

## **Report of the Advisory Committee on the activities of the Instituto de Tecnologia e Nuclear**

The Advisory Committee (Unidade de Acompanhamento) of I.T.N. met at Sacavém on the 15th and 16th of April 2009. The first day was devoted to presentations of the Direction and researchers of different scientific groups giving an overview of the activities. The second day, after short visits, the Committee met for discussion and preparation of the present report.

The general impression of the Committee is positive. Despite obvious limitations, the scientific activity, both in services and academic research, is important and of good level. The Committee recognizes the success of the directors in establishing a good environment for scientific work and stimulating cross collaborations between the different groups. The involvement of a substantial number of young researchers, preparing their thesis or working at post-doctoral level is a significant sign of the vitality of the research and of the attractiveness of the site.

However, the fraction of permanent or, at least, stable posts is certainly too low, which generates some instabilities and makes the establishment of development plans and of strategies hazardous. The Committee encourages the directors to negotiate with the authorities in order to establish a plan of human resources adapted to the developments to be done in forthcoming years. In this context, the Committee has been informed in the course of the meeting about a possible organisation of a new entity (Física-N) to be installed in the campus with obvious interactions with several departments of the Institute, what may constitute a good opportunity for formulating a long term strategy.

The main shortcoming of the situation of the Institute is the extremely large dispersion of the origins of its financial resources. The Committee noted that the dominant, almost unique, resource comes from a very large number of small grants allocated in terms of small research or service contracts to individual members or small groups, sometimes in collaboration with Universities or other institutions. Although such situation demonstrates the enthusiasm and success of the members, it is not compatible with the existence of long term goals and, more importantly, the establishment of a global research strategy. The Committee recommends that an adequate part of its budget is guaranteed to the Institute in order to allow the Direction the establishment of medium and long-term work plans beyond the general current expenses.

Still within the context of funding and human resources, the Committee noted that a major part of the activities of one of the departments (Radiological Protection and Safety Unit) is due to obligations legally assigned to ITN. Consequently, it would be more appropriate that both human and financial resources for these services of this department are allocated as regular funding in a way independent of the research activities of the Institute. This recommendation by no means suggests the independence of the Department. Indeed, the close relationship between the research in this field and the state-of-the-art services rendered to authorities, industry and medicine as well the interaction and collaborations with the other departments are very fruitful and must be maintained.

The activity report of the Institute has been carefully written following a traditional format where all activities are presented in a too uniform and exhaustive way. The Committee would prefer a document where the general strategy and those of each Department appear more clearly. The scientific part should be reduced to a few (although more developed) highlights, followed by a simple list of the ensemble of achievements. Also, the scientific sector (R& D Units) must appear in the organization chart as the central and main part of the Institute. It must be more detailed, particularly in what concerns the responsibilities and different ratios between researchers, students, post-docs and technicians.

The Institute is organized in four departments although, in some cases, the subjects overlap several departments. The Department of Chemistry has a good scientific unity. The activities in solid state, organo-metallic compounds and radiopharmacy are of excellent level with a good output in publications and international conferences. The radiopharmacy group has recently extended its activity to biochemical and cell studies and also to animal studies, with the development of new installations at a new building for this purpose. The Committee draws attention to the safety conditions in which the researchers are operating with radioisotopes. Among the different departments, the Department of Chemistry is the most similar of a university research group, what certainly should favour the attractiveness for university professors for performing research activities at the Institute. It plays also an important role on horizontal activities using some of the facilities of the Institute. The Committee encourages such interactions which are fruitful and reinforce the specificity of the equipment available at the Institute.

Integrated in the Chemistry Department, the groups of environmental chemistry and luminescence (GeoLuC) accomplish an excellent work in the best environment, namely using the possibilities of the reactor.

The Physics Department is very much centred on the activity of two accelerators. The scope of activities is very large resulting in a substantial contribution to the output of the Institute. Very much organized like a large facility, a multitude of collaborations widen the variety of thematics. The accelerator laboratory upgrade that was done recently with emerging possibilities for -among other- accelerator mass spectrometry and instrumental carbon dating will provide new research opportunities for both the staff of the Institute and external users. In the future, it may be useful that part of the activity is dedicated to internally funded research in order to avoid a too large dependence from the external demand. The Committee appreciates the high level of performance accomplished by both accelerators but believes that the infrastructure should be completed by supporting techniques, in particular optical and electron microscopy, with a view to reduce the dependence from external resources. Specific activities should be envisaged for the exploitation of the high resolution X-ray detector that was acquired recently.

The X-ray group is starting a new phase of development, establishing also new and promising directions of research. The high quality of the equipment represents a good opportunity that must be fully exploited. The Committee recommends that the Direction pays a special attention to the integration of this group in the scientific strategy of the Institute.

The Committee noted that the traditional activity on neutron scattering has been abandoned, except for the utilization of international facilities in a few experiments. One may regret that this activity has not been successful despite several investments and encouragements of successive directions. Presently, the reduction of the level of enrichment of the core of the reactor has negative consequences on the quality of the neutron beams. Consequently, it would not be reasonable, in the present situation, to recommend a continuation of this activity, although the immediate consequence is the integration of the concerned researchers in other activities.

