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ANAMORPHIC CARTOGRAMS

Problem of relative-units

Contemporary cartograms are regularly constructed on the territorial topographically expressed units. Those are usually territories of villages, counties, districts, departments, regions, areas, republics, states etc., which are in the frame of accepted mathematical-cartographical projection formulated in given map scale, in sufficient fidelity. Against their utilization as relative units on cartograms, there is no objection, as far as they are expressing such relative indexes like density of population per 1 sq. km, the proportion of arable land or forests from total survey of correlation unit, hectar-yields etc., i.e. indexes related to the extend, to area of correlation /topographical/ unit.

However the application of relative units in cartography has been employed in such en extend that /and hereby in great measure/ also indexes of non-extending character, like e.g.: birth rate or death rate, the share of economically active population from total number of inhabitants, volumes and shares of production to certain number of workers etc., etc., have been expressed in them. Perhaps it is no need to prove that such indexes have not direct relation to the extend of topographical units and therefore their expression with the help of cartogram in topographic units, methodically is not correct! The application of topographical units for interpretation of non-extending relative indexes i.e. data which have not relation to the extend, to area of applied related unit, can't be justified, but only exculpated, tolerated from certain apparent point of view of graphic basis unity, e.g. in complex atlases. This "unity" is however fictitious, and from semantic point of view, it induces throughout incorrect visual perceptions: relative index high intensity

over small territorial unit is extinguishing by comparision with smaller intensities of the same index /non-extending one/ upon great surfaces of topographical units. Many cartographers ang geographers, or other makers of these cartograms even do not realize the methodic dissonance of relative non-extending indexes with topographically expressed unit, and they forget th at the relation unit does not mean the correlation to its extend. From this reason, non-extending relative indexes, if they are determined for cartographical interpretation, they need another expression of relative unit than the topographic one.

Utilization of principles of cartographic anamorphosis upon construction of cartogram basis

The substance of anamorphosis is not unknown conception neither in cartography nor in geography. For the first time, we have encontered with this graphical-mathematical principle upon the map of H. Wiechel /1903/, although the propre conception of anamorphosis originated much later. This map of H. Wiechel was commented by M. Eckert /1925/ as an "interesting experiment" which did not find its followers. Later on, Wiechel method still yet was used, but mainly for illustrating purposes /in U.S.A./. Soviet economic cartographers N. N. Baranski and A. I. Preobrazhenski /1962/ characterized this method of cartogram as "wild method", that is more suitable for praxis but is very interesting from the theoretical point of view. Upon this method also in American geographer W.Bunge /1962/ came to stop, who commented the world map constructed by W.S. and E.S. Woytinski as a map that has enriched "number of cartographic curiosities". In the contemporary cartographic literature we enconter /though only very coutiously/ with conception of geographical and cartographical anamorphosis at E. Arnberger /1966/, J. Bertin /1967/, and R. Cuenin /1972/. For a given region, also the cintribution of L.I. Wasilevski /1970/, can be considered as significant. In this one the author tried - and not without success - to support and

develop the advantages of new method by the fact that he proposed several variants of mathematic relations close to region of mathematic-cartographical projections. Certain problems of anamorphosis in Czechoslovakia were occupied with, by O. Kudrnovská /1964/, when she expressed the density of population in ČSSR according to regions with the help of equidistances, and Z, Murdych /1973/.

On the base of our researches we can state that with help of principles of cartographical anamorphosis, we can construct, on the whole simple maps, which already don´t need to be called curiosities, but which have their scientific raison d´être, they are in stringent mathematical and consequently in logical and methodical accordance with interpretative theme.

Simple case of anamorphosis can be easily veryfied on the example of construction of graphic basis for cartogram, in which the correlation units /districts/ are in due proportion to their inhabitants.

For comparision, in Fig. 1 the basis for SSR cartogram is illustrated, on which the correlation units are expressed topographically, in due proportion to their extend in equivalent conic projection.

