

# Physics in Poland

A few remarks on the structure and development of physics in Poland by Professor L. Dobrzynski of the Physics Department, Warsaw University Branch, Lipowa Str. 41, PL-15-424 Bialystok, Poland.

The conclusions of the meeting in Schloss Dagstuhl described recently by Maurice Jacob in *Europhysics News* 22 (1991) 175 have stimulated me and my colleagues to think the following: if there is no common way in which physics developed in western countries, then there is no one who can advise Poland to "just copy us". Consequently, can we say anything about a "Polish way" of developing physics?

This is not an academic question, especially if our foreign colleagues reflect on how to help us. It is clear that western Europe may not have enough means to sponsor all-embracing collaboration with the post-communist countries. Nevertheless, the question remains whether there is any room for finding some means of self-support by remodelling that which did not work too well until now? I think that these are key points for starting any deep discussion on how Polish physicists may enter the mainstream of world-wide science.

First of all, without false modesty one can say that quite a fraction of Polish physicists collaborate and occasionally even compete successfully with their western colleagues, so it is not the situation that Polish physicists find no place on the map of European or world science. The problem consists rather in a how typical such a situation is. Personally, I believe that the international appreciation of research carried out in Poland (please note that I am not speaking here of Polish physicists working abroad) is not particularly well-founded. One can try to blame the lack of advanced technologies, sophisticated hardware and ultra-fast computers. If these were the reasons, the only problem would consist indeed in asking for help, which sometimes also for the sake of a good political relations between countries is occasionally offered to us from the western world. The purpose of this essay is to describe some problems of Polish physics, the knowledge of which may be useful for our western colleagues.

## Universities and Institutes

Let us start with a brief inspection of places where physicists can be found in Poland. Essentially there were always only three locations namely, the universities, research institutes belonging to the Polish Academy of Sciences, and institutes belonging to the Polish Atomic Agency. About 2000 of physicists work at universities of various kinds. The number of physicists working at the institutes of the Polish Academy of Sciences is three times

smaller, and certainly more than an order of magnitude fewer physicists work in institutes belonging to the Polish Atomic Agency. In fact, the number of full and associate professors employed at the universities is comparable to the total number of physicists at the Polish Academy of Sciences. Nevertheless, the Academy turned out to be much more efficient in establishing international agreements than the Ministry of National Education to which the universities belong. On the other hand, contacts with large international organisations like the International Atomic Energy Agency and the recently established membership of CERN have been conducted under the auspices of the Polish Atomic Agency — an institution which administered a huge amount of money in its roughly 35 years on existence. This Agency, however, was always under such political pressure that the development of science was rarely its primary concern.

The educational system worked out in the past did not care too much about the natural development of science at the universities, and intentionally left the field open to the two organisations from outside the universities. In spite of this, the average number of papers from basic research, published per year *per capita*, is probably roughly the same at the universities as at the Polish Academy of Sciences or the Polish Atomic Agency. Should we add that academics also have teaching

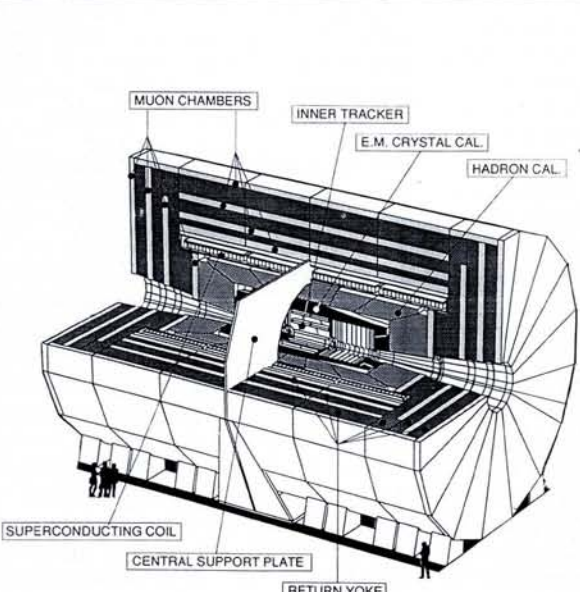
obligations, so they might be easily excused for publishing relatively few papers?

## Industry

Let us say now few words about another place in which physicists are expected to be found. I mean here the industrial laboratories. In this case one should admit that one can hardly find any such laboratories which feel a need to employ physicists. Heads of Polish companies usually exhibit a total ignorance on what a physicist can do and how they can be used for the development of industry. This is again an heritage of the communist system, where companies had to produce and stick to certain para-economic factors, without being forced to compete and permanently raise the standard of their products. Such requirements would have unavoidably led to a recognition of the rôle of science. On the contrary, scientists were often shown as egg-headed, who by doing something not "useful" could only be subjects of a pity. The system of negative selection to the leading posts in the country often entailed the appointment of narrow-minded pseudo-specialists to management and even ministerial boards. As a result, industry never felt a need to develop good laboratories which would employ highly qualified physicists.

