PART 5. ASTRONOMICAL DATA CENTERS

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THE LA PALMA DATA ARCHIVE

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I - Introduction

The Observatorio del Roque de los Muchachos is perched atop a volcanic caldera on the island of La Palma in the Canary Islands, 400 km off the coast of North Africa. Three of the telescopes at the observatory are products of a collaboration between the UK, the Netherlands, Spain and the Republic of Ireland. They are the 1.0-m Jacobus Kapteyn Telescope, the 2.5-m Isaac Newton Telescope and the 4.2-m William Herschel Telescope (which saw first light in July 1987)[1]. The telescopes are computer controlled (running under ADAM software), and the observations are recorded primarily in electronic form. Recognising the success of astronomical-satellite data archives, such as that generated by the International Ultraviolet Explorer, a La Palma Data Archive has been established at the Royal Greenwich Observatory. The archive will be used by astronomers wishing to exploit data obtained by other observers, by engineers interested in the performance of telescope and instruments under varying conditions, and for monitoring the way in which the telescope is used.

The archive includes an on-line observations catalogue, and software for querying it, and for generating requests for copies of data. The proprietary period, during which the data may not be copied, is currently 1 year from the date of observation.

At the time of writing, the archive includes about 50 Gbytes of spectroscopic and imaging data, mainly from the Jacobus Kapteyn and Isaac Newton telescopes. Intending users of the facility should address their enquiries to the archive manager at RGO (currently Ed Zuiderwijk, EJZ@UK.AC.RGO.STAR).

The software for querying and managing the archive is a Dutch contribution to the La Palma venture. It was written mainly by Ger van Diepen and Ernst Raimond at Dwingeloo (drawing on the electronic-archiving experience of radio astronomers) and is maintained by Dorothy Hobden at RGO. The software is not site-specific, and could be adapted for use by other observatories. It is written in Fortran, the executable code occupying about 3 Mbytes.

II - How the archive works

Observers export their data from La Palma on FITS-format magnetic tapes. Copies of the tapes are shipped to the UK, where the images are processed (but not reduced) into the archive. The tapes generated on La Palma can be read as normal FITS tapes, but incorporate a large number of extra keywords (treated as comments by the standard FITS software). The keywords are grouped into 'packets', according to the type of information which they carry. For example, there is an 'observations' packet, which records among other things the right ascension and declination of the telescope, and a 'detector packet', which records the type and physical status status of the detector. The astronomical data are treated as a further packet. The archiving software sorts the data on

[1] The other telescopes at the observatory are the Carlsberg Automatic Transit Circle (UK/Denmark/Spain), the 2.5-m Nordic Optical Telescope (Norway/Denmark/Finland) and the 60-cm solar telescope and 61-cm photometric telescope (both Swedish).

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incoming tapes by packet, and generates archive tapes which each contain data of one packet type. Thus an engineer wishing to investigate the past history of a given instrument need only load the tapes containing the relevant packets. The software also generates an observations catalogue (a summary of which is held online), listing the keyword values for each observation made.

The data from the 3 telescopes currently fill about 20 1600-bpi magnetic tapes per week, and this number may increase considerably with the commissioning of prolific instruments such as TAURUS, which generates spectroscopic datacubes occupying several Mbytes each. Space for storing the tapes at RGO is becoming scarce, and consideration is being given to the use of optical disks for long-term storage.

III - Querying the archive

The online observations catalogue includes for each observation the following information: name of the observer, telescope, detector, instrument, type of observation (e.g. ARC calibration), name of object, type of object, wavelength/passband, polarisation accepted, right ascension, declination, zenith distance, integration time, seeing, time/date of observation and proprietary period. The software permits searching of the catalogue on any parameter or combination of parameters. So, for example, an astronomer may list all observations made of Seyfert galaxies, in the right ascension range 7^h - 19^h, by the Isaac Newton Telescope or William Herschel Telescope, in seeing of better than 1 arcsec. The resulting list may then be sorted by any of the parameters, and may be used to generate requests to the archive for copies of the data.

Remote querying of the archive will shortly be possible over the networks.

IV - Statistical results from the archive

A preliminary observations catalogue for the Isaac Newton Telescope, detailing 9000 observations made during the period 1984 - 86, was used to investigate the way in which the telescope had been used. The results were presented by Benn & Martin (1987). They showed, for example, that the mean yield of integration time at the telescope was 3.4 hours per night, the remainder being used for calibration or observing overheads (e.g. telescope slew), or lost due to poor weather or technical problems. The yield was independent of season, the quality of the weather correlating inversely with the length of the night. This yield-figure is of great interest to observers, engineers and designers. No comparable analysis appears to exist for other ground-based telescopes.

Benn & Martin also showed that, despite there being no constraint on observers to use sensible designations, about 90% of the object-names were recognisable by a simple computer program, a reassuring statistic for archivists.

V - The future

The ambitious electronic archives being constructed by ground-based and orbiting observatories (e.g. at ESO, STScI) furnish the astronomer with a formidable database. Access to these data would be easier if the archivists were to standardise formats where possible. It might even be practicable to generate a combined observations catalogue, for a substantial fraction of the world astronomical community's collecting area.

Reference

Benn, C.R. & Martin, R., 1987. *Q. Jl. R. astr. Soc.*, **28**, 481.