

Subsurface water exploration in Hungary between the two World Wars

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Judging the results of hydrological investigations between the two World Wars from certain historical perspective several trends and characteristics can be recognized reaching the state of full utilization in our days only.

Being hydrogeology a relatively new science, during the first period of its development it was cultivated by some outstanding personalities of Hungarian geology, not specialized in hydrogeology only, but dealing with many branches of geology. Some of these scientists were in fact all-round men of science. These researchers created sometimes real schools around their personality having a great professional influence upon their fellow-researchers and upon the whole scientific life.

At the beginning of this period the development of subsurface water exploration was very much influenced by the severe economic position of the, in area strongly reduced, country. The area left was overwhelmingly a basin territory containing a high amount of subsurface waters. Yet, at the same time, increased attention had to be given to the water reserves of the Mesozoic formations, the more, because the reserves of high value mineral and medicinal waters are related to the karstic and fissure waters in the Mesozoic formations. The pioneering researchers recognised the economic importance of subsurface waters already at the beginning and realized that the significance of subsurface waters will continuously grow with time.

The investigation of subsurface waters was much promoted by the formation of a hydrological section within the Hungarian Geological Society in 1917. The aim of the section was to study the hydrological and hydrogeological conditions of the country and to develop the science of hydrology. The first three volumes of the Hydrological Bulletin appeared, as an appendix of the Geological Bulletin (1918—1920), but beginning with 1921 it was published independently giving a forum for hydrological research, prospecting and publications.

Systematic *groundwater* surveying, based on proper scientific principles began in the mid-twenties under the guidance of S. ROHRINGER. First a grid of observation wells was created between Taksony and Baja in the Danube—Tisza midlands. Based upon the observations carried out in these wells a contourline map of the water table was completed showing the conditions on the 2nd October, 1932. The map is quoted in several handbooks as well. From 1933 the groundwater observation grid was expanded by the Hydrographical Institute over the Great Hungarian Plain as a whole. The groundwater contourline map of Budapest was compiled by H. HORUSITZKY in 1935 and T. GEDEON carried

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out groundwater-flow observations in the Tisza-valley. Detailed groundwater investigations were made in the Soil Research section of the Hungarian Royal Geological Institute by P. TREITZ and L. KREYBIG. The pedological maps completed by this section show also the water storage capacity of soils, and other important hydrological parameters.

All the above groundwater investigations and observations rendered not only immediate advantages for agriculture and irrigation, but laid a solid foundation of more extensive and more profound, very successful groundwater surveying, developed after World War II. by the Hungarian Geological Institute (MÁFI) and by the Hydrological Scientific Research Institute (VITUKI) leading to international reputation.

A. VENDL described the origin and accumulation of bitter waters (Epsom-salt waters) occurring at Southern-Buda. His description is still up-to-date even today. Similar investigations were made by A. LIFFA on the „Mira” bitter water occurring at Jászkarajenő, and by Z. SCHBÉTER on the bitter waters occurring at Bana. The natural soda waters occurring at Balatonfüred and related partly also to groundwaters were reexamined by L. LÓCZY, JR. in 1930.

With respect to *formation waters* or *artesian waters* it is well known that due to the geological conditions in the Hungarian basin, these can not be explored but by deep well drillings. The ratio of artesian wells to population and to area in the Hungarian-Basin is probably one of the highest in the world.

The Hungarian Geological Institute collected, observed, arranged and interpreted all geological and hydrological data derived from the drilling of artesian water wells under its supervision. Leading personalities in this work were T. SZONTÁGH, J. SÜMEGHY, and E. R. SCHMIDT.

The manysided activity of J. SÜMEGHY contributed to a great extent to the development of the science of subsurface water surveying. Thus, e.g.: by the measurement of the outflow temperature of the water in more than 500 artesian and other drilled wells he computed the geothermal temperature values with respect to the whole Great Plain. His related initiatives were fully expanded in the fifties when a large scale geothermic research began. In addition SÜMEGHY made some far reaching conclusions with respect to the relation of geothermic gradients to the substructure of the Great Plain.

The systematic and manysided work of E. R. SCHMIDT contributed to a great extent to the complex recognition of formation, and artesian waters. Surveys show, that the number of artesian wells reached some 20 thousand at the beginning of the forties. In the explanations, attached to some 22 soil-maps some account is given about the results of his detailed, and manysided research, containing not only hydrogeological data, but also technical, production, hydraulic, hydrodynamic and geothermic data as well. His observations and maps about the gas content of the artesian wells are of outstanding importance, giving some incentives to contemporaneous and later hydrocarbon prospecting. His maps, showing the occurrences of waters containing gases are now utilized in the preparation of a new map compiled for water economy purposes. He also studied intensively the behavior of gaseous artesian wells, the problem of water waste and the life span of artesian wells.

The *thermal waters*, occurring in the basin sediments deserve special attention, due to their economic importance. As it is well known the exploration and development of thermal waters was bound always to hydrocarbon prospecting. An outstanding personality of thermal water prospecting was F. PÁVAY-

VAJNA. The wells drilled to find hydrocarbons did not find any significant pools, but some of them yielded a high amount of thermal water. PÁVAY-VAJNA recognized the possibilities hidden in thermal waters and advocated their utilization. The wells Hajdúszoboszló-I. and II., Karcag-Beregfürdő I. and II., Debrecen I. and II. and Tiszaórs I. yielded a big amount of thermal water with some natural gas, supporting the establishment of thermal baths, giving restoration of health and recreation to several ten thousand people day by day. Especially Hajdúszoboszló was developed into a recreation centre of high reputation also abroad. Interesting to note, that the thermal water wells of Hajdúszoboszló are in a zone of rich natural gas accumulation, discovered in the sixties.

Immediately after World War I. great emphasis was laid upon the scientific and practical examination of *karstic thermal waters* known and utilized in the area of Budapest. Outstanding personalities of this work were some professors of the Technical University at Budapest, such as e.g.: F. SCHAFARZIK, A. VENDL and F. PAPP. The results of their investigations were published in several papers and monographies.

The investigations were later extended over a larger area, where karstic thermal waters occur in fractured, karstic carbonaceous reservoir rocks.

Some studies about the genesis of different waters, based on a high number of analyses, were also published. F. PAPP made an attempt to arrange the medicinal water sources according to their origin in different groups. GY. VESZEL-SZKY examined the problem of juvenile waters and their radium emanation phenomena. E. SZÁDECZKY-KARDOSS studied the different types of artesian waters in the Great Hungarian Plain and examined their value to indicate key horizons.

The above mentioned prospecting and research activity indicates a continuously growing development. The geologist-hydrogeologist generation acting between the two World Wars kept and further developed the scientific heritage inherited from the predecessors. The present generation also received a highly valuable heritage from the previous generation. It is an obligation to keep the noble traditions alive, which made Hungarian water prospecting and hydrogeological research great and fascinating. This is the best way to remember the pioneers.