

A situation and orientation of mining-geological education in the transitive economy of the Czech Republic

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Introduction

The Czech Republic is the country whose evolution has always been connected with an intensive utilization of mineral raw materials. Domestic mineral resources have been mined, according to historical studies, for more than three thousand years. In the Middle Ages, the high level of mining reflected in the formulation of the oldest integrated mining law codex - the Jihlava mining law in 1249 and the Kutné Hory law "Ius regale montanorum" in 1930. Therefore, in 1836 an outstanding expert in the history of our mining Kašpar, the count of Šternberk, could write rightly: "The history of mining is so intimately interconnected with the history of our country that it is not possible to separate them wholly". The history of mining education in the Czech country can boast about two world primacies. The first of them is the foundation of the oldest mining school in Jáchymov in 1716 that represented the first school thus directed with systematic professional teaching. The second means the commencement of a university theoretical teaching of mining sciences at Charles University in 1763 that, in spite of a short period of its existence, was of crucial importance to the next development of mining. In this way the oldest mining academy was formed that was named "Academia metallurgica omnium prima".

From 1989 to 1996 a share of the mining industry in the GDP considerably decreased to 2.2%. Nevertheless even nowadays, full two thirds of our industrial production depend, from the standpoint of value, upon the processing of mineral raw materials being, however, only partly of a home origin. After 1989, in connection with a transition from the centrally planned economy to the market economy some decisive changes occurred that showed themselves in the industry of mineral raw materials. The goal of existing economical transformation is the rebuilding of the Czech Republic into a modern industrial state at respecting all developmental trends of human society.

The presented tendencies significantly represented both in the secondary mining education and pedagogical and research activities of the Faculty of Mining and Geology at VŠB-Technical University of Ostrava. The Faculty, which has its direct root in the Mining Academy in Píbram founded in 1849 and that represents the last element of a complex development of mining education in the Czech countries since the beginning of the first mining state school in Jáchymov in 1716, was directed largely to the complex of mineral raw materials to the eighties. Changes

characterizing the present turbulent environment in the world and especially in transitive economies of our type, manifested themselves in its transformation into a modern multidisciplinary university workplace dealing with not only traditional research-pedagogical fields, but also related and following fields that totally prevail at present - when evaluating from the viewpoint of students' interests.

Basic Tendencies of Economic Development of the Czech Republic and Their Reflections in the Faculty's Development

In addition to common megatrends in the development of human society, such as a steep and territorial very uneven growth of world population with a subsequent immense increase in energy and material demands, deepening economic and social differentiation, a transition from industrial to information society, fundamental changes in technologies to technologies demanding less energy and raw materials considerate to the environment, globalization of all spheres of human activities, a marked change in opinions of coexistence of human society and nature leading to the philosophy of sustainable development, and others that have an impact also on our state, we can define certain tendencies in the economic and social development specific to the Czech Republic.

The economic transformation of the Czech Republic must rest upon several facts, namely:

- the existence of considerably developed metallurgical, mechanical, chemical and processing industries undergoing structural and technological changes;
- the outlasting existence of inefficient productions and excessive energy and material demands of the whole economy that follows from its low efficiency;
- the long-lasting traditions of utilization of its formerly very important mineral base that is and also will be of importance in the fields of energy minerals, building and some nonmetalliferous raw materials;
- a necessity of including into the international trade and especially import of mineral raw materials (primarily energy minerals and fuels),
- a considerable dependence upon the economic development of the outer environment, especially Western Europe.

The economic transformation of the Czech Republic is defined by the democratic legislative system, a decisive change in property rights, the market environment, a change

in the economic structure leading to the prevalence of the service sector and to the damping of uneconomical productions. The economic reform, restructuring of industries and mining can be ranked, in addition to the world-wide trends in development of science and technique, among substantial aspects that have influenced and will determine the prospective intentions of the Faculty, the offer of fields of study and their forms. It is obvious that, with regard to the Faculty's field, basic governmental documents, such as economic, energy, mineral and information policies are necessary to be analyzed and influenced, especially from the standpoint of goals and tools rooted in them.

