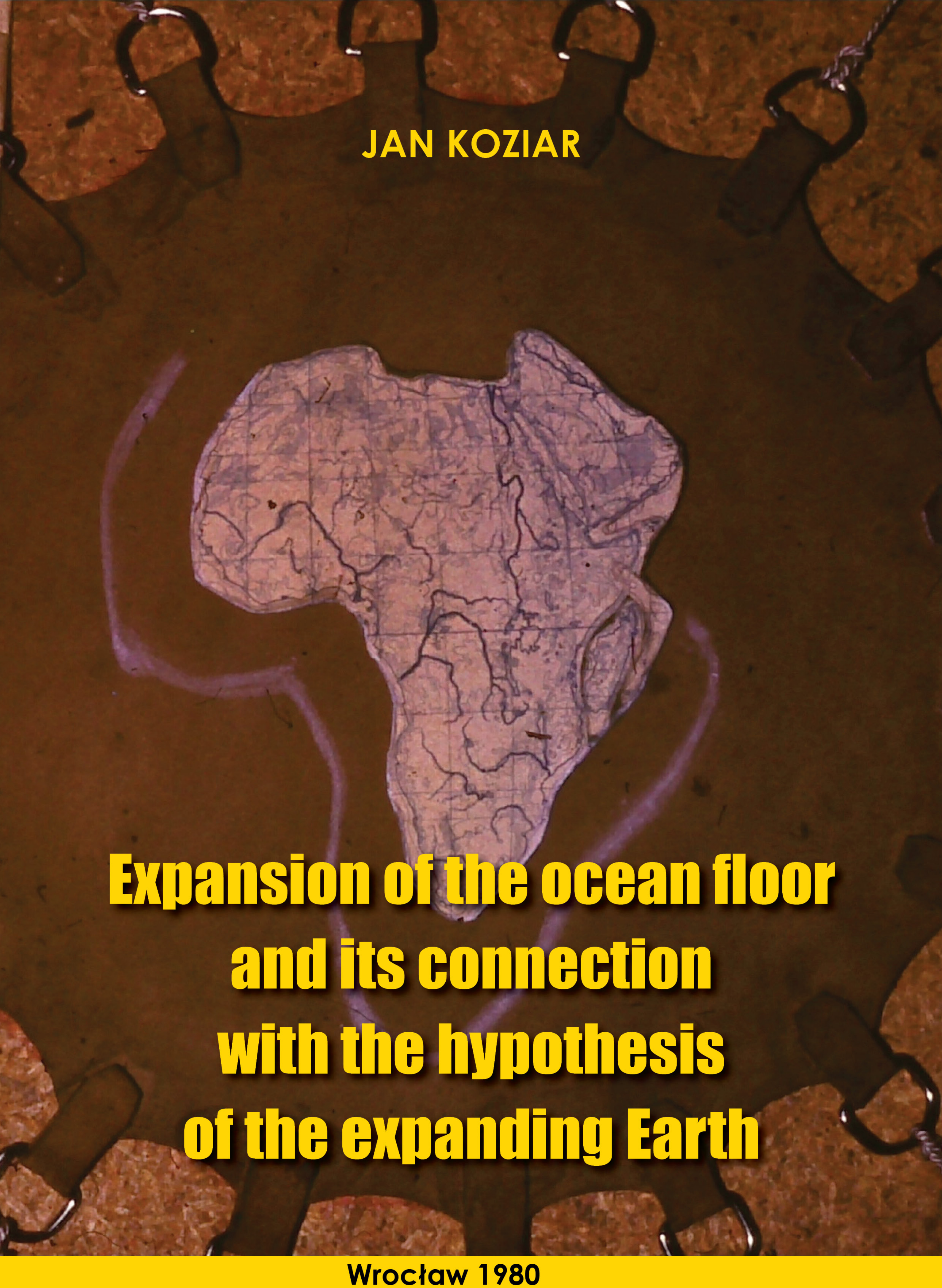

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Expansion of the ocean floor and its connection with the hypothesis of the expanding Earth

