projects. One project in particular, "Small fibres" consisted of 160 fibres with a core diameter of 90 µm for the Autofib2 (robotic positioner)/ WYFFOS (optical spectrograph) commissioned in July 2001 (see also *ING Newsl.*, **4**, 26 and *ING Newsl.*, **5**, 19 for more information and first light report). The procedures and experience of the "Small fibres" project were used in the GMOS/bHROS project. ING is actively looking for more fibre work from external institutes for the future.

For more information on the GMOS/ bHROS project please visit the following sites:

Gemini South telescope:
http://www.gemini.edu/

HROS project page:
http://www.osl.ucl.ac.uk/hros/ /new/fm-index.html ¤

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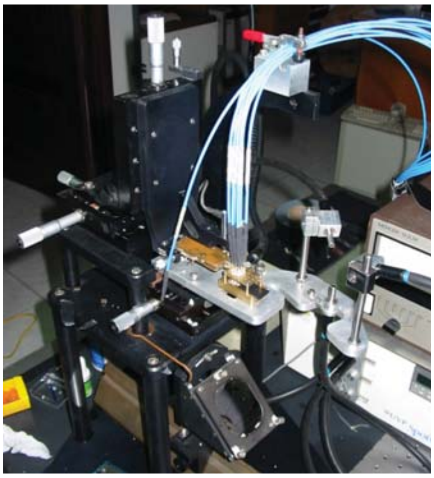

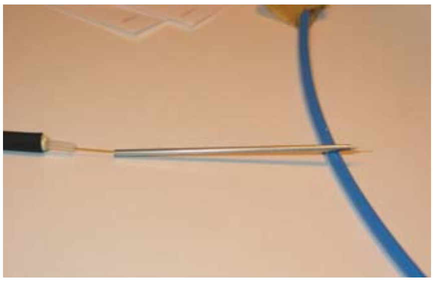

Figure 1 (left). Fibre grounding and polishing. Figure 2 (top right). Fibres in body plate gluing. Figure 3 (bottom right). Metal tube gluing.

Do It Dry... INT Primary "Vapour Cleaning"

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In June 2003 'vapour cleaning', a concept invented by ING staff, was used to clean the Isaac Newton Telescope's primary mirror (2.5m) for the very first time.

The primary mirrors of the telescopes at the Isaac Newton Group are regularly cleaned to decrease the frequency of aluminising. Over the last few years ING has moved from annual aluminising to condition based aluminising, only doing it when the reflectivity and scatter measurements indicate it is needed. The advantage is that an extra three nights are available to observers every year that aluminising is not carried out, not to mention the real risk of damage to the primary mirrors every time they are removed from the telescope for aluminising.

Regular cleaning is currently done by a method called "snow cleaning" or "CO_2 cleaning". This cleaning method uses liquid CO_2 that forms snowflakes once it is in the open air. These snowflakes hit the mirror surface and capture dust particles. The temperature shock between the cold snowflake and the "warm" mirror will easily break the bond between the dust particles and the mirror. The particles together with the snowflakes fall down onto the telescope structure. There the dust can be wiped away from the structure. This way of cleaning the mirrors is quick and easy restoring the reflectivity by about 1–2% and decreasing the scattering.

Unfortunately stains like water and oil cannot be removed using this method. A better way of cleaning the mirror is to use water, soap and natural sponges. First we wet the mirror surface with water to flush away all the big dust particles. By dabbing and with the use of soap on the sponges the water and oil stains can be removed. The rest of the soap has to be washed away by using water before drying. The best way of drying is to keep the surface wet until the very last moment when the water is blown away with filtered clean air. All the dust and most of the heavy stains can be removed using this method. The reflectivity and scattering can be recovered to values close to those retained after aluminising. Therefore this method is much better than the "CO_2 cleaning"method.

A disadvantage of the "washing in situ" method is that it uses roughly 5–10 litres of water per square meter. This can be a problem when a copious amount of water is running around mirror cells and associated equipment. Particularly electronics have to be protected. So normally novel ideas have been developed to seal the mirror or optical component to stop the water leaking around the telescope which reduces the risk of water damage. By using the "water vapour method" only 1–2 litres of water is used per square meter. The advantage is optical results equal to "water washing" without the risk of water damage. The small amount of water used is easily controlled with sponges or towels placed at the bottom of the telescope structure.

The ING invested in 3 industrial vapour cleaners to be used for the "vapour cleaning" process. Before the machines were used on a telescope mirror, extensive tests were done on similar coated mirrors. It was found that it was very difficult to cause any damage to the aluminium coating. Indeed only one test, which involved holding the vapour stream only a couple of centimetres away from the surface and in one position for 20 minutes caused a slight degradation of the coating.

The primary advantage of vapour cleaning starts with wetting the mirror. For this part of the procedure a soapy vapour can be used by pre-mixing water with soap. By wetting the mirror this way, the soapy vapour will start cleaning whilst removing the large dust particles. The vapour is heated to a temperature of about 35°C. Therefore the temperature shock between the warm vapour and this time the "cold" mirror helps to release the particles from the mirror (reverse of the "CO_2 cleaning" method). Before drying the mirror, the soap can be cleaned away from the surface and the steam can keep the surface wet. Even without touching the mirror surface the "vapour cleaning" will give a better result than the "CO_2 cleaning". Finally to achieve the same results as the "water washing" method, sponges and dabbing still need to be applied to the mirror surface after the wetting.

The result of the washing of the INT 2.5m primary was so successful that plans are made to repeat this procedure on the William Herschel Telescope primary (4.2m). This is believed to be the very first time that such a process has been used on a major telescope mirror anywhere.¤

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Vapour cleaning (left) and drying (right) INT primary mirror.

Satellites and Tidal Streams, an ING–IAC Joint Conference

On May 26–30, 2003 ING, jointly with the IAC, organized the third major astronomical conference on La Palma, with the title "Satellites and Tidal Streams". As with previous conferences, generous financial support was provided by the Excmo. Cabildo Insular de La Palma and the Patronato de Turismo. The venue was the pleasant seaside resort of Los Cancajos, a few kilometers south of the main town of Santa Cruz de La Palma.

Current cosmological models predict that galaxies form through the merging of smaller substructures. Satellites and tidal streams might then represent the visible remains of the building blocks of giant galaxies. They therefore provide important information on the merging history and galaxy formation in the Universe. In this conference the observational evidence for substructures, their internal structure and their dynamical evolution and disruption within the tidal field of the host galaxy was discussed and confronted with theoretical cosmological predictions of hierarchical merging and galaxy formation. With some 90 participants, including 'old hands' as well as a healthy contingent of young astronomers, the conference underlined the vibrant developments in this field and was a great success!