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From the President* of the European Physical Society

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The European Physical Society started in 1968, at the end of a period of scientific growth, when Europe, emerging from the ruins of the last war, had recovered a reasonable scientific activity, compatible with its cultural and economic standing. Physics played an early role in this recovery. Many of us temporarily left our own countries soon after the war, to train where scientific activity was still bright and shiny, and then came home to start new groups. We thus recovered the taste for meeting, discussing and working together with Europeans, as well as with our American or Japanese colleagues. This was also when CERN started. If the first post-war generation trained mostly within Europe, the second did its PhD's or long post-doctorate stays in the United States, which was then developing faster than elsewhere. The return to Europe of this second wave, gave the final impetus to launch a large and strong physical society, which would, hopefully, play in Europe the same role as the American Physical Society in America.

Where do we stand now?

We certainly have had lean years all through the 70's, with many people and some physicists denying the use of physics, and even equating physics to pollution, industrial overgrowth or nuclear weapons, while other prominent physicists have announced that whole sectors of physics were dying fast. There was also a major scare in the early seventies about the employment of physicists. And finally, in most countries, financial support swung away from fundamental research and especially physics and chemistry: in my own country, support for experiments in physics dropped by 50% in five years in the late seventies.

But physics seems to have survived with flying colours. Its internal dynamism is undiminished, with new results, new ideas, new problems in all sectors: from quarks to collective modes in heavy nuclei; from controlled chemical reactions between atomic beams to surface reactivity; from wave propagation in disordered media to convection and turbulence; from semiconductive lattices to polymer kinetics, membranes, micelles... Physicists seem to have a keener interest in other sectors of physics or in other scientific fields, and indeed they interact more strongly than ever with mathematicians, engineers, chemists and other researchers in the earth, life or space sciences, in both their usual laboratories and around large installations such as high flux reactors or synchrotron radiation sources.

In my country as, I believe, in many others, the contact between university and industry or organizers of applied research is being renewed and is better appreciated on both sides. This is true, not only in the obvious sectors such as micro- or opto-electronics, aeronautics and energy, but in the more classical subjects, often centred on materials. This leads to a renewed influx of young physicists in industry.

What can EPS do in this context?

First, we must obviously help stimulate *excellence* in research. With a tradition of original work and ideas in physics and with a sizeable volume of effort, there is no reason for Europe not to play its full role, as indeed it has done in a number of sectors during the past decades. A struggle for excellence does not mean necessarily to be "in" all the latest fashions, but rather to create some. It does not exclude systematic effort as a basis for new advances, but it means an ambition to play sometimes the leading role. This is indeed the only way to justify the large amount of support that physics enjoys in Europe.

With its limited means, this is surely where EPS has its main responsibility and can have its biggest impact. Indeed EPS is now successful in organizing fairly large meetings and in getting their abstracts published in the *Europhysics Conference Abstracts* series. But Divisions should use all their scientific competence to keep a real originality of topics and lecturers. European Topical Conferences should be promoted, with perhaps an emphasis on intersectorial or applied subjects. More advice could be given on the many summer or winter schools organized in Europe, both east and west. The unending effort to promote scientific publications with real quality and substance should go on, with hopefully some progress made in regard to Letters. New prizes should probably be set up, similar to the Hewlett-Packard Europhysics Prize, if only to induce our scientific community to reflect on the originality and importance of its activity. The really good coverage of lively scientific topics made by *Europhysics News* should continue with the same quality. The journal might also be a forum for the scientific policies which, in our various countries, provide some of the necessary props for excellence: the level of material support to the laboratories, and the ways that scientific selection is made;

*** Professor Jacques Friedel was elected President of the European Physical Society by Council at its meeting on 1/2 April, 1981.**

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how to plan and use to the best advantage large equipment? also how to provide the minimal necessary influx of young physicists, to avoid missing a generation of potential physicists, and creating a generation gap? how to keep the enthusiasm and efficiency of the many physicists recruited in the sixties?

Another top priority is to help marry physics with *Society*. We should favour contacts of physics with other branches of science: why for instance has the division on biophysics and physics in medicine, discussed at York, never materialized? We should worry how physics teachers are trained and kept in contact with our evolving science and technology. We should explore employment outside the universities for young and older physicists. We should keep the gates fully open between fundamental and applied research, between university, major organisms of research and industry, small and large.

