

## ON PARALLELISM IN THE EVOLUTION OF ORGANISMS AND ITS ROLE IN SYSTEMATICS

N. N. YAKOVLEV

Palaeontological Society of the U. S. S. R., Leningrad

**ABSTRACT** :—The author discusses the effect of similar environment in producing similar forms at different periods. Thus different species of the "genus" *Strophalosia* originated from different species of *Productus* at various intervals in an attempt to keep the ventral "area" of the shell (fixed to the substratum) above the mud that was being rapidly deposited at the sea bottom. *Strophalosia* is, therefore, properly a "genomorphy". A parallel case is that of species of *Gryphaea*, both being of polyphyletic origin.

The author considers that "Orthogenesis" or "Trends in evolution" is not the resultant of any mysterious vitalistic force but merely an attempt at adjustment to environment.

**P**ARALLELISM in the evolution of organisms is observed when due to environmental influences, for instance, a rapid accumulation of silt (mud) deposits on the sea bottom—different species of the same genus (*Productus* among Palaeozoic brachiopods), give rise to new forms, belonging to new genera. It was generally assumed that different species of *Strophalosia* (*Strophalosia horrescens* and others) were of monophyletic origin, *i.e.*, they had developed from one common ancestral species of *Productus*. In fact the chief peculiarity of the genus *Strophalosia*—a high area of the ventral valve with pseudodeltidium—has developed in some species of the genus *Productus* independently of other species, for deepening of the ventral valve became necessary when there was danger for the animal living in a fixed position, to be buried under the mud that was rapidly accumulating on the sea bottom. Thus, when establishing new species of *Strophalosia*, they must *not* be compared with other species of that genus, but with species of *Productus*. Of course, it is the dorsal valves that ought to be compared, as they serve as a cover to the ventral valves; and in the forms intermediate between *Productus* and *Strophalosia*, these valves undergo but slight changes, if any. The character of the spines in the sculpture may also be taken into consideration when making comparisons and determining affinities. Such spines, for instance, are characteristic of the Permian species *P. tenuituberculatus* Barbot de Marny from

the town of Kirillov on the Beloje Lake. In 1907 I cited three examples of the provenance of three species of *Strophalosia* from three different species of *Productus* (Yakovlev, 1907). A similar phenomenon is observed in the case of *Gryphaea*, repeatedly originating from *Ostrea* in the course of the Jurassic period (Trueman, 1940). As *Strophalosia* and *Gryphaea* are not of truly monophyletic origin, they cannot be considered as independent genera and species, but represent only morphological grades and may be designated, in contrast to varieties, by the new term "genomorphs", proposed by Lang and Trueman. Thus, the number of genera may be considerably reduced. Similarly, *Proboscidella* and *Kutorginella* are 'genomorphs' of *Productus* from the Carboniferous and Permian.

The progressive evolution of the corals *Hexacoralla* and *Tetracoralla* represents an independent parallelism in the development of ancestors and descendants in their passage from the state of a solitary coral to a compound polypary—at first branching and subsequently grading into a massive polypary, with closely adhering and coalescing walls of the separate individuals of the colony. This gives the polypary greater compactness and makes it possible for the Mesozoic *Thamnasteria* and the Palaeozoic *Phillipsastrea* to discard the now useless wall of the separate individuals (Lang, 1938). Besides, some of the Mesozoic corals (*Microsolems*) subsequently develop porous septa. This

obviously reduces the effort on the part of the coral in secreting the skeletal material, as well as the energy required for the construction of its colony (the principle of economy of building material and energy). The gradual development observed in separate groups of animals and termed by some scientists "orthogenesis" or "trends in evolution," is considered by them from the vitalistic point of view, as an expression of the principle of self-improvement or the result of some mysterious internal factors. To such a conception must be opposed a realistic explanation of the above mentioned phenomena based on the influence of the physical

environment—similar environmental conditions leading to analogous changes—on which are dependent the above mentioned instances of parallelism.

## REFERENCES

- Lang, W. D., 1938, Some further considerations on trends in corals. *Proceed., Geologists Assoc.*, London, Vol. XLXX, pt. 2, pp. 148-159.
- Trueman, A. E., 1940, The meaning of orthogenesis. *Trans. Geol. Soc.*, Glasgow, Vol. XX, pp. 77-95.
- Yakovlev, N., 1907, Sur la fixation des coquilles de quelques Strophomenacea. *Bull. Comm. Geol.*, St. Petersburg, Vol. XXVI, No. 4, pp. 181-201.