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JAN KOZIAR

Expansion of the ocean floor and its connection with the hypothesis of the expanding Earth

Report

Problem of the development of the oceanic lithosphere

The question of the development of the oceanic lithosphere has been explicitly put forward in the fifties as a result of the revival of Wegener's theory. It was obvious that the process of drawing continents apart from each other, according to this theory, must be controlled by a process of formation of a new oceanic lithosphere. The latter process has been recognized and defined in the period 1955 – 1968 due to united efforts of geologists and geophysicists. It turned out that the oceanic lithosphere is being produced only on oceanic ridges, i.e. on the sub-aquatic longitudinal elevations that are located generally in the middle between the continents (Fig. 1).

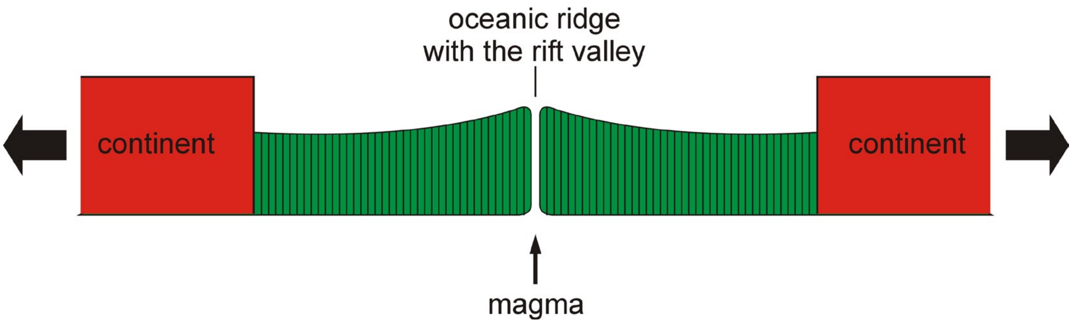

Fig. 1. *The scheme of the development of the oceanic lithosphere.*

As we can see in Fig. 1, the lithosphere between the continents is being torn beneath the rift valley and the new space is continuously filled up by the magma that rises from the upper mantle. So, the lithosphere is composed of a succession of vertical increment sections. The age of them increases starting from the ridge axis towards each of the neighbouring continents. This process has already been proved and it was possible to define the age of individual strips of the oceanic lithosphere. Consequently, a global chronological map of the oceanic lithosphere could be drawn and the rate of its expansion could be estimated as well. The maximum rate of it is 12 cm/year and this rate refers to the south part of the Pacific Ocean.

The question of the global interpretation of the expansion of the oceanic lithosphere remains open. The expansion can be interpreted either as a result of the expansion of the globe as a whole [6], or as a result of a deep circulation of convection currents at the constant size of the Earth [5]. The latter idea assumes the necessity of the existence of zones where the oceanic lithosphere could be consumed. Both island arcs and oceanic trenches are thought to be such zones.

Nowadays, the second interpretation is very popular and it is known as “the plate tectonics”. However, no satisfactory crucial test between the alternative possibilities has yet been carried out.

Some examples showing that the entire globe must expand, are presented below.

Expansion of the ocean floor as a manifestation of the expanding Earth

Let us consider the pattern of the tectonic structures in the South Atlantic (Fig. 2).

