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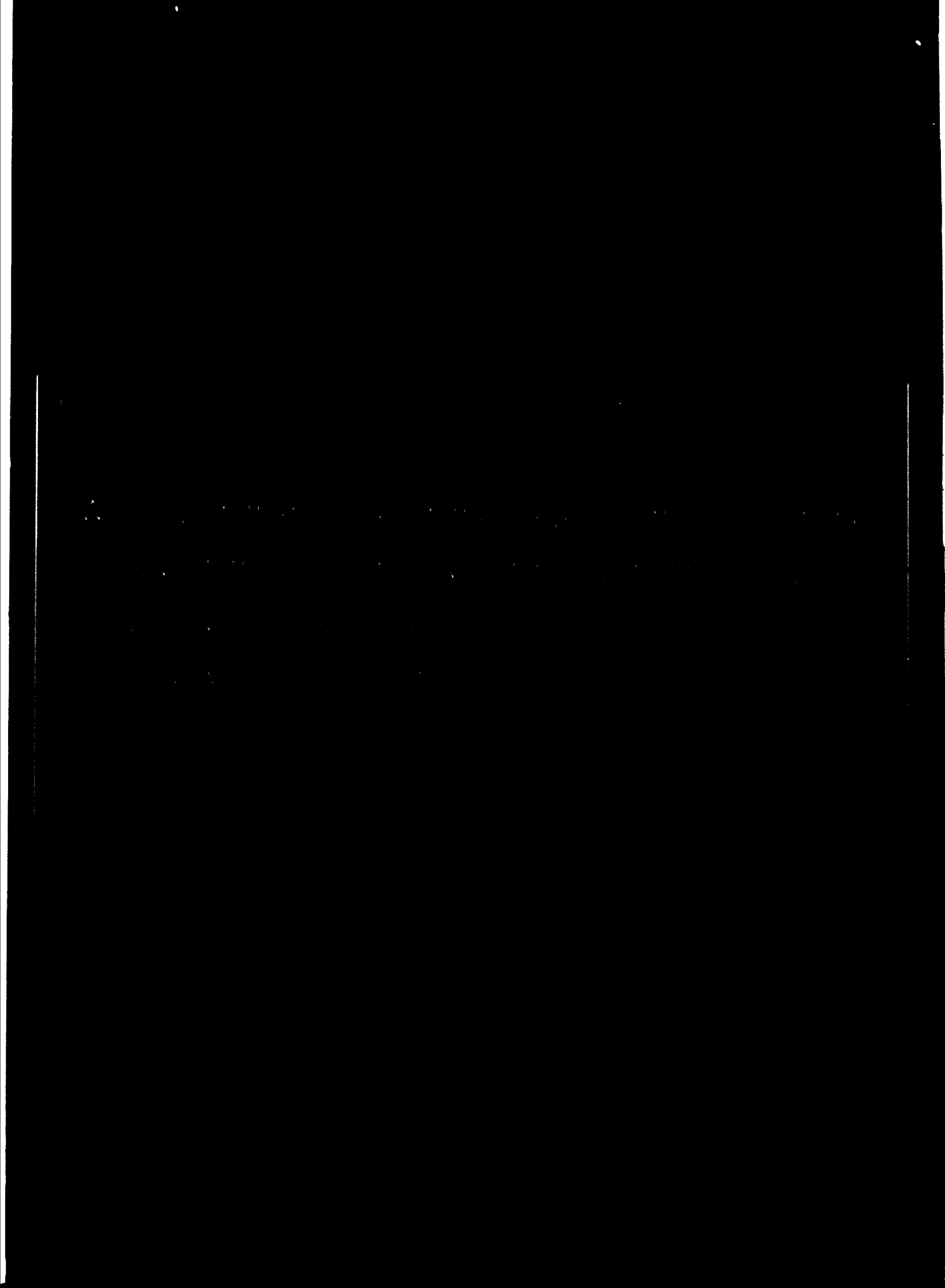
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Ad Hoc Expert Group Meeting on Co-operation among
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Co-operation

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CO-OPERATION AMONG UNIVERSITIES, INDUSTRIAL RESEARCH ORGANIZATIONS AND
INDUSTRIES WITH SPECIAL REFERENCE TO THE HUNGARIAN EXPERIENCE ✓

by

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Examining the co-operation between the universities and the industry the starting point is the fact that the university in the Hungarian practice is fundamentally an educational institution. At the same time their accumulated mental capital, the broad scientific spectrum of the universities of several faculties and their organizational flexibility qualify the universities for carrying out research and consultory tasks. In this way the educational and research work form an organic unity. This is the precondition of a high level modern educational work of high social efficiency. On the one hand this fact guarantees the continuous increase of the practical industrial training of the staff and indirectly the appearance of practical problems in the curriculum. On the other hand it enables the students to take part in the solution of practical tasks originating from the industrial production. This is a way to decrease the distance between the general requirements of the university and the special ones of the industrial practice.

