Importance of Innovation Highlighted

The Europhysics Study Conference *University-Industry Collaboration in Research: Enhancing Synergies* highlighted the need to improve industrial innovation by enhancing, and maybe even restructuring, industrial cooperation.

Stimulating industrial innovation is seen by H.G. Danielmeyer, presently the member of the Board of Directors at Siemens responsible for external relations, as being the fundamental problem facing industry in the west. It has been addressed recently in a report (see below) by a study group which he chaired. His summary of the Europhysics Study Conference on university-industry collaboration confirmed the importance of some key issues.

Discussions at the meeting made it clear that many structural deficiencies exist. For example, there are not enough incubators where research ideas can be nurtured to industrial significance, and science parks are often ineffective as they tend to stress real-estate aspects. More significantly, few small- and medium-sized companies (representing the fast growing segment of many economies) profit from research carried out in the public sector.

More discussion of the opportunities is needed, and governments may have to impose a top-down strategy to stimulate changes because its influence could be as important as industry's market pull and universities' technology push.

H.G. Danielmeyer speaking during the Europhysics Study Conference on University-Industry Collaboration (Bad Honnef, 29-31 January 1995). Some 40 representatives of industrial companies and university organizations and institutes active in industrially-oriented research participated. They included Directors or senior managers from eight companies who were responsible for links with universities. It is planned to publish the proceedings as a supplement to Europhysics News in the form of a guide. The conference was co-organized by the EPS Action Committees for Physics and Society and for Applied Physics and Physics in Industry, with an organizing committee chaired by H.G. Danielmeyer. The organizers acknowledge the invaluable support provided by the European Commission's Directorate XII.

But much more critical is the profound difference between the industrial and academic/institute cultures: it clearly represents a barrier to innovation. Professor Danielmeyer felt that some of the ideas put forward at the meeting confirmed the importance of creating strategic centres for innovation, that may not necessarily involve a physical site but could resemble "laboratories without walls". Jointly funded and managed by universities and industry, the centres would aim to get scientists and engineers from the two sectors back together again. Such an approach would invariably highlight certain issues such as intellectual property rights. The consensus at the conference on this particular issue was that both sides should declare their property and ideas before entering into a formal collaboration so that there were no recriminations later on. Moreover, universities often misconstrue the value of patents. Patents need to be defended vigorously (which costs money) and they are often traded by industry as part of technology package (something that universities are generally unable to handle). This said, inventors and investors deserve rewards so there are cases where it is sensible for a university to file patents.

Most major companies are now collaborating, often extremely successfully, with university-based research groups. There was a consensus that cooperation must expand and improve. It seems necessary to train scientists on both sides in ways to operate more effective collaborations. There should be plenty of scope for analysis because several different models seem to work. The government-supported university-industry partnerships pioneered by Philips in Holland

Technology in the 21st Century

State and federal government in Germany spends about 25000 MDM each year on research in universities and centres; industry invests some 50000 MDM in product development and process improvement, of which roughly 5000 MDM is for long-term projects of the type sponsored by government. Based on the ratio of 5 to 1 in government to industry spending for research, the country should be able to innovate successfully. But a report* of a study chaired by H.G. Danielmeyer from Siemens and President of the German Physical Society says this is not the case because the two parties have grown apart; one can no longer talk about a joint capacity to innovate. Indeed, concrete proposals are needed for improving collaboration between industry and the government-supported research sector.

Technology Transfer Outmoded

Technology transfer has been seen for almost a generation as a reason to increase the amount of public-sector research. The idea was very simple: one funds a large amount of basic research which "automatically" finds its way into appropriate industrial companies, and eventually into consumer products. This technology transfer model is no longer valid because:

- the timescales to transfer research results have become much longer than product cycles;
- technology has penetrated deep into most industrial areas, so requirements are reduced and what is needed is available around the world;
- industrialising countries can now meet their own research and development requirements;
- the value of a product today lies less in its technical features but more in the service it offers;
- small- and medium-sized companies do not profit from technology push.

The outcome is that government institutes have evolved into becoming independent suppliers of research and technology. This isolation can only be overcome by creating a framework whereby industry and universities are integrated as partners in an innovation process. Specific topics are also needed and to identify these the study group asked expert panels to examine seven, strongly growing areas of direct interest to the electrical and electronic industries, namely communications, education, traffic, health, environment, construction, and security. Out of this came six priority areas (new materials, sensors/actuators, micro-/opto-electronics, electo-optics/electromechanical devices, energy systems, information technology).

Innovation Projects

The study argued that priority topics for innovation within these areas should not be selected in terms of the traditional model of basic research leading to applied research and eventually development because the chain is easily broken. It is better to differentiate on the basis of whether a topic tends to be systems orientated or driven technologically. The former (*e.g.*, infrastructure for traffic control and energy) is market-driven and a system integrator has the task of assembling agreed contributions, including those from research. Science-driven topics (*e.g.*, new materials) are essentially technology-driven and here there must be a close auditing of research results. The report classified some 200 topics for innovation accordingly. For example, sensors for navigation are system-driven whereas biosensors are technology-driven (with other types of sensors falling in between).

To implement the innovation projects, the report called for a stronger role by government in assigning resources, joint preparation by industry and the government sector, and the discarding once and for all of the views that the best research is carried out independently of application and that public-sector institutes cannot be entrusted with innovation projects. One also needs centralised coordination, an exchange of staff between the partners, and comparable working conditions regardless of whether someone comes from industry or the public sector. More fundamentally, an innovation culture needs to be created, with an education system to match.