On Fig. 2 the same "districts" are constructed, but in due proportion not to dimensions of regions, but to number of inhabitants. They are classified so as to correspond with the space arrangement of topographical districts and by it to the whole approximative appearance of SSR. The scale of topographic basis is 1:2 000 000, and that one of demovalent basis is expressed by the following relation:

$$1 \text{ sq. mm} = 500 \text{ inhabitants.} \qquad /1/$$

In Fig. 3 the variant of "lined" arrangement of demovalent districts is illustrated, which has a series of advantages from the point of automatized processing of anamorphic cartograms. It is evident that more alternatives

of mutual arrangement of new related units can be constructed, according to which, criteria of cartographic interpretation are decisive.

In Fig. 4 an exemple of noncontinual / disconnected/ circular demovalent basis for cartogram is illustrated, in which the scale can be expressed with the following relation:

$$d = \frac{1}{20}\sqrt{A}\ , \qquad /2/$$

where d = the circle´s diameter,
A = number of inhabitants in each individual district.

Comprehensibly, it is possible to construct the base for cartogram also with the help of utilization of several other geometric shapes. It only confirms the advantage of anamorphic cartograms, because against the existing one, they can mobilly utilize such an important property of cartographic expressing elements as the shape /form/.

In Fig. 5a the topographic basis and in Fig. 5b demovalent basis for cartogram of district Martin /Middle-Slovakian region/ is illustrated according to villages, the area of which is in due proportion of economically active population, according to relation:

$$a = 10\sqrt[3]{N_{iea}} \qquad /3/$$

where a = area of demovalent "village",
N_{iea} = number of inhabitants economically active in each village.

Any relative index, related to number of inhabitants in given correlated units /in case no.5 to number of economically active population/, expressed by the change of intensity according to current used scales on contemporary cartograms, upon these demovalent bases, will be interpreted in mathematic correct way. Beside it, such a basis can be considered as an independent way of projection. It can be

applied for cartodiagram as well, or for combination of cartogram with cartodiagram.

We are convinced that anamorphic methods will uncover the whole series of new possibilities and they will enrich the method cartographic interpretation.

Literature:

Arnberger E.: Handbuch der thematischen Kartographie, Wien, 1966

Baranski N.N., Preobrazhenski A.I.: Ekonomicheskaya kartographia, Moskva, 1962

Bertin J.: Sémiologie graphique, Paris, 1967

Bunge W.: Theoretical geography, Lund, 1962

Cuenin R.: Cartographie générale. Tome I. Paris, 1972

Eckert M.: Die Kartenwissenschaft. Band II. Berlin und Leipzig, 1925

Haack H., Wiechel R.: Kartogram zur Reichstagswahl, Gotha, 1903

Kudrnovská O.: Equidistance lines and their use in structural cartograms. Sborník čs. společnosti zeměpisné, Praha, 1964

Murdych Z.: Metody anamorfózy mapy pro geografické účely. Acta universitatis Carolinae, Praha, 1973

Wasilevski L.I.: Anamorphirovannye karty peremennogo masshtaba i ikh primenenie v ekonomicheskoi kartographii. In collected articles: Novoye v tematike, soderzhanii i metodakh sostavlenia ekonomicheskikh kart. Moskva, 1970