1. Industry oriented post-graduate courses and extension training

Two different types of higher level technical educational institutions exist in Hungary: technical universities and technical colleges. The three technical Universities: the Technical University of Budapest (BTU), the Heavy Industry Technical University of Miskolc and the Chemical Industrial University of Veszprém instruct "certificated engineers". The technical colleges instruct "works engineers". The period of instruction is usually 5 or respectively 4 years.

The organized training possibilities after the graduation at technical universities are the following:

- scientific scholarship at the universities,
- engineer-specialist education,
- extension training courses,
- "Aspirant" state scholarship.

To explain these lines in detail it seems necessary to give a brief survey of the Hungarian scientific graduation system. The degrees attainable are the following:

- dr. techn. - Doctor's degree granted by the university. The requirements are - Doctor's Thesis and examinations.
- Candidate of Sciences or rep. Doctor of Sciences. These two latter degrees are granted by the National Postgraduate Degree Granting Board working under the control of the Hungarian Academy of Sciences.

The granting is preceded by a process containing the defense of theses and in the case of the Candidate's Degree passing special examinations.

The scientific scholarship supports a two-year research period at the universities to fulfil the requirements of the dr. techn. degree.

The engineer-specialist education is a two-year course (usually two days weekly). The aim is to get either special or interdisciplinary or economic-management oriented competence. Having finished the course the students earn a new(second) diploma and they can obtain the dr. techn. degree during a simplified process.

The courses are organized by the Faculties, the number of participants is between 10 - 30.

The Electrical Engineering Faculty of the BTU have made an attempt at a research engineer special training. The large majority of the participating students work on subjects given by industrial research institutes or enterprises which offer scholarships for this purpose. The work is directed by university staff members and during the two-year period the students attend courses connected to their subject. The diploma-work prepared at the end of the training is reported by the referees as a Doctor's Thesis.

As one can realize this educational form is very near to the post-graduate doctoral training but its essential factor is the close industrial connection.

The extension training courses are organized by the Engineers' Extension Training Institute of the DTU. The long-range concepts of these courses are formed and their programme is supervised by the Engineers' Training Board, a non-administrative social organization obtaining specialists. The courses are of very broad spectrum and a great number of the lecturers are well-known industrial specialists who can expose the up-to-date practical results. The usual period of the courses is in the order of ten to 100 hours. The courses generally do not give any kind of graduation. There exist several exceptions (about 15 per cent) ordered by industrial enterprises or ministries. The participants of these courses have to pass examinations necessary for the work on particular jobs.

The aspirant state scholarship is an organized instruction to prepare the Candidate's Thesis and the examinations. The aspirant works at a scientific workplace (which may be a university or a research institute) for three years under the direction of a staff member of a higher degree. The subject selected by the aspirant should be one from the list issued every year. (Otherwise the Thesis cannot be prepared in this organized way.) The subjects are proposed by consultation with the sectoral ministries, consequently they aim at solving actual tasks.

The aspirant state scholarship is the training form which is available for participants from abroad. (It can be completed in a non-Hungarian language as well.) This usually happens on the basis of inter-government agreements on cultural exchange or - more rarely - on private intention. Hungary has cultural exchange agreements with many developing countries on which basis numerous aspirants work and learn at Hungarian universities where they are given all possible help.

As for the training courses for other countries one has to emphasize the role of UNIDO in this kind of co-operation. The BTU have organized in-plant training courses of 10-week periods on the basis of the agreement between the competent Hungarian authorities and UNIDO. The subject of these courses is "Repair and maintenance of medical instruments". The number of participants was 20 in 1972, 16 in 1975 and 15 on the course in process just now. The courses have proved successful and produced great interest. As a consequence similar courses are under preparation on the subjects of water conservancy as well as on the standardization and quality control.