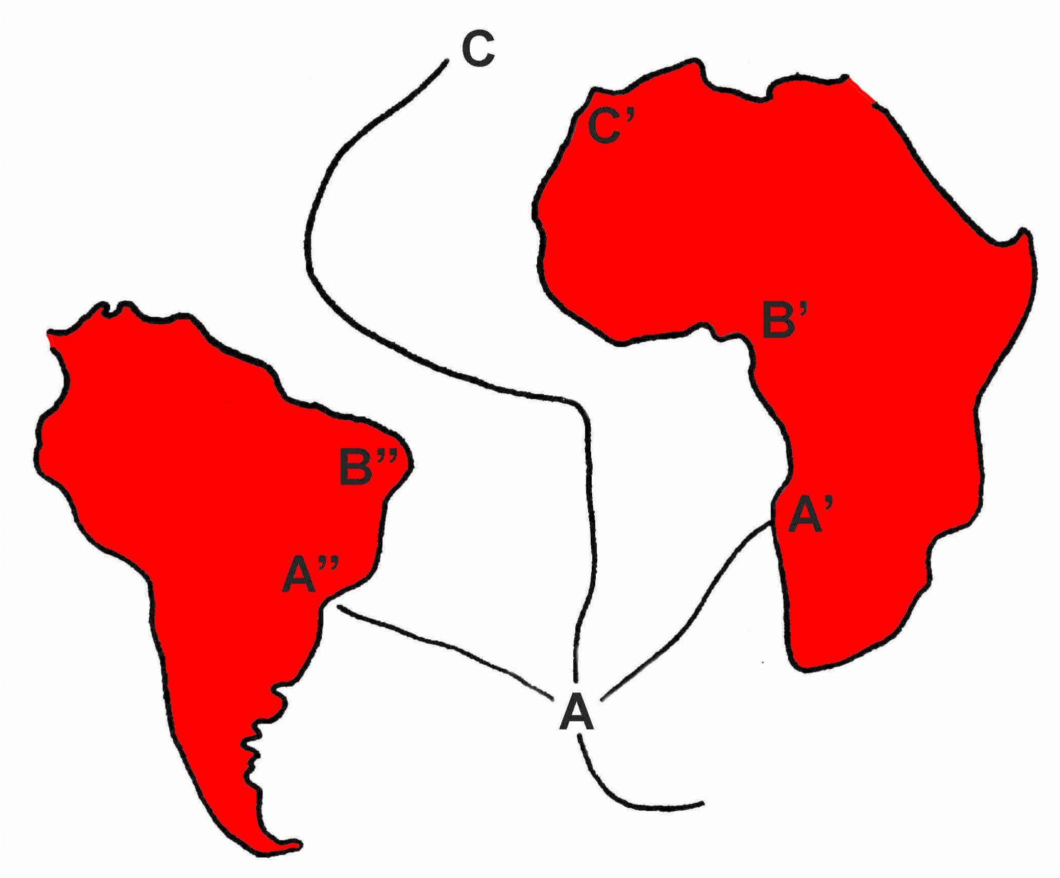

Fig. 2. *Main structural features of the South Atlantic*
A, B, C – Mid-Atlantic Ridge ; A, A’ - Walvis Ridge; A, A” – Rio Grande Ridge.
The points marked by the same letters were situated on the same position before opening of the Atlantic.

In the central part of the region is a ridge, where oceanic lithosphere is generated. The ridge generates two arrays of sub-aquatic volcanic mountains (i.e. the ridges: Walvis and Rio Grande) at the island of Tristan da Cunha (point A). The ridges reach the coasts of Africa and South America at the points A’ and A’’, respectively, i.e. at the points which contacted each other before the opening of the Atlantic Ocean. If we had to do with a simple drawing of the two continents apart from each other, all the three points should be located on a straight line. However, this is not the case, because the central point (A) is shifted to the South. In order to explain this situation, the proponents of the hypothesis of convection currents: Wilson [7], Dietz and Holden [2], had to assume, the movement of the whole plate to the North (Fig. 3) apart from assuming the circulation of the currents themselves.

