Introducing Grants is the Main Achievement

The locations of Poland's main universities and physics research institutes.

It is just over three years since a new body responsible for research in Poland was born. Called the Committee for Scientific Research (KBN under its Polish acronym), it evolved from an advisory committee of the Prime Minister set up in 1989 and its main goal has been to introduce a peer-reviewed grading of research institutions. Aside from the research grants system there have been other reform projects in science, notably those affecting university autonomy, the Polish Academy of Sciences (PAS) where staff levels have been reduced by one-quarter, the regulation of scientific degrees, and a shake-out of industry labs whose staff was reduced by something like a factor of 10. These will not be discussed as the issues are fairly specialized, the outcome local, and the impact on the international physics community indirect.

The background to physics in Poland is well known and without being too dogmatic, governments in the communist period were pro-science but constrained ideologically, highly centralized, imitative of Soviet models, and favouring political purity. There were many excellent scientists but relatively few centres of excellence, especially in the universities. The priority was seen to be the need to change to a competitive system of individual and targeted grants from a planned structure with a hierarchic redistribution of R&D funds, where over 85% went to huge industrial institutes and state-owned factories employing 100000 scientists (by comparison, university-level institutions employed 30000 academics). Regarding physics, Jozef Spalek of the Institute of Physics, Jagiellonian University, Cracow, who chairs the EPS East-West Coordination Committee, notes on page 54 that the absence of strict selection standards based on merit, combined with large projects designed to protect large sectorial institutes, inhibited research and teaching by discouraging diversity in multidisciplinary border areas such as biophysics. Moreover, artificial separations had developed since in common with most other former Soviet-bloc countries, the Academy was made responsible for basic research, industrial institutes for applied work and the universities for higher education.

Support the Best

Witold Karczewski, the KBN Chairman, wrote in *Society – Science – Government* (KBN, 1992; Ed.: A. Kukliński) that the Committee decided to support the best people and the best institutions both in basic and applied science, but that the "criterion of usefulness" of the latter was absent, mainly because industry had to fight for survival rather than for development. His remarks are still valid because the recently elected government, which enjoys strong support from the large agricultural sector that is conservative and socialistic at heart, does not have a coherent strategy of economic development within which to set scientific objectives. Observers comment that the KBN's main achievement has been an improved recognition of the importance of intellectual potential to transform the country, which translated into improved funding for science in 1992 and constant funding in 1993 (with the new government the situation for 1994 is unclear as a budget has not been finalised).

Briefly, the KBN is composed of 58 members with two-thirds elected by the scientific community and one-third appointed by the government. There are two commissions (for basic and applied research) and two physicists are members at present and several are among the fifteen candidates for new elections to the maths, physics and astronomy sub-commission or Group. In being responsible for science policy, the KBN outlines the main trends for scientific research, participates in the preparation of the budget, defines funding criteria, and allocates funds. It took over from the abolished Central Fund for Science and Technology that mainly based funding decisions on proportional distribution established in preceding years without reference to scientific standards. To minimize damaging institutes with the introduction of a competitive system, the KBN decided to directly finance, at least for a transition period, the basic cost for an institute to perform its "statutory" tasks. The aim is that these funds will become permanent, but not the most important source for statutory activity, for those institutions whose work is considered necessary. The scope of statutory financing is not clear-cut, but it is related to an institution's grading and ensures some flexibility in funding decisions. Difficulties arose in defining the basic organizational structures to which funds should be sent for research in university-level institutions where a traditional unit such as a faculty may have good and bad components (the solution was to identify a homogeneous, lower-level unit).

The Committee faced a formidable task in late-1991 when it set about preparing the first budget (for 1992) since there were some 400 institutes, either sectorial R&D institutes attached to ministries or institutes belonging to the PAS, and more than 800 basic organizational units in university-ranked institutions. Faced with a decrease in real terms of 60% in the first quarter's provisional budget allocation, it was decided to assigned statutory funding non-proportionally based on international criteria of excellence in fundamental science.

Shock waves were felt everywhere, with some institutions ranked "A" (where work is deemed absolutely necessary for the advance of science and conditions should be created to develop the best scientific teams) estimating their financial needs to be 2-3 times the allocated statutory funding.