B. Industrial research, design and consultancy activity

To illuminate the research activity of the universities I will briefly summarize on the one hand the proportions of the technical research in the whole research spectrum, on the other hand the technical research system of Hungary.

In Hungary 3.2 per cent of the whole national income is assigned to research purposes. During the last ten years the research costs have increased to about two and a half times more. The rate of their growth exceeds that of the national income and is far higher than the world average. About 2/3 of the research costs is assigned to technical research while about one half of the researchers work on technical fields. The proportions are more or less the same at the university research areas as well.

After the above mentioned extensive development of the research basis the conditions are ripe for an intensive development. The intensive period requires:

- the selection of the subjects,
- the concentration of the material and mental forces of the research on the selected subjects,
- and finally a strong co-operation among the individual research institutions.

To satisfy the three requirements listed above the centralization of the control on the research field is necessary. As a sign of this centralization a long-range scientific research plan of fifteen years period has been elaborated and discussed by every competent administrative and social forum. This long range plan contains national main research lines and specific target programmes. The co-ordinators of these main lines and programmes are designated in the plan as well as their total costs. At the same time the sectoral ministries have worked out their own main research lines and target programmes too.

A new financial support system has been introduced for the research. The new system prefers the projects belonging to the long-range plan and for this reason the projects themselves will be endowed rather than the research places.

In the period of the intensive development considerable increase of the manpower base of research institutes is not possible - but not desirable either. At the same time it seems to be desirable to form a flexible expert group around the research basis which can be drawn into well defined research projects.

On the basis detailed above the university has a double role in the system of the research and development. On the one hand it deals with subjects selected and supported financially by the governing ministry (e.g. Ministry of Education) or the Hungarian Academy of Sciences. On the other hand it can supply the outer expert group of the industrial research institutes and enterprises. This latter activity can be carried out in two ways: through the system of contract-projects or by occasional and temporary exchange of the staff members and researchers. The latter exchange form has only recently been introduced. On the other hand there is a continuous and lively personal contact among the administrative authorities, large

enterprises and universities: the staff members participating in the scientific councils of the industry, and industrial experts as members of the university councils.

Turning now to the DTU as an example: this university is the largest complex research place of our country. Its more than 1500 staff members cover practically the whole area of the technical sciences on seven faculties: Civil Engineering, Mechanical Engineering, Architecture, Chemical Engineering, Electrical Engineering, Traffic Engineering and Water Supplies Management.

The university staff works on slightly more than 200 scientific subjects. About 2/3 of them belong to the projects emphasized by the long-range plan. The best cultivated areas are as follows: research of solid-states, research of bioactive compounds, computer techniques, petroleum chemistry, forming and protection of the human macro- and micro-environment, building technology of complex light structures, research of electronic components, plastic material producing and processing, energy production and transport, food producing agriculture and its machinery, public traffic security, technical mechanics, pharmacology, motor vehicle maintenance, water supplies management. (On the non-technical fields the industrial economy, the philosophy of sciences and the pedagogy are the best cultivated areas.)

About half of the total research costs originates from research contracts. This ratio is higher than the national average and the contract projects mean a very important factor for both the financial policy of the university and the participants whose incomes rise with the research rewards to the same level as that of the industrial engineers.

The contract projects are considered extremely useful in serving the purpose mentioned in the introduction if they are carried out in the frame of long-range agreements for large projects between the university and either ministries (Heavy Industry, Light Industry, Housing and Public Construction, Transport and Communication) or large industrial firms (Oscpel Works, Ganz-MAVAG Works) or research institutes (Central Research Institute for Physics, Research Institute for Plastic Materials).

It would be desirable to do preparatory and exploratory research at the universities in fields which are not directly profitable and therefore not actively cultivated. Later these, too, could prove useful and become starting points of further research work. The support of this kind of work has not yet been solved satisfactorily.

The DTU has direct connection with 23 universities abroad (mostly of socialist countries). The agreements between them plan educational as well as research co-operation. The result of the connections with developing countries is the organization of the Mechanical Engineering Faculty at the Gran Technical University by the experts of the DTU. Its success will be the starting point of similar mental export expectable in the near future. The university is ready to offer its experiences in the training organization with pleasure.

