

## History of construction stone-material exploration in Hungary till 1945

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Exploration for construction stone-materials (stone and gravel) is an activity of mankind since several thousand years. In the area of historical Hungary stone exploration has a considerable past, but systematic gravel exploration began after World War II. only. The geological construction of the Carpathian-basin is quite different from that of other parts of Europe. The stone utilization possibilities, deviating from the average, lead to the development of some peculiar stone exploration principles.

In montaneous areas stone material, satisfying public demand, can be found everywhere and therefore till the beginning of big scale mechanized, i.e. industrial stone quarrying, production was rather occasional and the aim of exploration was to find the place where the requested stone outcrops. Construction demanded already since ages some special sorts of rocks to cut constructional blocks, ornamental stones and exploration was aimed at finding the corresponding rock-sorts.

The compact *igneous rocks*, such as e.g. granite, was usually only locally used, thus the significance of these rock-sorts was rather restricted. The effusive rock-sorts satisfied mass demands, not requesting any special sorting and exploration. Volcanic tuffs were utilized in building in big scale in Hungary, Slovakia and Transsylvania, and to satisfy increasing demands some more systematic exploration was necessary.

With respect to *sedimentary rocks* the utilization of sandstones was rather insignificant in Hungary as compared to other countries in Europe. Alone the Carpathian (flysh) sandstone was regionally employed. The coarse limestones and travertines were in large scale utilized; and only some special kinds of compact limestones were looked for.

From the group of *metamorphic rocks* only the Transylvanian marble was explored for, and utilized since the time of the Romans.

*Conscious stone utilization* began in Hungary in *Roman times*, though it is supposed that in Transsylvania the Dacians conducted already some quarrying before the Romans. The Romans utilized in Dacia compact limestone, volcanic tuff and marble. In Pannonia first at all travertine was utilized, volcanic tuff was not fashionable, though some andesite tuffs were employed by the Romans in their baths. Marble and granite was imported to Pannonia, the other rocks showed local significance only.

During the *Middle Ages the Hungarians* first explored the Roman ruins to find suitable stones for their buildings. Especially the imported marble and

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granite found in the Roman ruins was utilized over several centuries, in some cases repeatedly recut. The old quarries, given up by the Romans some centuries ago were gradually reopened and new ones became explored. Good quality stones were transported country over, and some of them, as e.g. the Jurassic red coloured compact limestone („red marble”) were even exported. At the end of the Middle Ages, due to the high variety of stones requested (stimulated probably by Italian stone-masons) exploration became quite purposeful.

During the 16–17th century construction utilizing building stones was restricted due to continuous fighting between the Hungarians and Turks. In the 18th century big scale reconstruction begins requesting building stones in increasing mass. First the ruins were exploited, followed by the reopening of ancient quarries, and also significant importation began based on waterway transport.

By the technical, economic development till the *mid-19th century* mainly the building stone import was increased. Exploration was restricted to some local efforts and there was no countrywide survey either.

In the middle of the 19th century systematic geological surveying began in the country forming also an exact geological base of building stone exploration. Steadily increasing industrial and economic development demanded more and more rock-material and made at the same time also long range transport possible. In this period the quarrying industry was more developed abroad, offering a higher variety of choice, therefore import was further increased, and foreign building stones „flooded” the Hungarian market, as e.g. the granite from Mauthausen.

The development of indigenous industry affected also the development of quarrying. A registration of all building stone sorts deemed to be necessary as a first step. The first survey in this respect was concluded to satisfy the demands of street paving in Budapest. The main aim of geological investigation was at this time the geological-petrological examination of the rocks, delivered for investigation by the quarries, and also the petrophysical interpretation of the different rock samples.

The investigated samples were first exhibited at the Hungarian Royal Geological Institute and later also described by F. SCHAFARZIK. (A detailed description of the quarries existing in the area of the states of the holy crown. Budapest, 1904.). The work of SCHAFARZIK was outstanding with respect to quarrying in this period, not only summarizing the known results but also taking part in surveying and opening up new quarries.

This period is Europe-wide the time of the first syntheses with respect to the building stone industry. In 1899 was published the basic handbook of O. HERMANN: Quarrying industry and Quarry-geology, Berlin, 1899. (in German), which was also the most important scientific source of Hungarian quarry exploration till World War II.

At the turn of the century the geological and petrological scientific principles are already available to expand systematic construction stone material exploration. A series of new, big, well-mechanized quarries are opened up to satisfy countrywide demands (dacite at Kissebes, 1870; granite at Dévény, 1885; andesite at Tarcal 1870; phonolite at Hosszúhetény, 1900).

The above period of construction stone industry was terminated by the first World War and its aftermath. The area of historical Hungary was reduced to one third only of her original area and the most important quarries were lost.

The available choice was suddenly changed: granite and the like were of poor quality, the andesite quarries were of local importance only, marble quarrying ceased to exist, the sandstone quarries were insignificant. Thus the existing quarries had to be expanded and new occurrences of suitable rocks explored, laying emphasis upon full utilization of geological field mapping results.

Data were further on collected, and registered by the Geological Institute, but upon request on part of some quarry owners several specialists were consulted, the most outstanding of them being L. JUGOVICS and F. PAPP.

L. JUGOVICS interpreted the exploration tasks in such a way as to explore the economically feasible stone reserves generally and not to interpret local, individual occurrences only. Thus he examined one by one the till then little known basalt occurrences and several andesites. Quarries were opened up over decades upon his advice.

The lifelong work with respect to quarrying industry of F. SCHAFARZIK was continued at the geological department of the Technical University, Budapest, by F. PAPP. He not conducted surveying work only, but taught also its methods, explained the properties and advantages of indigenous rocks not only for the specialists, but also for the public. He also continued the systematising work of SCHAFARZIK. In his book: Occurrences and possible utilisation of our natural rocks, Budapest, 1942; in addition to the description of the rocks and their occurrences also a systematic classification relating petrological properties and possible utilization is given; making the book very useful also for the specialists without geological background.

F. PAPP began the interpretation of systematic petrophysical investigations from petrological point of view promoting an evaluation of the results of physical tests according to the petrological characters of the rocks. The final aim of his endeavours was the completion of a full monography about the Hungarian quarrying industry, but this was unfortunately prevented by World War II.

Between the two World Wars increasing demand, and the availability of integral geological-petrological-petrophysical aspects promoted the opening up of several new quarries forming the backbone of postwar big scale quarrying in Hungary.