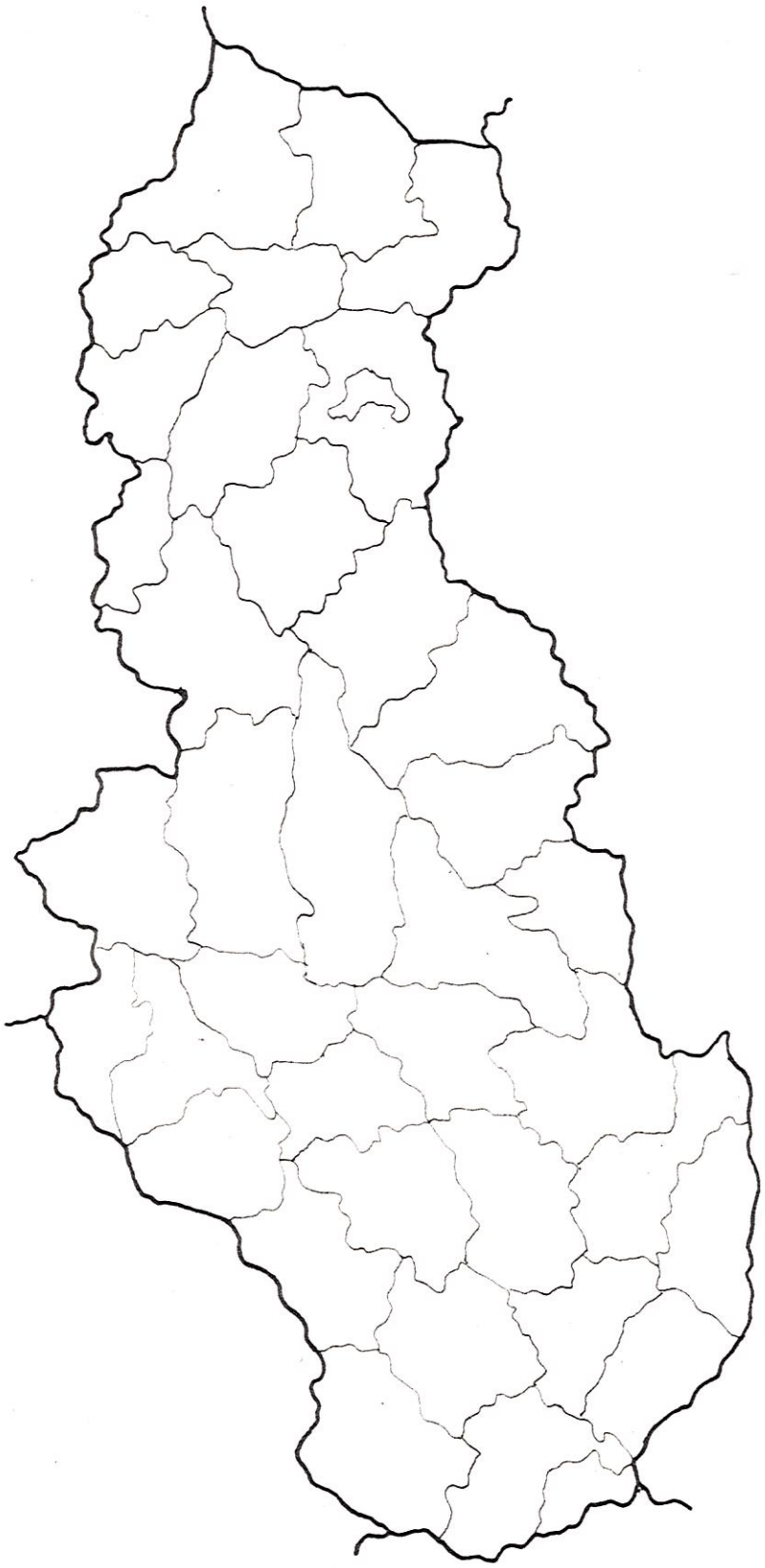

Fig. 1

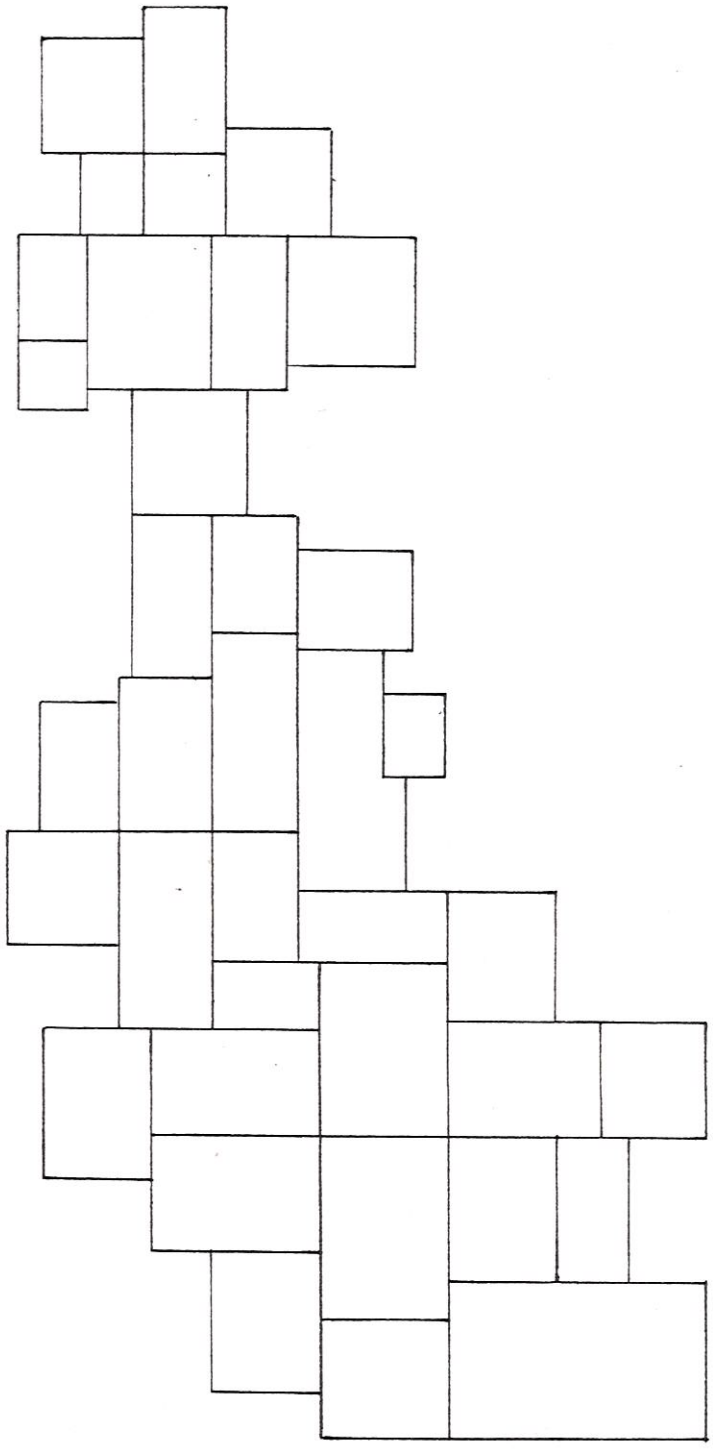