The Reaction and Nuclear Safety Department is a central and most visible part of the Institute. The Committee thinks that, despite the absence of research in neutron scattering, the reactor plays an important role and it is the way how several groups can interact. The potentialities of the reactor should be more profitable to the Institute and the Committee encourages the development of activities taking advantage of this unique facility. One possible way, already emerging, is neutronography and neutron tomography, techniques that don't imply large investments but are developing in other nuclear centres with modest power.

The interest is partly in material research and industrial applications as well as in the cultural domain already present at the Institute. The present utilization of the reactor is done with competence although some studies (namely in neutron activation analysis) could be done by other methods based on mass spectrometry. The Committee is aware that the operation of the reactor may be interesting beyond its present utilization but thinks that the members of the Institute may better profit of its possibilities.

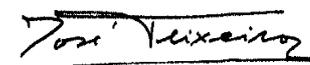
As mentioned above, the Radiological Protection and Safety Unit has been assigned obligations to provide legally required services such as environmental and individual radiation monitoring and to operate Portugal's national standard laboratory for radiation measurements. The unit has continuously developed and upgraded their methodology and instrumentation such as the re-activation of a whole-body counter and introduced new techniques such as biological dosimetry. In order to meet the requirements of a national monitoring institute it participates in a wide range of international intercomparisons and has started the process to obtain the accreditation of its environmental and individual monitoring services. The quality of the services of this unit benefit very much from its own research activities carried out simultaneously. In particular in the areas of computational dosimetry and environmental monitoring the research work is of high quality and the Committee appreciates the collaborations with other European research institutes and the active participation in EC funded research projects. In order to meet current and future challenges in radiological protection, the Committee recommends that the Institute focus on the issues of radiological protection of patients and medical workers in view of the rapidly increasing use of new radiological diagnostic and therapeutic techniques, as well as on further developing methods and techniques needed for response to radiological emergencies such as nuclear accidents or criminal attacks. For rapid decision-aiding methods the availability of a ICP-MS would be an asset.

This short review is by no means exhaustive with regard to the totality of activities of the Institute. Several actions, in particular the laboratory of vibrations and acoustics, develop a remarkable and original research in collaboration with universities and international centres. The group of instrumentation has a good activity but is too small to develop if not in collaboration with the industry.

The presence of large instruments, namely the reactor, the two accelerators or high magnetic fields justifies per se the existence of the Institute and its specificity but imposes, as well, an opening to Universities, namely in the role of training and full participation in second and third university cycles.

The possibilities of development of the site, whenever performed in dialog with the different partners and taking into account the development of the present activities represent a real chance of a better integration of the Institute within the research activities of the country, both at the University and Industry, particularly those using large facilities or related to nuclear physics and chemistry.

Saclay, May 8, 2009



José Teixeira

## A) Members of the Advisory Board

- Emeritus Professor Freddy C. V. Adams (director of Micro-Trace Analysis Centre - Mitac, Belgium)
- Engenheiro Manuel Cruz (Vice-Presidente do Conselho de Administração do ISQ, Portugal)
- Professor Carlos Frederico G. Campos Geraldes (Prof. Cat. da Univ. de Coimbra - Dep. Bioquímica, Portugal)
- Dr. Hans-Georg Menzel (Responsible for the Radiological Safety at CERN, Switzerland)
- Dr. José Teixeira (Directeur de Recherche no CNRS - Saclay, France) (president)
- Professor Carlos Varandas (Prof. Cat. do IST, Portugal)

## B) Main recommendations:

The Committee recommends:

- 1) That the directors negotiate with the authorities in order to establish a plan of human resources adapted to the developments to be done in forthcoming years.
- 2) That an adequate part of the budget is guaranteed to the Institute in order to allow the Direction the establishment of medium and long-term work plans beyond the general current expenses.
- 3) That both human and financial resources related to obligations legally assigned to the department Radiological Protection and Safety Unit are allocated as regular funding in a way independent of the research activities of the Institute.
- 4) That the Institute focus on the issues of radiological protection of patients and medical workers in view of the rapidly increasing use of new radiological diagnostic and therapeutic techniques, as well as on further developing methods and techniques needed for response to radiological emergencies such as nuclear accidents or criminal attacks. For rapid decision-aiding methods the availability of a ICP-MS would be an asset.
- 5) That part of the activity of the Physics Department is dedicated to internally funded research in order to avoid a too large dependence from the external demand.
- 6) A special attention of the Direction to the integration of the neutron scattering group and of the X-ray laboratory in the scientific strategy of the Institute.
- 7) That the Direction studies the possibilities of developing neutronography and neutron tomography as tools for material research, industrial applications and in the cultural domain.
- 8) That the Direction produces a report where the general strategy and those of each Department appear more clearly. The scientific part should be reduced to a few (although more developed) highlights, followed by a simple list of the ensemble of achievements. Also, the scientific sector (R& D Units) must appear in the organization chart as the central and main part of the Institute.