the field has made recovery more difficult.

The situation has substantially improved over the last two years. Some investment has been made. However, any programme for the development in Astronomy must necessarily include simultaneous components, risking to compromise the objectives aimed at, would any of them be neglected. These components are

(i) the education of a new generation of astronomers, both at University level and at doctoral level. At the doctoral level this should preferably take place abroad or through international collaborative projects, until a "critical mass" is achieved; this implies a steady number of grants for some period of time,

(ii) the support of a small number of infrastructures, providing the necessary facilities for research and education, and the support to those fields where competitive work is already being done, in order to avoid dispersion of the available resources,

(iii) the establishment of a small number of temporary positions, both at the technical support level and post-doctoral level (national and/or foreign) so that research teams can be provided with acceptable working conditions; at a more advanced phase an adequate number of permanent research positions for Astronomy should also be considered,

(iv) finally the access to adequate observing facilities for Portuguese astronomers and postgraduate students.

The signature of this agreement with ESO is an event of great importance for the development of the astronomical research in Portugal. Not only does it fulfil some of our needs – the access to adequate observing facilities – but it also allows the collaboration and, at some level, participation with ESO at an exciting time – the time in which a very large telescope of a new generation and the important related instrumentation are being developed at ESO.

I believe this agreement constitutes the undeniable proof that the decision makers in Science and Technology in Portugal finally give to Astronomy the credit it fully deserves and receives in other countries in Europe. I take this ceremony as a real commitment for a continuous and serious effort to develop Astronomy in Portugal. A commitment to provide conditions that allow the Portuguese astronomy to grow to levels comparable to the European ones over a period of time of 5 to 10 years.

I want to thank the Secretary of State for Science and Technology for his decisive support and involvement at the crucial stages of the negotiations with ESO. And to express to the ESO Director General my gratitude for his comprehension and understanding, that has been so important for the conclusion of such an advantageous agreement for us. I feel that Prof. van der Laan's attitude during the whole process was closer to the fellow astronomer and well beyond the negotiator's job.

Of course, years of low profile take time and an enormous effort to be replaced. Mentalities probably take even longer to change. But as an astronomer I must say this is a time of optimism and strong hopes for a brighter future.

A Short Summary of Astronomy at "Centro de Astrofísica da Universidade do Porto"

M. T. LAGO, Astrophysical Centre, University of Porto, Portugal

In 1988 JNICT (the national research council) took the decision to finance the first research centre in Astrophysics in Portugal, the "Centro de Astrofísica" at the University of Porto.

Although in activity since 1988 the Centro was officially created in May 1989 as a financially autonomous association within the University and is housed since October 1989 at the new building of the University Computer Centre.

As personnel it involves

- 2 University staff (Ph.D. in Astronomy, 1979, 1982),
- 8 Ph.D. Students (1 M.Sc. in Applied Statistics, 1988; 2 M.Sc. in Astronomy, 1989, 1990; 1 M.Sc. in Astronomical Technology, 1989; 3 D.E.A. in "Astrophysique et Techniques Spatiales", 1989, 1990; 1 "Licenciado" in Surveying Engineering, Univ. Porto, 1984) and
- 2 temporary staff (1 "Licenciado" in Physics/Applied Mathematics [Astronomy, University of Porto, 1989] in charge of the computer management and assistance to users, general administrative activities and part-time research, and 1 secretary/librarian).

It also involves several undergraduate students of Astronomy (terminal year).

Because of the particular situation of Astronomy in Portugal, we believe that any programme aimed at the development of Astronomy must necessarily include five simultaneous components. There would be a risk of compromising the objectives if any of them would be neglected; the "Centro de Astrofísica" therefore includes all of these components in its objectives:

1. The education of a new generation of astronomers – the shortage of adequately trained and active prospective supervisors in Astronomy in Portugal implies that, at this initial stage, the majority of the doctorates must be prepared abroad, and those to be prepared at home also need to benefit from a close and continuous collaboration with scientists from well-known foreign institutions; therefore the Centro has been trying to guarantee a continuous and equilibrated scheme of grants as well as the necessary contacts.

At the same time, the Centro provides conditions for its visitors to collaborate in the undergraduate teaching and to involve the terminal year students in its projects. Therefore the Centro's support for education comes,

– *at university level:* through support to the only undergraduate degree in the country aimed at the education of the new astronomers, at the School of Sciences of the University of Porto; this interdisciplinary degree was set up in 1984 and is jointly offered by the Physics and Applied Mathematics Departments. It has a four-year plan of studies, a *numerus clausus* of 15 students per year and is structured in course units of which 37% are in Physics, 32% in Mathematics, 25% in Astronomy and 6% either in Chemistry, Geology, Mathematics or Physics. The initial three years providing basic training in Mathematics and Physics, except for an introductory course (first year) intended as an overview of modern Astronomy and aiming at keeping alive the student's enthusiasm. The 3rd year offers a general Astronomy course and finally the 4th year includes 5 options from an annual list of various topics in As-

tronomy, naturally strongly dependent on the availability of lecturers (local and visiting). An example of such a list includes Astrometry, Cosmology, Extragalactic Astronomy, Formation and Evolution of Stars and Stellar Structure. Some of these courses are fully delivered (or include units of 10 to 15 hours) by visiting professors or researchers; this has proven to be very stimulating, exposing the students to different people and also helping to compensate for the lack of "people around", considering that the number of astronomers in Portugal is presently so reduced – well below the European average of 1 to 2 astronomers per 100,000 inhabitants;

– *at a younger level:* taking Astronomy to the Schools through a programme involving the Centro, the Regional Education Authority and the Government Local Authority; this includes sessions with a portable planetarium „Starlab" donated to the Centro by the Government Local Authority (the planetarium sessions are prepared for age groups 5–7, 8–10 and 10–12), talks on various topics of Astronomy and the preparation of slide sets with explicative texts to be lent to teachers at various levels.