Fig. 2

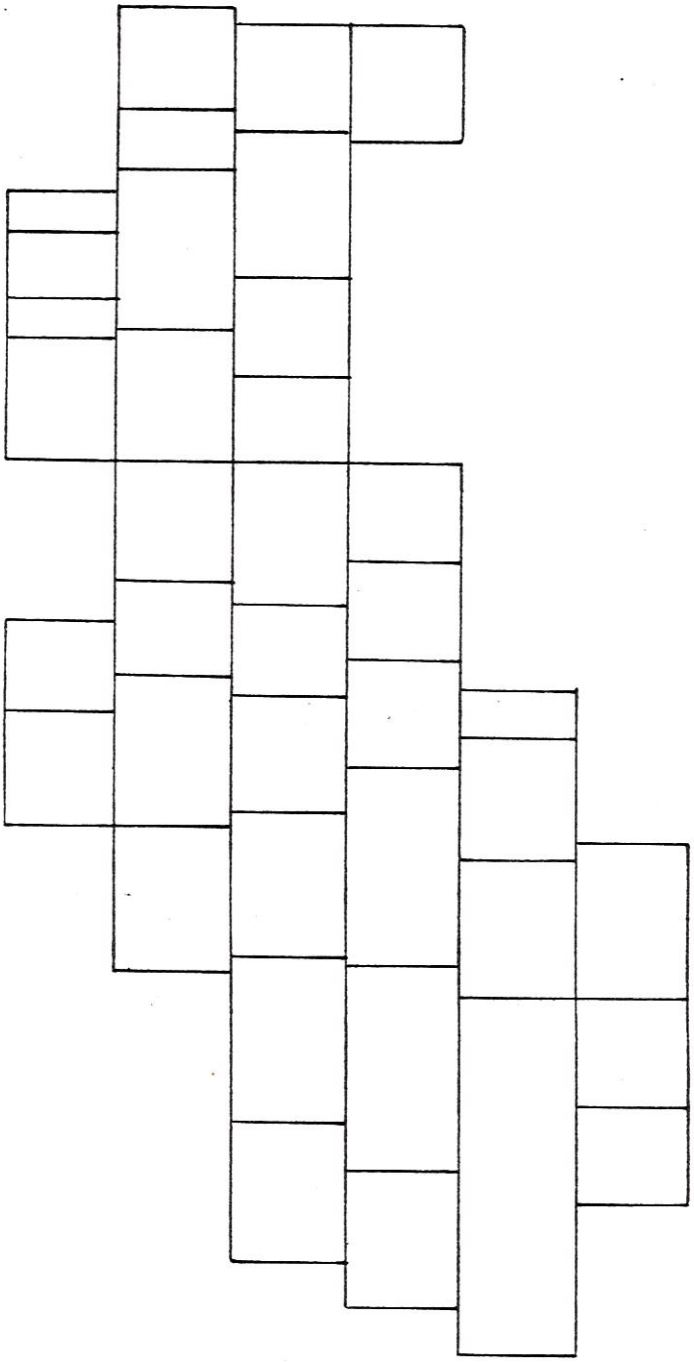

Fig. 3