Statutory financing is of course not the whole story for together with salaries and maintenance costs in university-level institutions covered by the Ministry for National Education, it does not include investment costs, bilateral scientific agreements, training, and research associated with teaching. The KBN also funds the so-called "statutory own research" carried out by universities, and covers specific items such as restructuring, special research instruments and the costs of non-scientific activities that are considered to be necessary state services but which were not included in Ministry budgets (*e.g.*, meteorology).

The First Year

The final budget (Table 1) for 1992 was in fact twice the first-quarter allocations (or almost 2.5 times if all expenditures are included), so while only half the needs were covered the situation was not as grim as it might have been. The first call for proposals for 1991 saw 1400 applications for research in physics (50% in condensed matter) of which 240 received support. Unlike some disciplines, peer review in physics was clearly stringent. Overall, KBN's 1992 funding involved 856 institutions, mainly of university rank (63%) followed by R&D centres attached to ministries (28%) and PAS institutes (9%). The KBN contributed to 38% of the universities own statutory research (918000 MPZL in 1992) organized by the Main Council for Higher Education and the Ministry for National Education which receives the KBN funds

Table 1 — KBN allocations for 1992 [2]

	KBN grants			% scientists
	MPZL	%	no. instns.	
Statutory activity				
· Academy institutes	653 250	24	82	10
· Ministry R&D centres	1329 500	48	239	20
· Organizational units in University ranked institutions	791 000	28	537	70
Own research in				
· University ranked institutions	350 000			
Specific activities	459 000			

for redistribution. The percentage involved was relatively large because little research funding of a statutory nature had been assigned in the past to universities. Units in university-level institutions who receive KBN grants currently pay about 25% to their institutions for overheads.

KBN grants to units in 1992 covered some 12% of the statutory activity in the Academy's institutes and ministry R&D centres — a relatively small percentage. The importance of units obtaining grants has increased owing to inflation, for without them their parent institutions would not be viable. For instance, grants to units at the top-ranked PAS Institute of Physics now support 50% of the Institute's activity as opposed to only 10% in 1992. Direct funding is also available from other sources and nuclear and particle physics, for example, receives extra funds *via* the National Atomic Energy Agency (NAEA) from the Ministry of Economic Affairs. A past emphasis on nuclear research means that there are many nuclear physicists, with estimates ranging from 400 working in the universities and maybe twice as many in various institutes to 40% in universities with 1.5 times this percentage in research institutes (there are 4000-4500 physicists working in research and the universities – see Table 2). Professor Lukasz Turski, the Director of the PAS Centre for Theoretical Physics in Warsaw, refers to the recent closure of the country's last nuclear reactor as a "disaster" but it should not be mixed up with "overblown" activities in nuclear and particle physics. Promoting what Professor Marian Grynberg, the Vice-President of the Foundation for Polish Science and Head of the Solid-State Physics Division in Warsaw University's Institute of Physics, refers to as a "better balance" has prompted the Foundation to invest in strategic equipment. This includes 6.3 MECU over two years for a 4.5 MECU molecular beam epitaxy facility being set up at the PAS Institute of Physics in Warsaw, and funds to purchase molecular biology equipment. The Foundation distributes each year about 11 MECU, the finance coming from residual government funds for capitalising industry and from the European Union's PHARE Programme for restructuring the economy.

Professor Jerzy Niewodniczański, the NAEA's President and the previous Dean of the recently constituted Faculty of Physics and Nuclear Techniques in Cracow's Stanislaw Staszic University of Technology, stresses that the Agency has reduced its staff to less than one-half and spun-off some applied units, while at the same time consolidating work at DESY in Hamburg and Poland's rôle as a CERN member.

Professor Lukasz Turski.

Table 2 — Physicists in Poland (1992/3; estimated)

total number		school teaching		universities & research	
12000-14500		8000-10000 ≈ 80%		4000-4500 ≈ 20 %	
no. in research	univ.	research institutes PAS	NAEA	ministry R&D centres	industry
4000-4500	2500 60%	1000 20-25%	500 10-12%	200 ≈ 5%	<100 ≈ 2%

PAS: Polish Academy of Sciences; NAEA: National Atomic Energy Agency

Consolidation in 1992 and 1993

"Survival of the fittest" continued in 1992/3 with institutions ranked "A+" received statutory funding in 1993 for principle activities that was based on the 1992 grant compensated for inflation (28% in 1993) plus an extra 3-5%. Those ranked "A" did not receive the prime, "B" and "C"-ranked institutions less than the inflation rate, and "D"-ranked nothing at all (although their units might be successful in obtaining individual or own-research grants). The number of individual grants in physics decreased in 1992 and 1993 as 60-65% of the roughly 270 grants in 1991 were for 30-36 months. Something like 100 grants were awarded in 1992 for an average of about ECU 15000 (compared with ECU 30000 for 1991). The two application rounds in 1993 resulted in some 80 individual grants in physics from 245 applications. Theory groups typically receive ECU 7200 pa and experimental groups in the "small sciences" some 2.5 times this sum.