## Policies

The problem of a negative selection of people, or the creation of leaders with not too high qualifications, was luckily not so clearly visible in the case of physicists, although even this community was not entirely free of the problem (the example of the Polish Atomic Agency is particularly drastic in this respect). It seems to me that much more important was a lack of an



## Poland at CERN

*A detector for CERN's proposed LHC collider.*

Roughly one-quarter of the nearly 80 Polish scientists working at CERN participate in four of the 20 projects devoted to R. & D. for LHC detectors. Polish teams are working on: muon triggers in a strong magnetic field; an integrated transition radiation detector and tracking chamber for electrons; embedded intelligent devices for triggering; silicon strip detectors, one of the best candidates for supporting the high energies, high luminosities and severe radiation found at LHC.

internal policy for the development of physics. This had to result in the distribution of subsidies which did not always favour the best groups and the development of physics wherever possible. For example, it is a rather common feeling among solid state physicists that their rôle in Polish physics was not appreciated sufficiently, and that the development of the high energy and nuclear physics has been carried out at the expense of solid state physics. The influential lobby of high energy physicists was inclined to think that owing to the close link between solid state physics and applied physics, the former is not basic enough, so it deserves less care.

Maurice Jacob is right when he writes that the membership of Poland in CERN is very important for Polish physicists. However, not less important is their access to other international enterprises, *e.g.*, the European Synchrotron Radiation Facility, the Institut Laue-Langevin and many national institutes such as the Rutherford Appleton Laboratory which are ready to accept proposals from various countries, Poland among them. I do agree with Dr. Jacob's statement that close links with CERN can drive physics development, as was the case for Portugal, but observing our Polish scenery I can risk a thesis that the lack of money for international collaboration with other centres may cost Polish physics much more than eventual gains from the rather expensive (for Poland) membership of CERN. The fact that Polish solid state physicists are well-known around the world should be recognised — not only verbally, but also in practice by Polish authorities deciding about the distribution of means and support for physics.

#### Solid State Physics

In order to illustrate the position of the solid state physics it is enough to note that two out of 20 large international conferences on semiconductor physics were organised and held in Poland. The first international conference on polarised neutrons took place in Poland in 1979. In 1993, Poland will organise the prestigious International Conference on Magnetism. Polish solid state physicists are on editorial boards of well-known international journals and on the boards of international organisations such as IUPAP and the IUCr. Problems like the physics of semimagnetic semiconductors and of actinides became Polish specialties, widely appreciated by the international community. The annual international schools on semiconductors, magnetism, positron annihilation, *etc.* form a rich landscape of Polish science.

#### Physics Teachers

Physics teachers at primary and secondary schools are not normally a subject of particular concern. Nevertheless, I think that a few words about this group may be

important for the western reader. The dichotomy of communist phraseology consisted, among others, in the fact that the rank of the school teacher was always inversely proportional to income and proportional to the level of indoctrination and/or to a compulsory subordination to the official way of judging reality. These features resulted in a strongly negative selection of teachers, including physicists. Of course, it does not mean that one cannot find excellent professionals and people who love their profession in spite of the fact that it reduced their status to that of a social pariah. What I want to point out here is that the system we had in Poland acted against the teaching profession. Even most devoted teachers had to face the brute reality of schools deprived of any normal physics labs, having extremely poor libraries and creating rather awkward conditions for a self-development and, consistently, for teaching physics well.

In fact, the income of academic teachers and scientists are not much to talk about. The penalty for being a scientist is tremendous. A simple bricklayer or plumber may easily earn 10 times more than a university professor. The libraries and infrastructure of Polish universities are rather poor. Under such circumstances Polish physicists face a challenge on how to make ends meet and at the same time to compete with a world which has much better access to information, owns various technical means to perform quickly almost any experiment, and can carry out calculations on the latest generation of computers. I think that this problem is not typical to Poland only but also to other post-communist countries as well. Besides, Poland always had much better scientific exchange with the western world than some other countries so some problems discussed here may be amplified elsewhere.

#### How to Help

In ending this essay I want to conclude that there are many ways of helping Polish physics without investing too much. One comes from the recognition of the fact that most physicists work in the universities so contacts with the universities should be intensified. The second stems from the recognition that Poland has particularly good tradition in solid state physics and one should keep some balance between the distribution of means for international collaboration in this and other fields, including especially money-consuming nuclear and high energy physics. Thirdly, one should remember that some of the more important problems of Polish physicists include the lack of a current information as well as the often empty shelves in libraries. Therefore, for sure, any extra copies of journals will be very welcome. Laboratory equipment which

seems old and out-dated can often be of a great use in schools, and even in university students' laboratories.

Last but not least, it seems to me that one can work out international scientific projects, financed by all sides, but in which the main experimental facilities would be developed in Poland and the weight of carrying out the experiments would rely mainly on Polish physicists. This concerns particularly already existing major centres like the Institute of High Magnetic Fields in Wroclaw and the Institute of High Pressures in Warsaw, which could easily serve as international centers if supported sufficiently well. Western companies could probably also make much more extensive use of some of our laboratories. Research made under contract from foreign companies may be cheaper in Poland than elsewhere, and the money earned in this way could go to further develop these laboratories. The presence of laboratories with relatively good equipment and expertise is, under the conditions described above, one of the Polish miracles, which can be explained only as result of a tremendous effort by Polish physicists.

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