The Centro has also been involved in the planning of the Master's degrees for students connected with it; several students from the Centro have successfully completed their degrees at various Astronomy departments with the following thesis:

– "The Solar-Stellar Connection", University of Sussex (1989),

– "Evolution des Etoiles Bleues et Lumineuses aux Environs de la Limite de Humphreys-Davidson", Universités Paris VII et Paris XI (1989),

– "IRIS – A Project on Infrared Image Sharpening", University of Edinburgh (1989),

– "La Fonction de Luminosité des Nébuleuses Planétaires", Universités Paris VII et Paris XI (1990),

– "L'^{3}He dans le Soleil, Étude Analytique de la Diffusion Microscopique", Universités Paris VII et Paris XI (1990),

– one thesis to be completed soon, Queen Mary and Westfield College – University of London (1990).

The University of Porto is also the national node for the European Astrophysics Doctoral Network, a consortium which today federates 21 European Universities all having a graduate programme in Astrophysics, ESA and ESO. This Network has continuously benefited from national, European Community (ERASMUS) and European Science Foundation support.

2. The Centro is the institutional structure providing support for the development of research projects, adequate postgraduate education, undergraduate education, the promotion of Astronomy (through the organization of conferences, courses, etc.) and the stimulation of science popularization.

The ongoing research projects at the Centro are in the following areas:

(a) – "Classification of Observed Astrophysical Structures"

(b) – "Cosmology – Jordan-Thiry theories and models of galactic formation",

(c) – "Stellar Astrophysics".

These areas have been selected because they were already active research areas at the University of Porto and all have research projects where Ph.D. work is carried on, namely:

(a) – "Classification of Observed Astrophysical Structures" – the quantitative analysis and application of statistical methods to the study of large structure and their origins, a collaborative project with people at ESO and the ST-ECF involving one Ph.D. student,

(b) – "Cosmology" – the study of dark matter in the Universe, involving one Ph.D. student at the Centro,

(c) – "Stellar Astrophysics"

– the modelling of winds in young stars, a collaborative project with people at the University of Sussex involving one Ph.D. student at the Centro (1990),

– the study of the evolution of pre-main-sequence stars, a collaborative project with people from the Astrofysisch Instituut, Vrije Universiteit Brussel, involving one Ph.D. student (1989),

– the study of MHD outflows from astrophysical objects, a collaborative project with people from the Department of Mathematical and Computational Sciences, University of St. Andrews (1989),

– the study of the interaction between young stars and molecular clouds, involving one Ph.D. student from the Centro at the Department of Astronomy of the University of Edinburgh (1989),

– two other Ph.D. students are expected to start in October Ph.D. projects within Stellar Astrophysics.

We are also working in order to try to guarantee that at a more advanced stage temporary post-doctoral positions (2- to 3-year contracts) are available not only at the Centro but also at other national Institutions. Furthermore, we are also trying to draw attention to the fact that if all this effort is to be fully explored it should involve a real commitment by the universities and national research authorities towards the opening of permanent positions in Astronomy at the various Institutions.

3. The Centro provides the local infrastructure to support research, through

3.1 – library facilities (a collection of back numbers of the most relevant journals was generously offered by some Institutions such as ESA, ESO, Utrecht Laboratory for Space Research, Observatoire de Meudon, Royal Greenwich Observatory and astronomers working there),

3.2 – computer facilities for data analysis, access to networks, data banks, data bases and larger computers existing in the country, as well as adequate software; the Centro is equipped with a μ Vax 3400, 700 MB in disk TK 70 and accessories such as graphic terminals, printer, Image Display device and adequate software is also available (Starlink, Nag, Matlab and MIDAS being installed); some Mackintosh are also available.

4. Observing facilities – the availability of observing facilities, either national or on a collaborative basis with international observatories, for the Portuguese astronomers and post-graduate students is vital; besides the existence of potentially very good sites on the national territory, such as Madeira, and the possibility of building a national observatory being very attractive and not to be excluded in the long run, the alternative of the participation in existing international facilities seemed to be more advantageous. People from the Centro were deeply involved in all the negotiations process that successfully ended in the present agreement with ESO.

5. Promotion of the popularization of Astronomy – the Centro has had various initiatives during the current year, namely through activities such as

– the local organization of the ESO exhibition in Porto (October 1990) including organized visits for students in the terminal years of Secondary Schools,

– the organization of a series of public conferences on several topics of Astronomy simultaneously with the ESO exhibition,

– various popular-level talks on Astronomy.

Most of these activities also involve the Astronomy students.

New ESO Scientific Preprints

(June–August 1990)

705. E. Gosset et al.: A Search for Quasars in a Field Around NGC 520. *M.N.R.A.S.*
706. P. Magain and G. Zhao: Empirical Study of Departures from the Excitation