Pedagogical and Scientific Intentions of the Faculty of Mining and Geology

By 1950 the development of teaching the geological, mining and metallurgical sciences in the framework of the uniform Vysoká škola báská had taken place. In that year the Faculty of Mining and the Faculty of Metallurgy were founded, in 1953 the Faculty of Geology was established. In 1959 the Faculty of Geology together with the specialization of Economics and Mining Organization from the abolished Faculty of Economical Engineering was affiliated to the Faculty of Mining. Thus the field of the Faculty was delimited serving as a basis of its research-pedagogical orientation.

On the 17th November 1989, a way to decisive changes in the development of Czech society was opened, which reflected also in the sphere of universities. Lately the research-pedagogical programme of the Faculty has been changed considerably both in content and in form. In addition, a substantial change was implemented in the organizational structure of the Faculty by the establishment of institutes with the aim to concentrate forces and means to develop research-pedagogical fields.

From the priority orientation of the Faculty of Mining and Geology to the complex of mineral raw materials, the range of fields of study was broadened to other areas that followed or rested on the former direction. An apparent trend is the tendency to interdisciplinarity and an increase in interest in the fields of study with the building, safety, ecological, economical and information specializations (Fig.1) that can be observed in the pedagogical and research work of the Faculty after 1989. Almost all faculties orientated towards mining not only in transitive economies underwent or are undergoing similar developments as follows from the analysis of their curricula.

A traditional field of study that must be, with reference to the economic development of the state included in the basic governmental documents, ensured by the Faculty also in the future is Mining Engineering. I remind that we are the only Faculty with this field of study in the framework of the Czech Republic. The teaching is drawn to help the graduate obtaining as many as possible jobs in the mineral and

processing industries home and abroad, and simultaneously meeting the qualification requirements strictly stated by the national mining authorities by law.

As for this field of study, it is merely this University that educates mine surveyors for mining organizations. A newly introduced relative field is Engineering Geodesy, the needfulness of which follows from already mentioned changes in ownership in the Czech Republic.

The second fundamental field is Geological Engineering as a complex geological field technically directed that in its existing form covers all areas of research and exploration activity in the sphere of applied geosciences. Theoretically and practically, the education tends to the acquisition of knowledge and art in the planning, implementation, management and evaluation of all types of geological work in the whole industrial complex, civil engineering or the administration, the evaluation of environmental problems and others. Special attention is paid to the utilization of applied informatics. Not long ago, an increased public interest in the environment and technical relics resulted in the introduction of the field of bachelor study of Geoscience and Mining Tourism that utilizes a broad professional Faculty's profile to prepare experts in specialized tourism.

The Faculty has a thirty years' experience in the preparation of university educated experts in the field of Fire Protection Engineering and Industrial Safety. In accord with newly created integrated safety systems and introduced measures in many industrially advanced countries connected with the growth and diversification of technological risks in the industry and society, the Faculty introduced a newly drawn engineering field of Safety Engineering supplemented by the bachelor field of Safety of Persons and Property. It is a case of fields of the interdisciplinary character with the universal technical basis complementing a broad spectrum of safety, economic-legal and management knowledge.

Applied informatics orientated to the utilization of control technique and computers in the automation of equipment and technological units in the industry of raw materials and generally in all industries utilizing the transport and energy networks represent activity developed for a long time. The study of Geographic Information Systems as information technology for spatial representation of the landscape and its natural and anthropogenic components falls into this sphere. The course of System Engineering in the Industry of Raw Materials is being developed newly that is directed to the education of experts having the knowledge in the methods of research, development, design, verification, control and maintenance of large systems in fields inside the Faculty's range.

As for the area of economic sciences, the education at the Faculty of Mining and Geology has been orientated, since the beginning of its existence, to economics and management in mining that is broadened to the whole industry of raw material at present. Graduates are prepared

to design, analyze and control activities from the viewpoint of economic and legal relations, including a trade in plants, financial institutes, commercial and consulting service. For the introduction of a new conception of the administration and self-government, the bachelor courses of economics, management, law and informatics in the administration have been established. A field of Commercial Engineering opened newly represents a future trend in this sphere. The goal is a very universally conceived education of graduates settling, in addition to engineering – technical problems, also economic, management, safety and legal problems so that they can implement required engineering and legal operations as representatives of entrepreneurial subjects towards the administration and, on the other hand, as exponents of state organs towards the entrepreneurs.