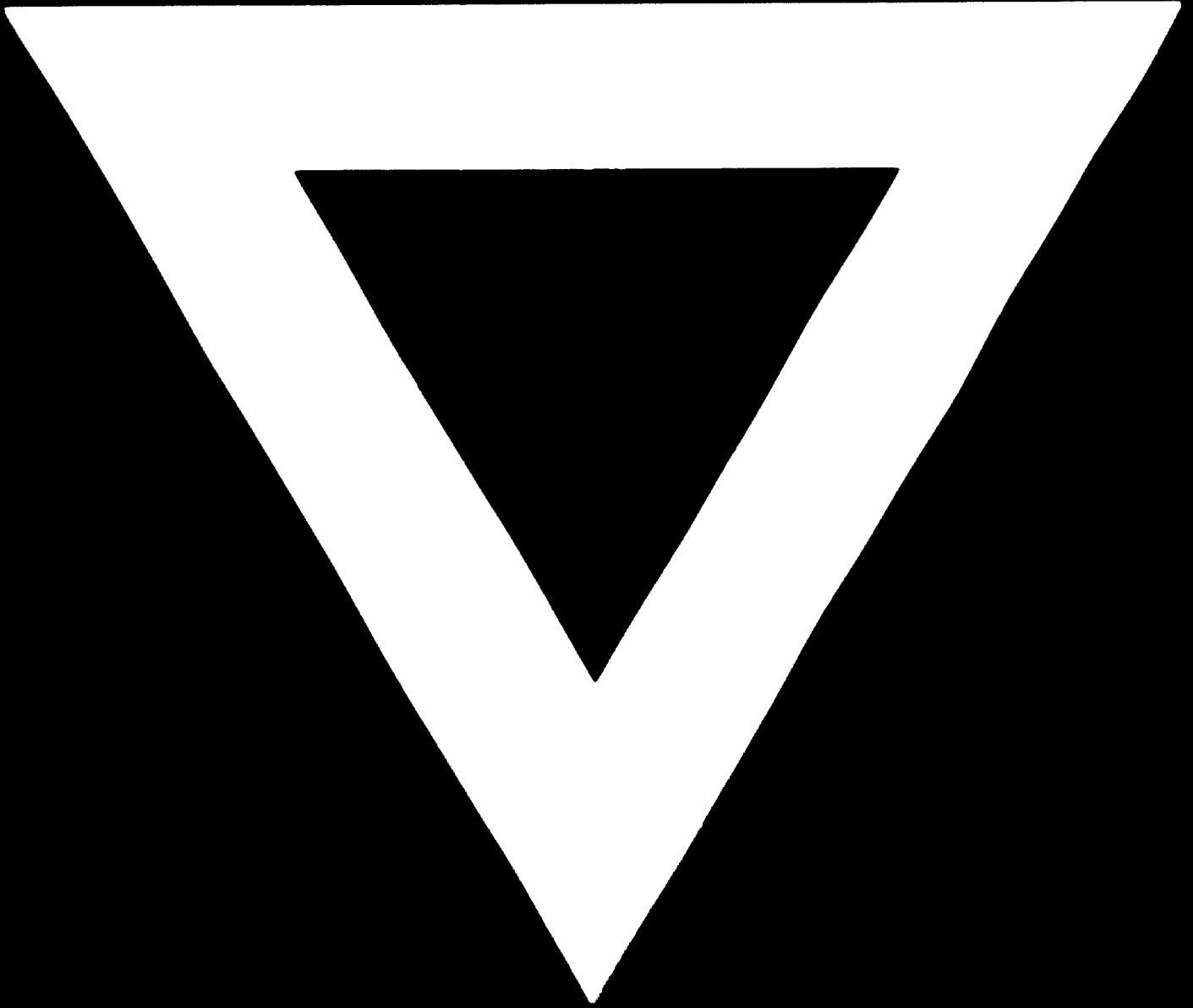
C. The role of the UNIDO

The Hungarian universities - among them the BTU - are ready to help the work of UNIDO either by supplying experts or by providing extension training courses similar to the above mentioned ones. Furthermore they can receive experts, aspirants, scholars either for exchange of experiences or for post-graduate research work.

The present practice in our country is that this kind of co-operative work can be done either on the basis of cultural exchange agreements between the governments or following agreements between the UNIDO and competent Hungarian authorities. The universities are ready to execute the operative details of these agreements with pleasure if they are competent in the field.



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