For the universities, this implies a new look at training — quantity and quality, the flux and ages of PhD's, interest in questions arising from industry or injection into industry of various knowledge and skills. For industry, this means a will to develop contacts with the universities and extract a maximum advantage in stimulation and — sometimes — collaboration. EPS has here taken some steps in the right direction, despite the difficulties due to the splitting of Europe into different nations and economic systems. The action should be encouraged, not only by a support of ACAPPI and the Physics and Society Committees, but, for instance, by having more industrialists in our Council, taking more advice from our Associate members, fostering contacts on a European scale of various national societies of applied science.

Finally we must care for *good relations* within Europe as well as with the rest of the world.

Within Europe, there are obvious and very real problems between east and west, which can be overcome only by a constant effort of mutual understanding and respect, although we must acknowledge that they could become intractable as a result of an international crisis. Some Secretariat activity in say Budapest might lead to a more balanced activity. There are also subtle but serious differences between north and south. Some effort should be made to help countries where physics is not a top priority to make it better known and, perhaps, better taught.

UNESCO and the ICTP in Trieste, the national physical societies, large scientific museums, large research institutes could be asked to help, in developing say, summer schools adapted for physics teachers, TV programmes or travelling physics exhibitions, cutting across national borders. Major progress towards the unity and effectiveness of EPS would come from the granting of financial support to enable members of committees to attend meetings.

But Europe must also look outside its boundaries. A first step towards APS should be followed by others towards countries such as Japan or Australia. An exchange scheme for young post-doctorates outside Europe could possibly be pushed through for developing countries, together with the European Science Foundation.

In these activities, EPS should keep in mind two considerations:

— EPS is not alone in Europe. When it was created, there were many national physical societies, which are now all members of EPS. I do not think that this major difference with APS should be considered in any way as a weakness of EPS. It is a source of richness and possibly strength for physics in Europe. Indeed, the creation of EPS has stimulated the national societies, and such questions as regional implantation, budgets, creation of research posts, teaching of physics and jobs for physicists can mainly be fought for and implemented at the national level — for the present at least. What EPS can do in these fields is to help and create a common will and common attitudes, while the more active the national societies are in these areas, the healthier will physics be in Europe.

— EPS is fundamentally short of money. It cannot ask too much from its members, who themselves have limited means, but it has to make ends meet and therefore it cannot, at the present, launch any new commitment that would involve expense. Indeed our budget has been in deficit for several years, and we just cannot go on in this way. If we want to have an effective action, we cannot restrict our commitments any more. But the time seems ripe for a renewed determination to help ourselves. We must, each of us, try and attract new individual members, as our retiring President has done so effectively. We must attract new associate members: organisms such as Nordita, CNRS, SERC and their eastern counterparts should be brought in. But lasting success requires that our supporters keep their interest: our future is in our own hands.

The Quantum Hall Effect

K. von Klitzing, Munich

(Technical University)

1982 Hewlett-Packard Prize Winner

When Hall effect measurements are reported, sensational results are not as a rule expected. Normally the effect is used to measure the concentration of free electrons in semiconductors and uncertainties of about 10% are typical in such experiments.

The peculiarity of the *quantum Hall effect* is that it is highly reproducible and the values measured are independent of any experimental parameter. Measurements in Germany, Japan, USA, and Switzerland on different materials and different samples, with different geometries, yield data which are identical within the experimental uncertainty of 10^{-6}. It seems that the result depends exclusively on the fundamental constants h (Planck's constant) and e (elementary charge). At present all experimental results and theoretical investigations indicate that on the basis of the quantum Hall effect, a resistor can be fabricated with a fixed resistance value of: $h/e^2 \cong 25812.8\ \Omega$ (or an integer part of this).

As the electrical unit ohm can be established with an uncertainty of 10^{-7} on the basis of the definitions of the mechanical and electrical units kilogram, metre, second, and ampere (SI units), the quantum

Fig. 1 — The former President of EPS, Professor A.R. Mackintosh presenting the 1982 Hewlett-Packard prize to Professor K. von Klitzing (right). Looking on are (left) Mr. J.L. Doyle, Vice-President, Research and Development, of Hewlett-Packard, (centre) Sir Sam Edwards, Chairman of the Prize Committee and (largely hidden) Professor J. Devreese, Chairman of the Condensed Matter Division. The presentation was made during the 2nd CMD General Conference in Manchester.