1 GEOPHYSICAL PROSPECTING

Location of the field works of ELGI in 1975 is presented on Fig 1.

The systematic geophysical mapping of the *Transdanubian Central Range* was continued. Exploration of raw materials, connected to the structural conditions of the Triassic basin floor (bauxite, brown coal, karst water) was included in our tasks as well. For the surveys gravity (Δg), magnetic (ΔZ, ΔT) geoelectric (VES, PM, UPM, VLF) and seismic (multiple coverage reflection and refraction) methods were applied.

On the *western margin of the Bakony Mountains* geophysical investigations were carried out with the following tasks:

1. exploration of areas of Triassic dolomite (limestone) outcrops
2. mapping of basement topography under 30–100 m thick overlying sediments
3. separation of areas of deeper basement.

On areas of outcrops the VLF method was applied to contour resistivity minima ($R<500$ ohmm) as regions worth for further exploration. The next step, determination of basement depth, is accomplished by VES, PM and refraction seismics. Locating of boreholes represents the end of this phase. From the first borehole, underground potential mapping is made to contour the borders of the bauxite bodies, as its anomaly map is more detailed and exact than the VLF map. Figure 2 illustrates our methodology.

Around Iharkút, successful bauxite explorations were carried out. The bauxite bodies fill up the tectonically preformed grabens of 50–100 m diameter. Even smaller carstic „wells" or „canyons" may contain bauxite. Thickness of the bauxite bodies varies between 30–50 m, their quality is good, there is no danger of karst-water, they can be exploited by surface mining, so in spite of the small extension, mining is profitable.

In areas of 30–100 m thick overlying sediments bauxite bodies of similar extension can be expected. Such a region is the 0,5 km wide terrace adjoining to the Iharkút area, covered by Eocene-Creteceous argillaceous complex. Results of investigations on such an area are illustrated in Fig 3. Detailed data were obtained from the underground potential mapping and from refraction seismics, planned according to the results of the UPM.

Further to the west, geological conditions become more complex. Geophysical investigations are hindered by the thick Cretaceous sediments (Fig. 4), exploration costs grow higher.

In the *southern margin of the Bakony Mountains* the basement is built up by Mesozoic and Paleozoic formations. Gravity and seismic measurements were carried out to separate them (See Fig 5.).

In the *eastern foreground of the Gerecse Mountains* seismic refraction measurements were performed to investigate the geological structure in order to determine the possible effect of karst water depression of the coal mines on the water discharge of the Budapest springs. Tracing of impermeable layers met several difficulties. The upper refracting horizon can be identified as the Triassic basement of the Tertiary basin, consisting of different formations, of velocities varying between 3800–4500 m/sec. No geological interpretation can be given to the lower horizon; at some places it seems to belong to the lower Triassic series of 4500–5300 m/sec velocity, at other places it is supposedly the high velocity cristalline basement (6000–6500 m/sec.) Up till now no borehole has reached its depth (see Fig. 6). In the future the problem will be approached by reflection seismics.

Bauxite and brown coal exploration was carried out in the area as well. The western part of the Bajna basin is promising for coal, the eastern for bauxite (see Fig. 7). Similar investigations were accomplished in the *western foreground of the Gerecse Mountains* (see Fig. 8). The raw material prospects of the area seems to be worse, than that of the former area, but no definite decision can be made at present.

For *alginite* explorations electric and geomagnetic surveys were carried out. In 1975 our tasks comprised tracing of deeper lying basaltic tuffs with possible craters of alginite fill-up. The electric soundings were hindered by the terrace gravel of varying thickness, geomagnetics by the changing susceptibilities of the tuff and lava. In the future, methods of higher resolving power will be applied.

The exploration of structures and ore prospects in the *Börzsöny Mountains* (Figs 9–12), started in 1970, continued this year. According to the correlation of the latest seismic results to gravity anomaly maps the elevated parts of the basement correspond to gravity highs. Around Szokolya, and to the east of it the basement has high refraction velocity and infinite resistivity, suggesting the probability of the existence of carbonaceous rocks. On the elevated parts signs of local volcanic dykes can be found. On the northern, north-eastern margin of the mountains the andesites of high resistivity are screening the Paleozoic basement having relatively low resistivity of 50–5000 ohmm.