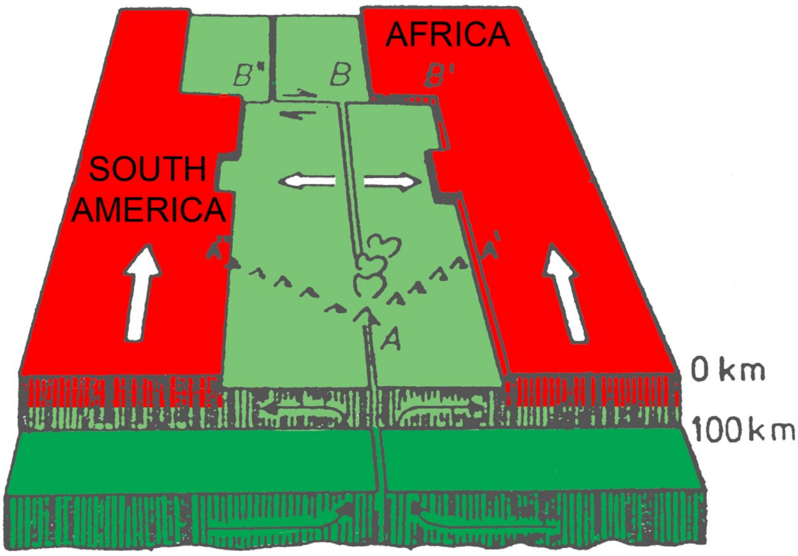

Fig. 3. *The sketch showing the development of the South Atlantic according to Wilson [7] see: Dietz and Holden [2] that has been based on the hypothesis of the convection currents and the assumption that the Earth radius is constant.*

This model is completely unclear in the frame of dynamics, as it requires a superposition of two movements without any mutual disturbance. Moreover, it does not give any explanation, in terms of dynamics, of the movement of the plate to the North. Furthermore, the model leads us to an evident contradiction. In the northern part of the considered region, the points on the ridge are shifted to the North, if compared to the corresponding points on the continental coasts (for instance the points C and C' in Fig. 2). Thus, the assumption of the movement of the whole plate to the South is necessary according to the presented model. However, such an assumption obviously contradicts the former one, i.e. the movement to the North, because it is impossible for any plate to move in opposite ditections at the same time. Consequently, this model is highly complicated and contradictory to the real tectonic structures.

One can assume a much simpler explanation that both the latitudinal drawing of the continents apart from each other, as well as meridional elongation of the ridge are being driven and controlled by one process, i.e. the isotropic stretching of the deep basement. The pattern that is observed in nature can be modeled easily by placing some stiff plates on a rubber base that is stretched radially (Fig. 4a and 4b).

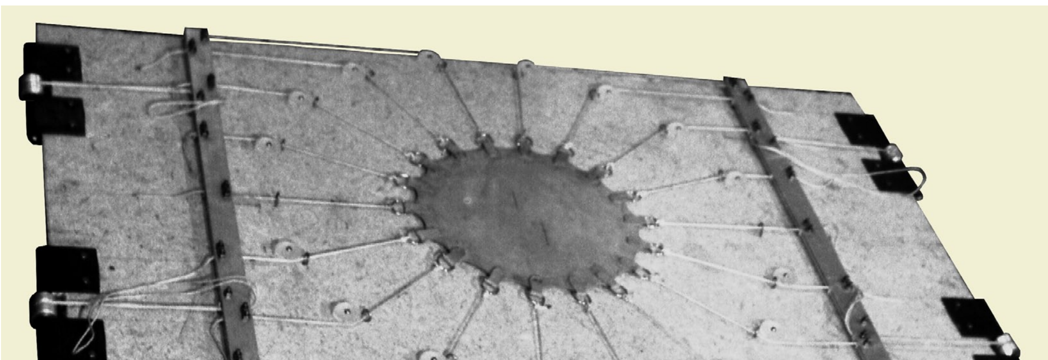

Fig. 4a. *The device for radial stretching of the rubber, which imitates the basis of the lithosphere below the depth of about 100 km (asthenosephere).*

