direction of the terrestrial field. Consequently, the geometrical axis of the magnetic bodies (if any) cannot be simply determined. Thus in this case, quantitative interpretation meets an obstacle of principle.

The Geophysical Institute is now working on this problem. Such problems and their solutions are reported in literature (5). It is a matter of fact, that this problem – because of the large-scale computing work – can be approached only in possession of high-speed electronic computers. Such machines are at our disposal only recently.

Anyway, the problem requires solution. Our region is a small-scale model of the whole Hungarian basin. Problems of the region are problems of the open basin too. Regarding the Hungarian-basin from a geomagnetic point of view, it is evident that the magnetic anomalies of the whole country are caused by basic volcanic and metamorphic rocks, just as in our region. It may be assumed that the former case is in majority.

An essential difference of the region as against the open basin is, that the magnetic bodies of our region are either on the surface or on the basin-floor. Accordingly their depth can be determinated by another method. In the open basin, however, considerable magnetic bodies (Pliocene basanites, some Miocene tuffs etc.) may occur also within the Neogene complex.

24 THE PRINCIPLES OF THE APPLICATION OF THE SEISMIC METHOD

The seismic method includes fundamentally two procedures: refraction and reflexion. They are based on the recording and interpretation of different waves and they are used to detect different geological patterns.

Refracted (head) waves are generated on discontinuities of sudden *increase* of seismic velocity. This requirement is met by the floor of the Hungarian young Tertiary basin – so by our region too (Fig. 2).

Reflected waves are generated upon boundaries of different acoustic impedances, with no regard to sign (it is not necessary that the lower medium should be of greater impedance). Taking this into consideration, the rock-strata of our region below the basin-floor, would require the application of reflexion procedure. The traditional reflexion procedure, however, demands a horizontal or near-horizontal, quiet, tectonically undisturbed (not dislocated) position of strata. In our region, such conditions are hardly to be expected.

Recently, experiments have been made with the so-called *directional, regulated operation* (DRO) which has been developped in the USSR for tracing strongly dipping, dislocated layers. The principle of its application is esentially identical with that of reflexion shooting. The essential difference lies in the fact, that, by a proper apparatus, it is able to select, from complex (and frequently random) arrivals, those arising from strongly dipping surfaces, inhomogenities.

It is hoped that this apparatus will supply data from the internal structure of the basement and of the exposures, i. e. of the actual Mecsek mountains and Villány mountains.

Our region – as regards the application of the seismic procedures – can be divided into three parts:

1. the exposures;

2. the shallow basins between the mountains, within the mountains and on the margins of the mountains; involving in the first place, coal and ore-prospecting problems;

3. the open, deep basins on the margins of the region, involving chiefly oil-prospecting problems.

1. On the exposures, on the present technical state, neither refraction, nor reflexion seismograph can be applied because of the aforesaid reasons. The physcal model of the exposures (boundaries with acoustic impedance contrast) suggest, that if seismic investigations will ever be made upon exposures at all, they will have the character of reflexion seismograph (e. g. DRO) survey.

2. In the shallow basins, the aim of mineral prospecting lies in the basin-floor or underneath it. The basin-floor is characterized (in general) by a sudden increase of seismic velocity; it is obvious that refraction may claim the decisive role. This role is emphasized by the fact that the correlation refraction shooting (availing itself of later arrivals too) allows a certain detailing of the basement (Fig. 4). The proper detailing of the basement, – i. e. tracing of not its relief but of its internal structure – requires, again, a reflexion character procedure (e. g. DRO).

It will be always a problem to impart the energy below the basin-floor (into the basement), since the incident wave on this surface suffers strong scattering and reflexion.

3. In the open, deep basins the goal of exploration (oil) lies within the young Tertiary basin-sediment formation. Neogene is thick enough (the basin-floor is situated sufficiently deep) to increase the seismic velocity in the function of the depth so as to approximate or attain that of the basin-floor. Practically, this reveals itself in the phenomenon of curved ray-paths and in the lack of the commonly understood refracted waves. An application of refraction shooting is not fully excluded by all these, only rendered to secondary importance.

As a matter of fact, the basin-floor also in such areas, requires refraction shooting, since reflexion shooting is not suitable for this special horizon. The reason of the latter are: scattering, diffuse reflexions and multiple arrivals. The basin-floor determined by refraction shooting (including some uncertainty (63) indicates the lowest limit of possible oil-investigations in such areas (where the interior of the basement is promising neither for genesis, nor for accumulation of oil).

For the resolution of the Neogene basin-sediments, refraction shooting is not suitable, on account of the above-mentioned curved ray-paths and of the perfunctory nature of the procedure. For this task, reflexion shooting is more suitable within the limits coming from the special nature of a young Tertiary basin. This is discussed in another paper (18). In our region, the problem of the exploration of the young Tertiary basin-sediments affects a small area, therefore, its importance is secondary.

It seems, however, advisable to mention, at least in a brief summary, that this chiefly Pannonian (Pliocene) clastic formation, essentially deposited continuously, does not, or only exceptionally, contain far-traceable *key-horizons.* This is sufficiently explained by the paleogeographical feature of the Pannonian stage: the sea of longer and longer zigzagging shore-line, later broken up into lakes and wandering to and fro. The consequent frequent facies-change, both in the vertical and in the horizontal (*lenticular* sedimentation), does not favour reflexions. Instead of key-horizons, only a mass of boundary elements, characterising the deposition (structure) of the sediments only statiscally can be recorded. Near the boundary of the Lower, resp. Upper Pannonian, however, usually a more or less correlatable array of boundary elements appears indicating the statistical facies-difference of the two substages. The degree of correlatability is sufficient, as a rule, only to enable us to prepare so-called phantom-horizons along the profiles, and, on the basis of these phantom horizons of the profile-sections, a phantom-contour sketch (near the boundary of the Lower, resp. Upper Pannonian) of a certain area (Fig. 5).

The figure throws light also upon the fact (known also from deep drillings), that the dip-angle of the structures of the Pannonian stage is small. Pannonian and Neogene sedimentary rocks in general were formed so that the subsiding basement was gradually – keeping pace with subsidence – covered by the sediments of the Neogene inland sea. During their subsidence, these sediments adapted the relief-forms of the basement (from then on, basin-floor), and over positive elements they took up positive forms and vice versa.

The Neogene complex contains slightly bent formelements of mild dip-angles gradually decreasing towards the surface. These are called – since their formation was not of classical folding – *settled structures*. Their "sharpness" was subsequently increased by compaction and may have been increased by the isostatic uneven (vertical) movements of the blocks of the basin-floor. The dip angle, however, even so, does not exceed 8°, this being another factor adding to the difficulties of reflexion shooting (to trace anticlines of small amplitudes, is uncertain).

The most important result of the investigations, concerning almost the entire area of the region is the map of the floor of the Tertiary basin (suppl. 2).

In tracing the basin-floor refraction seismograph played a considerable role.

25 THE PRINCIPLES OF THE APPLICATION OF THE GEOELECTRIC METHOD

The task of the geoelectric method on our region is, in fact, identical with that of seismic refraction shooting: determination of the basin-floor. Namely, the relief of the basin-floor in the first place, and – through the lateral variation of the specific resistivity – its petrographical composition on the second place.

This task can be fulfilled, if the specific resistivity of the basin-sediment complex as a whole, differs considerably – at least by one order of magnitude