* Technologien im 21. Jahrhundert: Aktionspapier zur Innovationsförderung (Zentralverband Elektrotechnik-und Elektronikindustrie e.V., August 1994).

have attracted considerable attention because they are strongly focussed. Warwick University, on the other hand, emphasizes collaboration on an equal basis at its industrially-funded Advanced Technology Centre, where the staff work in more-or-less the same fashion, and with the same rewards, as their counterparts in industry.

From the many discussions at the meeting one concluded that physicists are at least as well placed as engineers to adopt the innovation culture the German report seeks. This is because they tend to have a broader perspective and training. However, physicists also need to learn about the new culture. So it is not surprising that some participants repeated the report's recommendations to reconsider physics curicula and to encourage further training at every stage of a physicist's career.

1996 EQEC/CLEO-Europe

Hamburg, 8-13 September 1996

Following the success of the first joint *European Quantum Electronics Conference/ Conference on Lasers and Electro-Optics* — Europe held in Amsterdam last summer, the partners in the venture — the EPS Quantum Electronics and Optics Division, the Lasers and Electro-Optics Society (LEOS) of IEEE and the Optical Society of America (OSA) — have decided to hold the next event in Hamburg at the Congress Centre on 8-13 September 1996. As before, there will be parallel EQEC and CLEO technical sessions organized by the EPS Division and by LEOS/OSA, respectively. The industrial exhibition, which in Amsterdam attracted over 200 companies, will take place on the same site as the conference.

Measures Needed to Promote University Participation in Large Experiments

Particle colliders are located in a few large laboratories, and physicists from all over the world make use of them by participating in large international collaborations that construct and run experiments. This procedure has worked very well up to now and has provided both laboratories and university groups with major scientific and technological challenges that have been tackled successfully. However, there is a danger that the situation will change since the size of the detector components which are now needed is such that construction by a university group could be inconvenient or uneconomic. The activities of university groups may then become limited and unattractive for graduate students. Furthermore, it would be very difficult to defend the importance of particle physics in front of colleagues from other fields who perform a large amount of experimental work at home institutions, and hence benefit from the possibility of technological spin-off. The attraction of the field, at the university level, to technically oriented scientists would be diminished, which could lead to an elitism in the large laboratories where major accelerators are located.

The following suggestions could help in keeping a healthy situation in universities:

– Members of university teams should be strongly represented in the leadership and management of large collaborations so that the views of outside institutions are taken account.

– Appropriate communication between all institutions involved in a experiment should be facilitated *via* the widespread use of video-conferencing.

– Every effort should be made by the large collaborations, and by the management of the central laboratories where experiments take place, to facilitate a coherent contribution from the home institutions. Home institutions, or a group within an institution, should be encouraged to take on entire projects or well-defined parts of a project. These mini-collaborations should have the full scientific and financial responsibility for their execution, with the central laboratories retaining a co-ordinating role. Home institutions could then play a full scientific role, benefiting from a variety of tasks and a large degree of autonomy in managing projects.

– Future experiments require a large and expensive infrastructure that is not an active part of the measuring devices. However, the magnets, structural materials, computer networks, *etc.* that will amount to a large fraction of the cost of an experiment are usually considered under the heading of a "Common Fund". Every reasonable effort should be made to keep the contribution of home institutions to such a fund at a reasonable proportion of the construction budget (as was done for the four large LEP experiments at CERN). Contributions in kind should be considered as part of the contribution, subject to the agreement of funding agencies.

Göran Jarlskog, *Chairman, EPS High-Energy and Particle Physics Board*

Physics Studies for Tomorrow's Europe

A conference entitled *Physics Studies for Tomorrow's Europe* sponsored by the EPS Mobility Committee of the European Mobility Scheme for Physics Students and by the University Teaching Section of the EPS Interdivisional Group on Physics Education will be held in the Aula complex of the University of Ghent, Voldersstraat 9, Ghent. on 7-8 April 1995. The meeting is being organized on behalf of the European Commission's Task Force on Human Resources, Education, Training, and Youth in preparation for the SOCRATES Programme. It stems from an initiative by the University of Ghent and the Commission and is being supported by the ERASMUS and TEMPUS programmes.

The conference aims to outline how physics studies and training should be organized in tomorrow's Europe. National reports by members of a scientific committee will be the basis for discussing: national curicula in physics; new requirements for future physics curicula; and implementing changes using exchange, cooperation and mobility.

Overview presentations entitled *Present trends in university physics education in Europe* (P. Brussaard, Utrecht), *Suggestions for future directions* (R.A. Ricci, INFN Legnaro), and *The European Union policy on higher education* (I.V. Mitchell, EC) will be accompanied by a panel discussion on *New needs in physics training* chaired by J.C. Lehmann (Saint Gobain), with contributions by representatives from government (J.E. Reilly, ERASMUS Student Grants Council), industry (F. Schneider, Daimler-Benz Research), universities (C.M. Ferreira, Technical University of Lisbon), university administration (M. Goffart, Dienst Internationale Betrekkingen), and students (M. van de Poel, Copenhagen)

There is no conference fee and copies of the national reports and the proceedings will be provided free of charge. For information, please contact: Mrs. B. Desmedt, Ghent University, Proeftuinstraat 86, B-9000 Ghent. Tel.: +32-9-264 65 39; fax: +32-9-264 66 99; e-mail: physteu @ rug.ac.be. A detailed announcement about the conference has been made available on the World-Wide Web at http://ipne.pne.ulg.ac.be/.