



## **European Physical Society: Position Paper**

### **Physics Research: the Relationship between Universities and National Research Institutes**

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The declared aim of the EPS is to help Physics and Physicists in Europe.

#### 1. Aim of this Position Paper

The aim is to give a balanced view of the appropriateness of organizational arrangements for National Research Institutes (NRI), particularly in those the countries of Eastern Europe which, in the past, relied in part at least on supplying Defence needs. We appreciate that even in Eastern Europe there are differences, country-to-country; nevertheless, there are some common features and therefore common recommendations. (We do not consider here the important role of applied research in Industry and in Government Ministry-owned establishments).

#### 2. The Rôle of University Research

Universities and, in a number of countries, the research institutes belonging to National Academies of Sciences have always been - and should continue to be - the source of much fundamental research. They are also the training ground for much of a nation's scientific 'manpower'. The interaction of research and teaching is vital.

#### 3. The Rôle of National Research Institutes

National Research Institutes are, by definition, largely funded by Government.

Ideally, an NRI should have 4-components.

- (i) One with a specific national task, such as Nuclear Technology, Standards, Engineering techniques, Environment, etc.
- (ii) A division responsible for fundamental research, some of which is in the area covered by (i). Such a division must carry out fundamental research of excellence, which is competitive at the international level.
- (iii) By definition, NRI will often have a unique facility (accelerator, reactor, observatory, etc.) which is available for the whole research community in the country. The facility will need adequate, well-trained local staff.

- (iv) A policy of strong co-operation with Universities (and other Higher Education Establishments) for the provision of training for research students.

It should also have a small section devoted to publicity, viz. to make the public aware of its work and be 'citizen-friendly'.

Direct funding of autonomous institutions is the preferred option, peer review being used to maintain standards.

#### 4. NRI in Transition

With the end of the 'Cold War' a number of developments have occurred, as follows.

- (i) In Western Europe, funds for those areas which previously benefited from the Cold War (Space Research, Nuclear Physics....), have been reduced, in relative terms.
- (ii) In some countries of Eastern Europe, as mentioned at the start, Institutes had Defence associations and thus there has been a need to change direction.

Here, we concentrate on (ii).

It is tempting to have closures or 'shot-gun marriages' with Universities. The latter should be resisted; funding shortages will inevitably lead to serious problems for both.

We recommend that serious attention be given to keeping NRI of adequate quality; certainly, those which are predominantly concerned with fundamental research, and which have international respect, should be maintained and indeed enhanced. The needs of basic research will continue to grow and those NRI with significant applied research efforts will have much work to do. An example of the latter concerns matters associated with the environment (pollution, of various forms ....).

Concerning funding, there is no substitute for direct State support, and certainly not for the component of NRI working in fundamental research. For the applied component, a small contribution might come from private industries, both national and international. The presence of good people with, as-yet, modest salary requirements, makes such Institutes attractive to International companies with specific requirements. It is appreciated, however, that efforts in this area have not yet proved generally effective.

#### 5. The Rôle of the International Laboratories

In some subjects, principally Particle Physics, Astronomy and Condensed Matter Physics, the needs of experimentation are so great as to be beyond the capacity of a single nation and International Laboratories are necessary. Permanent scientific staff should be kept to a minimum; cross-fertilization with University Departments and NRI, is vital. The sophisticated techniques developed must be used 'at home' as well as in the International Laboratories.

National funding for the International laboratories must include not only the subscription but also sums for the national science base (Universities and NRI) in order that the appropriate user-equipment can be provided.

#### 6. Comparisons with other Countries

No two countries are alike in their possession of, and need for, NRI and detailed descriptions are not very helpful. However, the Appendix gives details of one, rather average Western European Country, the U.K.

Appendix     Funding Arrangements in the UK

A1     Regarding gross expenditure on Research and Development (R and D), expressed in terms of Gross Domestic Product, (GDP), the UK is 3rd out of the major countries (Germany, France and the U.K.). It is however, 13th in terms of pounds sterling per head of population invested in General University Funds for scientific research. Overall, funds for R and D are about average for the more developed countries of Western Europe.

A2     Total R & D expenditure in the UK is about 2% of GDP.

Government expenditure on R & D is ~ 0.6%

University Research receives ~ 0.27%, of which about half goes into 'fundamental' research.

A3     The 0.33% (0.6-0.27) is divided between Government Departments (Agriculture, Health ...), which have their own Research projects, and Research Institutes.

A4     Research Institutes (e.g. the National Physical Laboratory) are part-Government funded and partly funded by income from projects for Industry, etc.

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