The 1:10 000 scale Csóványos sheet was revised according to the latest geophysical data. The hydrothermally decomposed parts can be separated from the fresh rocks and from the layered agglomerate-lava complexes. The latter is dipping mainly toward the margins except on the central part, where it is dipping inward,

Three prominent IP anomalies were found. It could be concluded that the IP highs develop on the edge of the resistivity minima. The decrease of resistivity is a result of hydrothermal decomposition and increase of pyrite content. The small PS anomalies of the area confirm possibility of metallogenesis.

The reconnaisance geophysical survey along the *Darno-line* was completed. *Between the Uppony and Rudabánya Mountains* the area of about 200 km^2 was investigated by several geophysical methods to explore the topography and structure of the Paleogene-Neogene basin floor. An attempt was made to separate the different formations of the basement (Fig. 13).

In the *Mátra Mountains* the elevated position of the basement under the mineralized area was detected. Refraction measurements indicated a high velocity (6200–7800 m/sec) horizon under the Neogene basin floor, which can be interpreted as deep cristalline basement (Fig. 14).

A sixfold coverage seismic reflection profile was measured across the *Rudabánya Mountains*. The time section indicates a steep fault on the western margin, while the eastern edge is represented by gradual subsidence. The erosion surface of the early-Paleozoic anticline is overlain by late-Paleozoic-Triassic sediments of dips parallel to the horizon of discordance.

An interesting result of the IP measurements is the high polarizability of the Paleozoic shales. This phenamenon can be used for formation identification.

Seismic reflection survey with *tectonic* aspect took place in the Transdanubian Central Range and in the southern part of Transdanubia (Figs 15). The conventional processing was supplemented by some methodological experiments, such as: filtering and deconvolution tests, retrocorrelation sections and different velocity analyses. The reality of formerly detected deep reflections was checked by special field observations. The final interpretation of this deep horizon, however, will require further informations (drilling, magnetotellurics).

The *civil-engineering* mapping of the *Balaton* area has been continued. During the winter of 1975 the first profile across the lake was completed. It shows strong tectonic activity even in the Upper Pannonian (Fig. 17).

Many small scale geophysical projects to solve engineering problems were completed for different companies. The method of civil engineering sounding, worked out in ELGI, was frequently employed. The fence-diagram of integrated geophysical measurements, carried out for the Danube water conservancy project, is shown on Fig. 18.

The geophysical survey of the *Great Hungarian* Plain, was continued on the Debrecen area. Gravity (Fig. 20), telluric, magneto-telluric and seismic reflection methods were included in the complex. The detailed gravity net rendered possible the automatic filtering of the maps and consequently resulted in better interpretation of residual anomalies (Fig. 21). With the results of magneto-telluric soundings the telluric izoarea map (Fig. 22) could be transformed to depth scale. Seismic reflection measurements, in 146,5 km length, were accomplished mainly by 12 fold (71%) and the rest by 6 fold coverage. The basement of Neogene sediments appears as marker on the whole area. Between the northern and southern part a 2–2,5 km wide mobile zone is situated, characterized by strong diffractions up to the near surface. It can be supposed, that this mobile zone represents the transition from the Paleozoic to the Mesozoic structural unit and at the same time the southern border of the flysch zone. The time map of the marker together with the extension of the mobile zone and location map of seismic profiles is shown on Fig 23. Some selected cross sections are presented on Figs 25–27.

Location map of the reflection seismic profiles measured for the drilling project of the Nyir region is presented on Fig. 24.

Refraction and reflection seismic measurements were carried out on the Permo-triassic anticline of the *Mecsek Mountains*. The Central Triassic basin floor is marked out as the horizon of strong energy decrease and that of discordance. The main tectonic elements can be well recognized on the reflection cross sections (see Figs 28). For the identification of the deep reflections occuring in some places exploration drilling is needed.