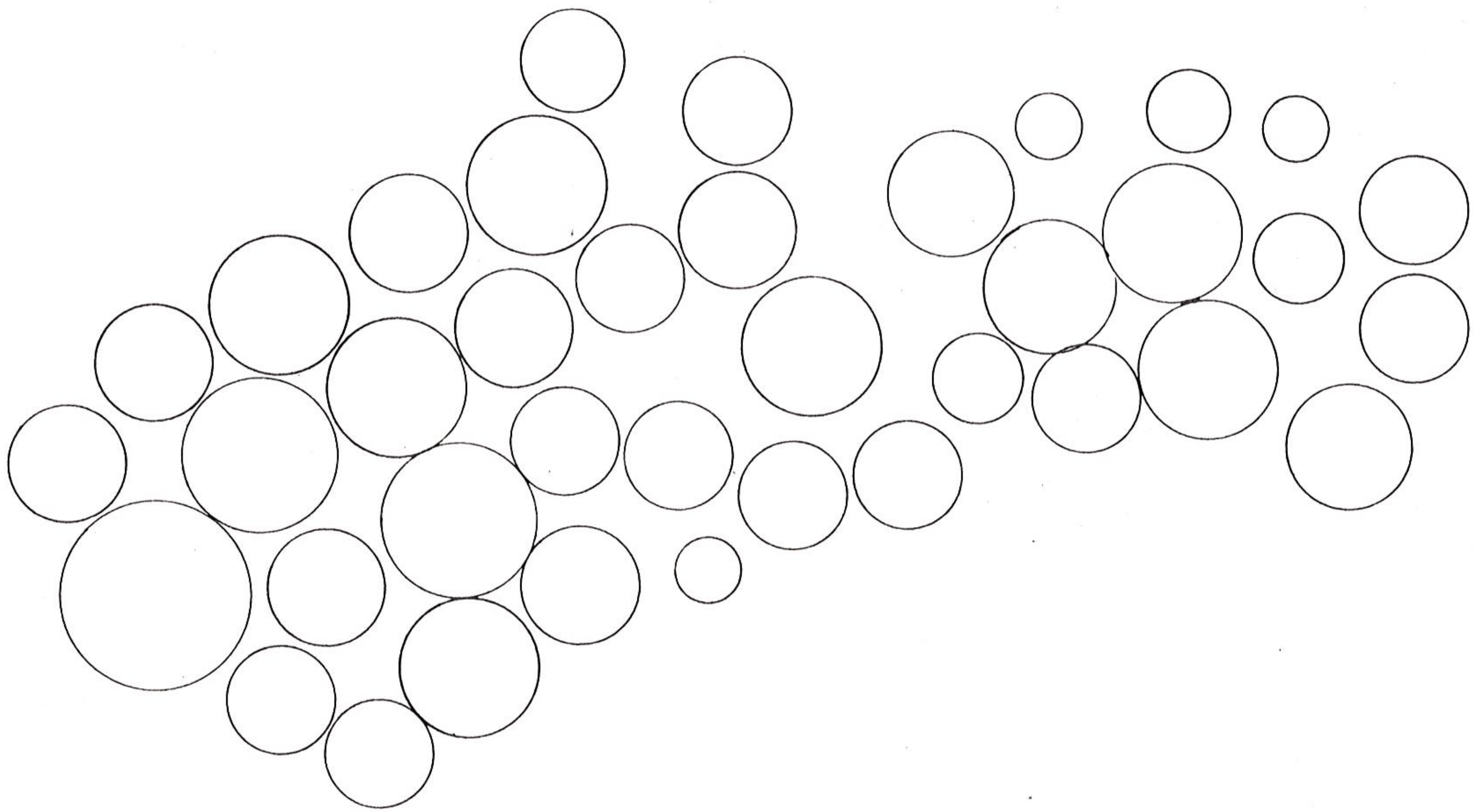

Fig. 4

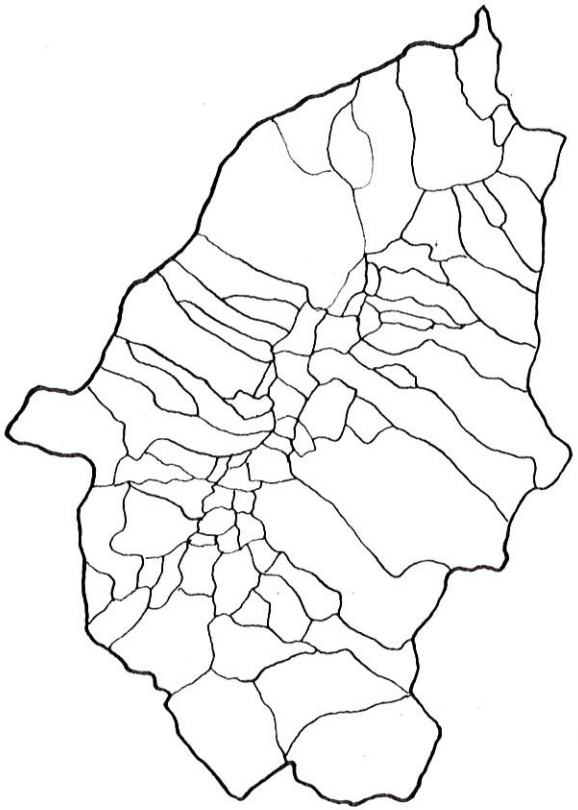

