observatory in 1976, to be succeeded by A.Boksenberg in 1981. The negotiations led to development of the Roque de los Muchachos Observatory as an international site operated by the Instituto de Astrofisica de Canarias with Spain providing the infra-structure in return for 20 per cent of telescope time and collaborative scientific arrangements. The International Agreement formalizing these provisions was signed in 1979, and in 1981 the INT, in common with other SERC telescopes, became part of an Anglo-Dutch collaboration with Holland taking a 20 per cent share in finance, manpower and observing time. Building and dome contracts were placed in 1979, immediately after signature of the International Agreement, and the completed building (with mechanical parts of the telescope already inside) was handed over in 1982 October. Optics, computers and the cassegrain cluster (i.e. acquisition TV, autoguider, intermediate-dispersion spectrograph and associated software) were installed during 1983 and first light received at the prime focus on 1984 February 1–2.

Commissioning and the first scheduled observations (from 1984 May 29) have confirmed the excellence of the site and immediately led to significant scientific results, e.g. discovery of a QSO with redshift 3·68, identification of Broad Mg II absorption in a low redshift QSO (which was rather unexpected), extensions of the Durham redshift survey with similar exposure times to those used on the AAT and the discovery of dramatic changes (from Seyfert 1 to Seyfert 2) in the line profiles of NGC4151 and 3C390·3 in the 10 years or so since they were observed with the INT at Herstmonceux (Penston & Perez 1984). Several other instruments were added in 1985, so that the telescope had a full complement and notable scientific achievements under its belt by the time of the Royal Inauguration on 1985 June 29, which was graced by the presence of the Duke and Duchess of Gloucester representing the Queen, the Kings and Queens of Spain, Denmark and Sweden, the Queen of The Netherlands and the Presidents of the Federal German and Irish Republics.

Pending completion of the 4·2-m William Herschel Telescope, the INT is our main optical facility in the northern hemisphere. After only 1½ years of full-time operation it is too early to make an overall assessment, but a

few trends are already apparent. The pattern of use is currently similar to that of the AAT, with an emphasis on cassegrain spectroscopy: for faint objects the good site and efficient equipment make the INT competitive with, and for some purposes even superior to, larger telescopes at other sites, especially in the far red which is important for faint galaxies with large redshifts and in the detection of weak emission lines against a strong continuous background. The interaction with Spanish and Dutch colleagues is proving both pleasant and fruitful and new facilities are still coming on line.

Thus after 40 years the INT is at last fulfilling the high expectations of its founding fathers.

REFERENCES

Axon, D.J. & Taylor, K., 1978. *Nature,* **274,** 37.
Bailey, J.A., Jones, D.H.P., Parkes, G.E. & Mason, K.O., 1978. *Mon. Not. R. astr. Soc.,* **184,** 73P.
Blades, C., Wynne-Jones, I. & Wayte, R.C., 1980. *Mon. Not. R. astr. Soc.,* **193,** 849.
Boksenberg, A., Shortridge, K., Fosbury, R.A.E., Penston, M.V. & Savage, A., 1975. *Mon. Not. R. astr. Soc.,* **172,** 289.
Netzer, H., 1974. *Mon. Not. R. astr. Soc.,* **169,** 579.
Penston, M.V. & Perez, E., 1984. *Mon. Not. R. astr. Soc.,* **211,** 33P.
Smith, F.G., 1981. *Q. Jl R. astr. Soc.,* **22,** 254.
Smith, F.G. & Dudley, J., 1982. *J. Hist. Astr.,* **13,** 1.
Ward, M.J., Wilson, A.S., Disney, M.J., Elvis, M. & Maccacaro, T., 1977. *Astr. Astrophys.,* **59,** L19.
Webster, B.L. & Murdin, P., 1972. *Nature,* **235,** 37.