Grants for 1994 will be announced shortly at which point one will have a clear picture of the funding situation as major projects start to be refunded.

Looking Forward

Professor Andrzej Hrynkiewicz, Head of the Division of Nuclear Spectroscopy at the National Atomic Energy Agency's Institute for Physics in Cracow, Professor at the Institute of Physics, Jagiellonian University, Cracow, and a Member of KBN, says that the plan is to increase the percentage of KBN funding for competitive grants to units only slightly (from 15-20% of total funds to about 20%) to allow more opportunities for equipment purchases. The bulk of funds will therefore continue to involve statutory grants to institutions. He says the problem for the future is to identify criteria for evaluating applied science in the absence of clear-cut industrial needs. There are many applied groups which developed when applied work often camouflaged basic research in order to obtain extra funds. But a change in mentality is also needed on the fundamental side because some groups working in basic science do not want to tackle what they consider to be trivial industrial problems at a time when technology-based industry is in such poor shape. Eventually, however, industry will develop and it is research's interest that it should.

On targeting research, Professor Hrynkiewicz described special programmes or strategic grants, which up to now mainly involved the international collaborations such as participation in DESY and CERN. They have recently been extended to include KBN's "organized grants". Hence, Warsaw's Institute of Physics of the PAS has been awarded 1.8 MECU for low-dimensional structures in conjunction with the new MBE facility.

Professor Jerzy Niewodniczański.

Meanwhile, the NAEA's Institute of Nuclear Physics in Cracow is proposing to develop a range of radiation detectors, and the PAS's High-Pressure Research Centre in Warsaw will shortly lead a 1.8 MECU project on nitrides synthesized at high pressures (the Centre's speciality) for wide band-gap applications.

The projects are seen as appropriate for the transition period while industry is weak and not as a resurgence of old camouflages; they are selected on the basis of scientific excellence linked to industry, specifically in the words of Professor Henryk Szymczak, the Director of the Warsaw's Institute of Physics of the PAS, to "a critical mass of scientists associated with existing industry". Some of the sectorial institutes are providing the link to industry if an institute such as a the High Pressure Research Centre cannot provide its own commercial infrastructure. The largest involving physics is Warsaw's Institute of Electronic Technology (86 staff) belonging to the Ministry of Industry and Trade. Apart from four atomic agency institutes, it is one of four ministry institutes listed by the Polish Physical Society's *Directory Physics Research in Poland 1992/3* as having a significant physics component (the others concern applied optics, electronic materials technology, and plasmas and laser microsynthesis). Professor Maciej Bugajski, the Institute's Director, points out that while ministry institutes "have suffered a lot" their

Professor Andrzej Hrynkiewicz.

Professor Maciej Bugajski, on the left, with Professor Henryk Szymczak.

links to government-owned industry remain strong. By producing integrated circuits, both as production series and prototypes, his lab is able to function with only 60% of statutory support from its ministry whereas most need about 80%. But such considerations are hopefully only for the short term and in trying to plan for the long-term, he feels that the "right way" is for the ministry labs to become national labs and for institutes and universities to broaden activities to encompass product development. He points out that a KBN mechanism involving matching contract funds with grants in fact already exists to promote this type of broadening.

Readjusting Rôles

The government appears to share Professors Hrynkiewicz and Bugajski's view that the best approach is to maintain today's scientific capacity in the long-term interest. Both agree that such thinking will determine the status and fate of research in the R&D centres attached to the ministries. While the creation of national laboratories has been discussed in government it has not gone further — perhaps because there are more urgent issues.