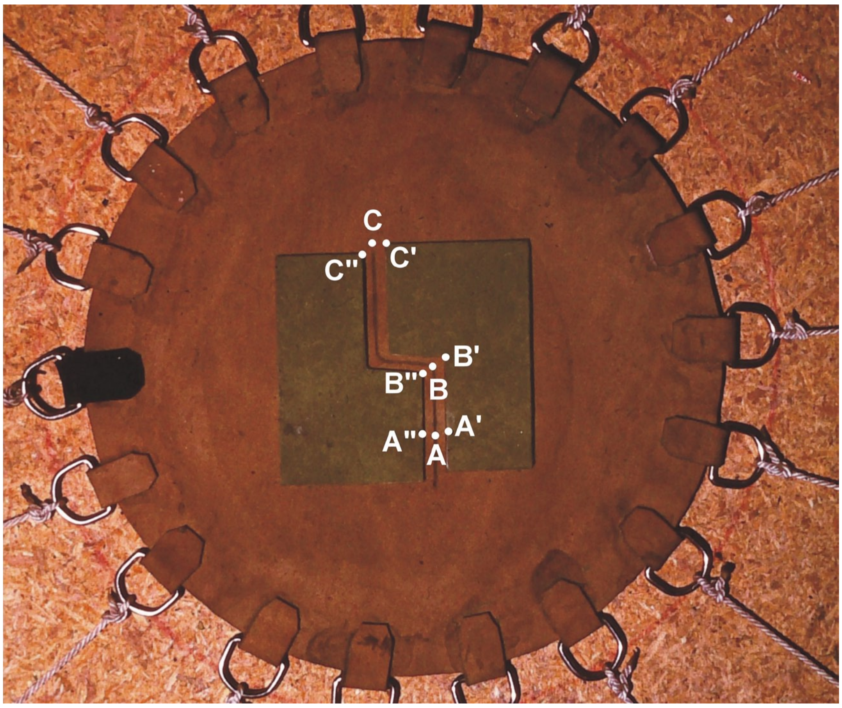

Fig. 4b. *The pattern of the tectonic plates illustrating the initial stage of the development of the Atlantic (compare with Fig. 2 and 3).*

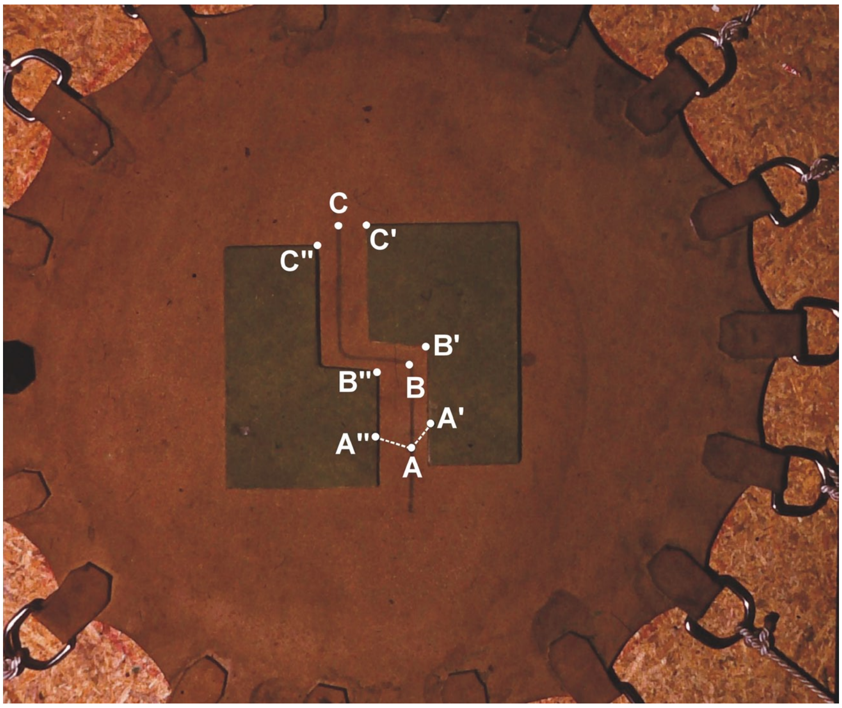

Fig. 4c. *The pattern illustrating the present stage of the development of the South Atlantic, resulting from isotropic stretching of the rubber.*

The situation resulting from the stretching of the rubber (Fig. 4c) corresponds to all observed relations, including the movement of the point C to the North. It also gives a very simple explanation of the whole system in terms of dynamics.

The presented model explains not only the drawing of the continents apart from each other, but also the elongation of the oceanic ridges when compared to the coast lines of the continents at the moment of the opening of the ocean, i.e. when the ridge and the continental coasts were located close to each other.