It is the field of Physical Engineering that represents a specific and considerably exacting trend in Faculty's pedagogical activity. That is directed towards the application of physical measuring methods, study of properties of natural and synthetic materials and the utilization of physical principles at constructing technical device, etc. We consider this field to be a logical complement of the given technically and technologically orientated fields of study.

What is an important area of Faculty's work is that connected with the environment. Environmental Engineering, Processing and Water Technology, Water Management and Waste Treatment and Disposal rank among fields of engineering study directed to the environment. To the future, water management orientated to the management of water supplies, water technology and operation of buildings and plants connected with water service, and also technologies of the processing and treatment of primary and secondary raw materials can be thought to be of great importance.

Moreover, other fields are closely connected with environmental care (Fig.2). For example, in the case of geological exploration it is a natural relation of geology, as the science on the Earth, to nature. In mining, mineral processing, or generally in all industrial activities, what is meant is the analysis and securing of their coexistence with the area of interest, with its abiotic and biotic components and other ways of area anthropogenization (especially agricultural and urbanization manners). Environmental problems become an integral part of all the fields because really effective changes ensuring sustainable development can be only thus accomplished. All these fields are followed with programmes of post-graduate doctoral study and other forms of post-graduate education that react to actual demands of the entrepreneurial sphere and the whole society. All tendencies of Faculty's pedagogical activity are fully in accord with research programmes that form fundamental preconditions for a successful educational activity.

It was the functional system of secondary technical education established already in the last century that

represented not inconsiderable part of education of needful experts in geology and mining. Geological and mining technical schools educated needful technical professionals necessary for practice. Nowadays, this educational level is, with some exceptions, almost paralyzed with ill-judged interference of concerned ministries and trade unions. It will be very complicated to solve this situation.

Fundamental Pedagogical Aims

I think that our pedagogical effort must pursue several fundamental aims, namely, in addition to providing the students with needed knowledge in basic, preparatory and field subjects, the following problems.

Education to system thinking.

Co-existence of activities of human society and nature that is a necessary assumption for the understanding of extreme complicated processes taking place in the anthroposphere. What is meant is the understanding of interrelations between natural and technico-economic systems in the whole hierarchic structure from local to global, including the historical aspect.

Education to the care of natural resources and their more qualified utilization.

Apart from commonly known principles of the necessity of not damaging renewable resources (soils, waters, forests) and the utilization of non-renewable resources (mineral raw materials) as considerate as possible. It is, however, necessary to illustrate that the human society needs mineral raw materials to its life, and therefore it must agree with necessary negative impacts of their utilization.

Education to creative analytic and critical thinking

in the elaboration of problems solving. I remind that many methods have been invented that aim at clearing the experts of habitual thinking procedures and stimulating them to search for new approaches and solutions (creative methods). It will be useful to concern with possibilities of their applications in the framework of professional preparation of students to problems forcing to evolve non-standard and often wholly new solutions and making it possible to accomplish present and future tasks.

Education to the engineering approach to the settling of problems

that should include tools such as analysis of livability and feasibility of technical intentions, assessment and control of risks, sensibility analysis, decision-making analysis, etc. Above all, it is necessary to learn how to bring economical, ecological and legal aspects into the solving of technical problems as an indispensable and natural component.

