The process of data-taking sounds simple – point at a target of interest (high-precision pointing is not required), obtain spectra at many spatial positions (currently hundreds to thousands). The removal of the instrument signature and the assembly of the data into a 3D data cube proceeds similarly to spectroscopic reduction with long slits except for the much larger volume of data. However, it is the analysis of those thousands of spectra which provides the greatest hurdle. Integral-field spectrometers in various forms have been available for decades but the publications resulting have in no way been proportional to their data volume, or allocated telescope time. The sheer scale of the data analysis and the need to do justice to the quantity of spectra has deterred many, and even the 3D spectroscopy pundits have to admit that they cannot analyse their data cubes fast enough. The lack of adequate data-analysis tools is becoming more acute with the installation of new common-user instruments offering IFS modes on 8–10-m-class telescopes, such as VIMOS, FLAMES and SINFONI at the VLT, and GMOS at GEMINI.

In order to try to ease this "data jam", all the European groups working in 3D spectroscopy came together in a working group launched by OPTICON – the Optical and Infrared Coordination Network for Astronomy. A proposal for a Research Training Network (RTN) in the 5th Framework of the European Commission was made in which young post-docs would be enabled to work on science projects with 3D spectroscopy. User tools would be developed and shared to increase the scientific exploitation and productivity of the data. The RTN, entitled "Promoting 3D Spectroscopy in Europe" was awarded and began on 2002 July 1. Post-docs are now being sought in ten European institutes. This article provides a brief overview of the 3D spectroscopy and a flavour of what can be expected from the RTN over the next few years.

2. Growth of 3D Spectroscopy

The first attempts at imaging spectroscopy used scanned Fabry-Perot interferometers to observe the velocity fields of emission lines in gaseous nebulae. Groups at Marseille and Manchester used photographic and image-tube recorders to obtain multiple narrow spectral band maps which, when stacked, allow the line profiles over an area to be mapped. With the advent of piezo-scanning Fabry-Perot spectrometers coupled with photon-counting detectors, rapid sampling of the spectral range could be achieved. The effect of transparency variations in the atmosphere would be reduced by the fast scanning and many scans could be averaged. The TAURUS instrument, used at many 4-m telescopes, was the most advanced realization (Atherton et al., 1982) and emission line maps of many extended targets were observed.

Photon-counting detectors could also be employed in rapid slit-scanning techniques where the positioning of a long slit on the sky was synchronized with the readout of the detector. The ASPECT system at the AAT (Clark et al. 1984) using the IPCS (Boksenberg & Burgess 1973) was successfully used for a number of projects from kinematic mapping of elliptical galaxies to spatial abundance mapping of spiral and starburst galaxies. The data volumes were modest with typically ten long slit positions. Scanning techniques suffer from changing seeing and transparency, which also produce line profile variations for Fabry-Perot spectrometers.

The first attempts to measure simultaneously spectra over a 2-dimensional field were made in the 1980's with fibre bundles packed into an area at the telescope focal plane and aligned onto a common "pseudo-slit" of a conventional spectrometer. Each fibre generated a single spectrum on the detector of one position on the sky. Several prototype instruments have been developed, and some of them are still in use today. The application of microlens arrays to astronomy brought a revolution in this field. An area of sky could be divided up by a monolithic microlens array. The beams from the microlenses could then be fed to a spectrometer and many spectra recorded on the same detector. The spectrometer design can ensure that the many individual spectra are packed on the detector so that there is minimal overlap. The Tiger, subsequently Oasis, instruments used for many years on the CFHT was the most successful example of this design principle and much science was achieved from resolving the kinematic components of galaxy nuclei to the jet structure of PMS stars (Bacon et al., 1995). Using the micropupil principle, the coupling of lens arrays with fibre bundles allowed more flexible designs even with several spectrometers. The integral field mode of the Gemini GMOS instrument uses this design, as does the VLT FLAMES facility; in VIMOS, currently the largest IFU unit in operation (80 × 80 elements), the fibres feed four spectrometers. There is no reason in principle for not extending the number of spatial elements towards that of the maximal spectrometer and two propos-

OBITUARY GUILLERMO DELGADO (1961–2002)

Guillermo started his career in radio astronomy in 1983 when he participated in the activities and development of the Maipu Radio Astronomy Observatory.

In 1986, at the time when Onsala Space Observatory and ESO embarked on the SEST project, Guillermo went to Sweden to become involved in the project. Upon his return to Chile he took an active part in the commissioning of the SEST. His contribution helped greatly in the early readiness of the SEST operations. Later on, he was responsible for the instrument maintenance and upgrades, including the installation of receivers and the design of their control system.

In 1989 Guillermo graduated as Electrical Engineer from the Universidad de Chile. In 1992 he went to Sweden to work on his doctorate at Chalmers University of Technology. He returned to Chile and the SEST in 1995 where he completed his Ph.D. thesis.

In 1997, health problems obliged him to be based in Santiago, where he was, essentially, dedicated to support the ALMA site testing and development campaign, including the maintenance of its equipment, the interpretation of the atmospheric transparency data from Chajnantor and the modelling of phase correction methods. His efficient work under difficult health conditions was impressive. Above all, Guillermo had an extraordinary capacity to handle a large spectrum of skills, ranging from electronic designs and opto-mechanics to software development and data analysis. He taught at the Universidad de Chile and encouraged students towards the world of astronomy. ESO and Onsala Space Observatory are deeply grateful for his contribution to ALMA and the SEST.

Guillermo was a first-rate colleague whose generosity and dedication was highly appreciated by all who worked with him. Until his very last weeks at the hospital he was actively involved in his tasks with an energy and will power only to be defeated by his physical condition.

Our expression of condolence goes to his wife, Alejandra, and their sons.

DANIEL HOFSTADT
LARS-ÅKE NYMAN