The elongation of the oceanic ridges produces a large scale copy or „caricature" of the shape of continental coasts. The oceanic ridges surrounding Africa and Antarctica are good examples of this – their shapes truly reflect the shape of the continents.

This relationship and its connection with the expansion of the Earth have been already shown by Carey [1] and Heezen [3]. Here, it will be only demonstrated on the device that has been presented above (Fig. 5a and 5b).

Fig. 5a. *On the left: the real shape of the oceanic ridge surrounding Africa. On the right: the shape of the ridge modeled with the assumption that the basis of Africa (asthenosphere) is being stretched isotropically.*

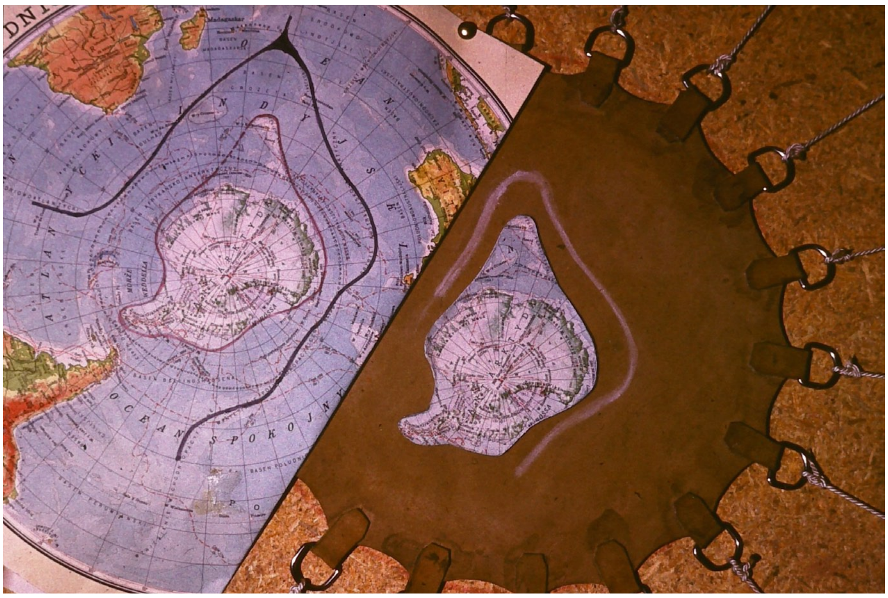

Fig. 5b*. On the left: the real shape of the oceanic ridge surrounding Antarctica. On the right: the shape of the ridge modeled with the assumption that the basis of Antarctica (asthenosphere) is being stretched isotropically.*

The shape of oceanic ridges which on a large scale reflects the outlines of continents is one of the main structural features of the Earth crust and can not be explained without the hypothesis of the expansion of the Earth.

Nevertheless, the theory of the expanding Earth cannot be reduced to the issues presented above. It explains many other important problems of contemporary geotectonics. It also removes basic contradictions among classic geotectonic hypotheses. Those problems have been presented by me in other lectures, beyond the Wroclaw Scientific Society. Whereas here, the scale of the expansion will be yet considered.

Function of the growth of the Earth radius

There have already been some attempts to estimate the growth of the Earth radius. Two highest values were obtained by Hilgenberg [4] and Carey [1] (Fig. 6).