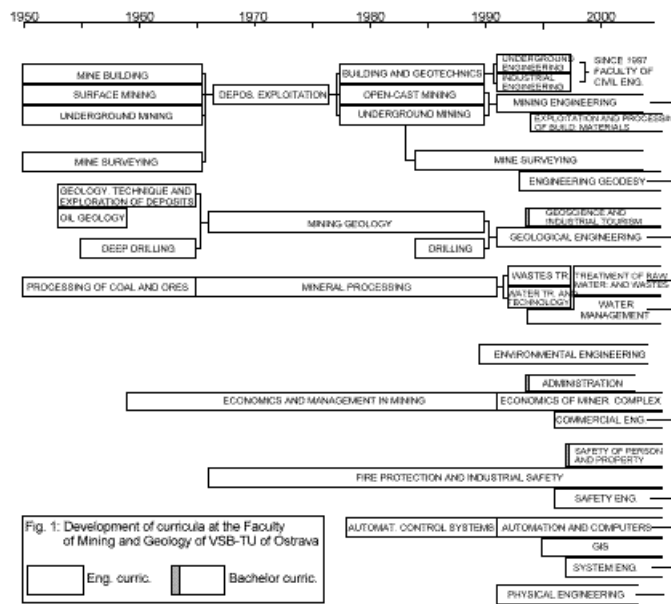
Education to ability to communicate with partners

that grows more and more in importance if we consider commonly introduced mechanisms of negotiations with organs of state authorities, self-government and representatives of public organizations. Education to the art of negotiation is essential because the public defence of projects becomes a standard. It requires conceiving the relation between science and techniques on the one hand and the public on the second hand as an equivalent and reciprocal relation.

Conclusion

I am sure that the sense of university education is to educate universally developed human beings possessing the latest information on their fields, who understand the surrounding world on the basis of study of natural, technical, economic and humanistic sciences and are able to realize their own thoughts. The internationalization of education that is a reflection of the present complicated and interconnected human society is also an indispensable attribute.

The path on which the Faculty started towards education of graduated experts represents a logical interconnection of traditional priorities and long-standing experience in new trends of development in sciences and, generally, the human society. The development in similar schools orientated to mining in the world and especially in Europe manifesting itself in analogous features was an inspiration. Another source is also a very close co-operation with the BERG Faculty of the Technical University of Košice in the Slovak Republic as well as the Silesian Polytechnic University of Gliwice in Poland. The co-operation leads to the mutual enrichment of educational and scientific programmes with new ideas. The future development of the Faculty of Mining and Geology and its position in the system of university education of the Czech Republic will depend –as indicated in previous paragraphs - not only on the orientation and rate of development in our economy, but also on the ability of pedagogical staffs to identify and implement main trends in scientific and technical progress in research-pedagogical programmes.



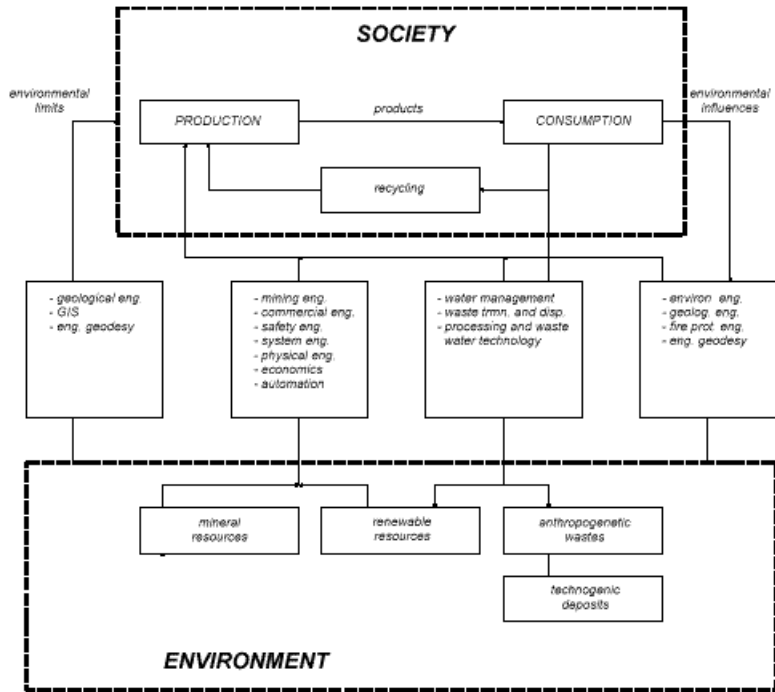


Fig. 2: Position of the engineering curricula in the nature