Fig. 5a

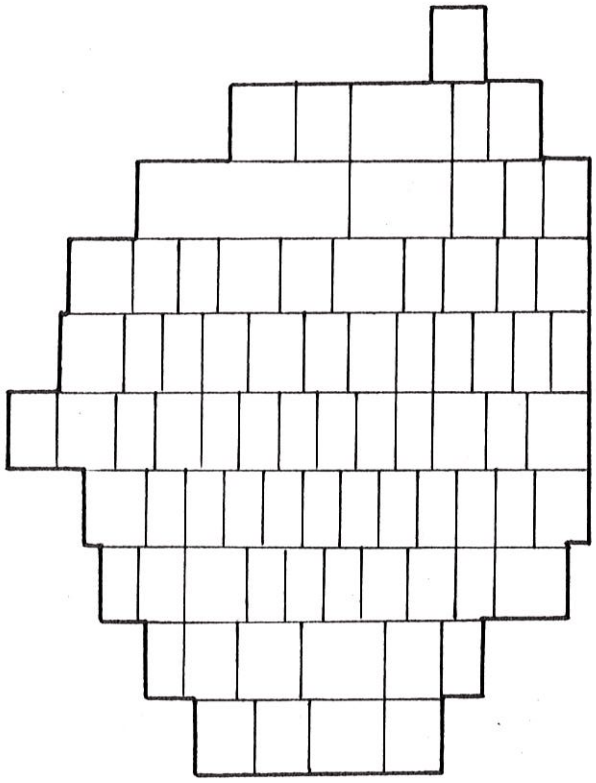

Fig. 5b