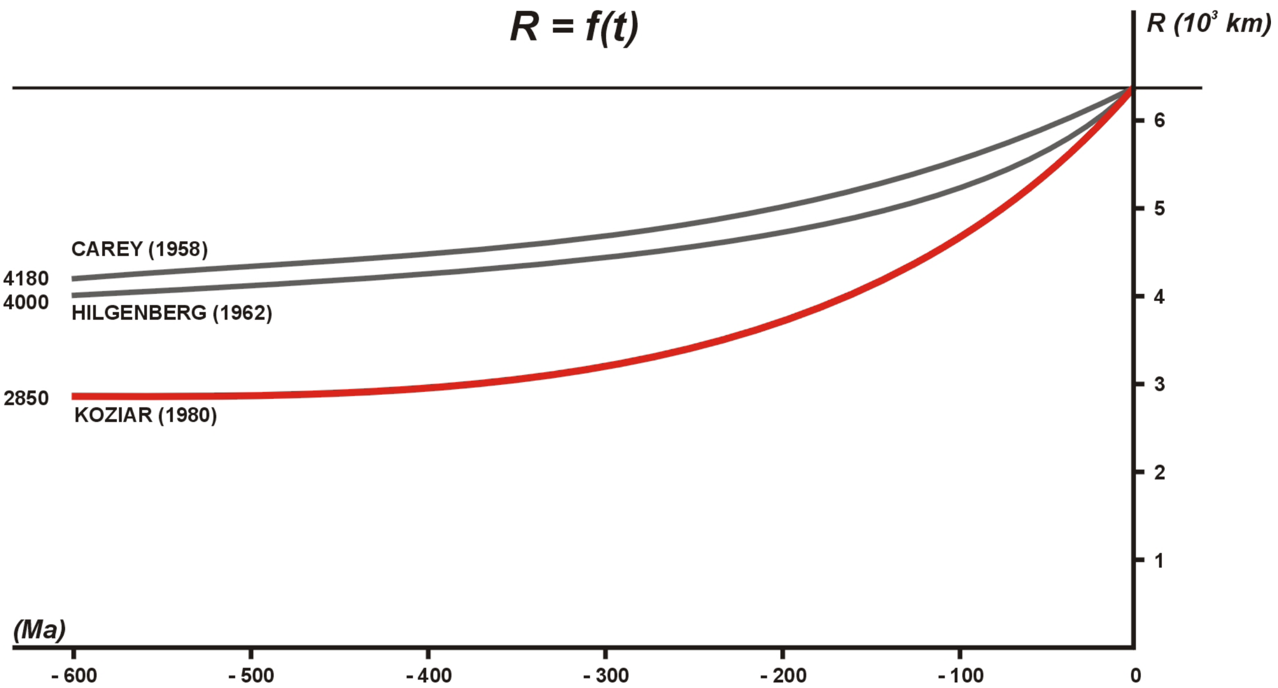

Fig. 6. *Function of the growth of the Earth radius. The values of the Earth radius in the past were calculated from the formula* $R_t = \sqrt{\frac{S - \Delta S_t}{4\pi}}$ *, where S is the present Earth surface area and* ΔS_t *is the measured global increment of the surface of the lithosphere starting from the moment t up to now. The obtained exponential function is expressed by the formula:* $R_t = A + Be^{\lambda t}$*, where: A = 2800 km; B = 3570 km;* $\lambda = 0{,}00725\ Ma^{-1}$*. Derivative of the function is:* $v_t = v_o e^{\lambda t}$*, where:* $v_o = 2{,}59$ *cm/year.*

Most of the estimations have been connected with the attempts of the reconstruction of the lithosphere. I used the chronological map of the oceanic lithosphere, measuring precisely the global increments of the lithosphere on the map at given time. In this way, proper values of the radius of the Earth could be calculated. The procedure could be applied to the Cainozoic and partially to the Mesozoic. It can be inferred from the data concerning the development of the continents, that at the end of the Precambrian the entire Earth surface was covered by the Precambrian crust that exists up today. In Fig. 6, it is represented by the point of the smallest value. The calculated points altogether could be well approximated by the exponential function (Fig. 6).

It is easy to calculate the present annual increment of the Earth radius from the function and it is 2.6 cm/year. That gives the present annual increment of the Earth volume which is 13 200 km^3 /year.

The Earth volume, according to the function, increased eight times starting from the end of the Paleozoic and twelve times starting from the end of the Precambrian.

It should be emphasized that so huge increment of the Earth volume must be caused by a process unknown to contemporary physics. Acceptance or rejection of the increment should be based on the analysis of facts only and not on the consistency with accepted scientific opinions.

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