The Academy institutes are moving towards the universities by creating undergraduate "non-public colleges" (see insert) since PAS staff feel strongly that they have a duty to teach to remain creative scientists. Profiting from a small inertia, the keyword is interdisciplinarity although to be fair the universities have started moving in the same direction. For instance, Warsaw University combined faculties to create a year or so ago a School of Science that offers personal tutors — a new feature for Poland — and the Jagiellonian University is reviving the school system under its original title of *Collegium*. As far as physics is concerned, the universities reaction to the colleges is ambiguous, perhaps because their undergraduate intakes have shown strong fluctuations and variations so it is difficult to judge needs and the likely response from prospective students. In contrast to the situation at technical universities, applications dropped markedly at most classical universities several years ago as students felt they could look forward "only to either a Nobel Prize or nothing". Entry requirements and curricula have since been modified and entries are tending to increase in line with unemployment. But to complicate matters, enrollment at some universities have dropped by 50% whereas Warsaw University has seen its physics intake increase from a low point of about 100 in 1990/1 to 414 in 1992/3 and 363 in 1993/4, with a similar number expected for 1994/5.

The Institute of Physics of the Polish Academy of Sciences, Warsaw.

Many academics appreciate that the PAS institutes have a long and prestigous record in basic research. Professor Grynberg acknowledges that they "do good work" and he believes that a "third solution" must be found involving an "adiabatic fusion" of interests. In the case of physics, he feels difficulties cannot be so large given that only 7% of scientists doing physics work in the Academy institutes as opposed to 87% in the universities. While the universities' weight is probably overestimated (Table 2), he nonetheless places the onus on them as some "hard discussion" is needed. Professor Turski implies difficulties may be more deep-rooted since "the education system has not yet been truely overhauled".

Encouraging Graduates

As pointed out by Professor Spalek on page 54, roughly 20% — a low percentage by west European standards — of each year's 600 master degrees in physics carry

Non-public Colleges Offer Undergraduate Courses

A recent softening of entry requirements in Poland meant that 140000 qualified young people applied to enter universities in 1992/3 but only 65000 were accepted for the 5-year master's degree. Faced with this demand, the first-year intake was raised to 80000 resulting in some courses becoming heavily overcrowded. But the steeply rising trend cannot continue for long as it strains both the universities and the country's scarce resources. A new initiative to increase the number of openings involves "non-public colleges" including one in science (there are also colleges in medicine, law, *etc.*) created by staff members of institutes of the Polish Academy of Sciences (PAS). They felt that the Academy had the flexibility and resources to provide the modern, interdisciplinary educational background that young people need in a transforming economy.

Professor Jan Mostowski (shown in the photograph) of the Centre for Theoretical Physics of the PAS in Warsaw is the Rector of the non-public *College of Science*. Supported by six PAS institutes and by the Institute of Electronic Technology attached to the Ministry of Industry and Trade, it rents equipment from universities. He explained that it is formally separated from the Academy, being owned by the private Stanislaw Ulam Foundation set up by several of the Academy's scientists in 1992. The College is in a sense modelled on the prestigious physical-technical university institutes attached to some of the institutes of the Russian Academy of Sciences [see *Unique Russian Training Scheme at Risk*; *EN* **23** (1992) 71]. Teaching started last autumn with interdisciplinary studies along the lines offered since 1992 by several faculties of the University of Warsaw. The 21 first-year students will choose courses in physics, chemistry, maths, computer science, and management for the first two years and then specialize in the third year.

Academy staff used to be restricted by law to teaching at the postgraduate level (many institutes have well-established postgraduate programmes) but the government changed regulations in March 1993 to allow the College to offer the three-year bachelor's degree. The students pay fees of about ECU 900 *pa*, roughly 2-4 times the monthly salary of a university professor; lecturers receive some payment, but nothing exceptional in view of the considerable time and energy injected. The College has applied for full recognition to teach the 5-year master's degree and Professor Mostowski is confident that it will eventually be granted. Observers from outside tend to argue that professional scientists in institutes with excellent research records should perhaps focus on research; the scientists themselves say, however, that they have a "duty to teach" as benefits pass both ways: the interaction with students sharpens a scientist's skills while students can access precious facilities, a modern research environment, and links to industry.

The *College of Science* will take in up to about 30 students next year. Longer-term, the various colleges could fuse to form the nucleus of a new university and go fully public if regulations governing the Academy institutes change. Pressure for this evolution arises because Warsaw University, the country's largest, only has plans under study for grouping 23 faculties, but no firm site for a modern campus to replace its scattered buildings. Meanwhile, other major universities are implementing long-established plans (Poznań University, for instance, has already partly moved to a new campus and construction of what is intended to be Jagellonian University's "Campus 2000" project on former military land in Cracow started recently).

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