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Book review

Rosa's "Hologenesis" revisited

D. Rosa: Ologenesi. Nuova Teoria dell' evoluzione e della distribuzione geografica dei viventi [R. Bemporad & Son Publishers, Florence, 1918]. Edited by A. La Vergata. Giunti Gruppo Editoriale, Florence 2001. 446 pp. €40 soft cover ISBN 88-09-02334-X.

The biological disciplines have undergone an exponential growth in the last few years. This has been due to the development and use of sophisticated technologies, and to many non-reductionist biologists' renewed interest in the more theoretical aspects of their sciences. For example, the works of Mayr (1982), Omodeo (1984), Papavero and Llorente-Bousquets (1993–1996), Papavero et al. (1995–2002), and the several authors that collaborated on P. Tort's *Dictionnaire* (1996) and on P. Rossi's *History of Science* (1985), all exemplify this renewed interest in the theoretical. In my opinion, the concern for theory is derived from a general reflection on a scientific area's general frame of reference, although having often gained quite brilliant results in many subfields of biology it continually needs to be updated with new and more explicit paradigms. However, the theoretical *corpus* of these new paradigms cannot avoid a rigorous historical and philosophical analysis.

The reprint of Daniele Rosa's (Susa and Italy, 1857—Novi Ligure et al. 1943) major work, "Ologenesi. Nuova Teoria dell' evoluzione e della distribuzione geografica dei viventi"[1] should be included in such analyses. This book was originally published in 1918 in Florence, when Rosa was full Professor of Zoology at the University of Modena (see Colosi, 1961; La Vergata in Tort, 1996; Luzzatto et al., 1997, 2000). Rosa's meditations on evolution, and his lack of satisfaction with the Darwinian version of evolution, had started long before, probably when he was still a student at the University of Turin, where he attended Michele Lessona's enthusiastic and completely a-critical classes on Darwinism (Zunino, 1996). In 1899, Rosa published an essay on variability's progressive reduction (translated into French in, 1900; re-published in German in 1903), followed by other theoretical articles (see bibliography in Luzzatto et al., 1997). After the publication of "Hologenesis", the rest of Rosa's scientific contributions, 12 works in all, were devoted exclusively to the discussion and further development of his theory. Especially noteworthy was his comparative synthesis of evolutionary theories (entry "Evoluzione", *Enciclopedia Italiana*) published in 1932.

Why reprint "Hologenesis" today? Moreover, why the critical edition, one preceded by 70 pages and 133 endnotes, and including four new appendices (Rosa, 1909, 1915, 1926; Colosi, 1944)? To answer these questions it is necessary to recall at least some of Rosa's ideas, particularly those concerning the concept of species and some aspects of the speciation process. From a synchronic standpoint, Rosa defined species as "germinal discontinuities", and he characterized them as having a "specific idioplasm" (an expression the author created to translate the German term "*Artenplasm*", that had started to be used after Nägeli's works, into hereditary material) that determined their individuality. It is clear that Rosa considered this to be a biological definition of species. His species concept was not "relational", it was "cohesive". This concept was published in recent times by Paterson and colleagues (see Lambert et al., 1987; Paterson, 1978, 1981, 1985) and it disagrees with the current orthodoxy of Darwinism. It is nevertheless important to emphasize that for Rosa (p. 216)[2], "…the species comes to be formed by the whole internode between two successive halvings, or, in any case, by the whole rectilinear tract of evolution that has been produced after the last halving. We can call these 'phyletic species' or 'phylomerus' (segment of *phylum*)…"[3]; "evolution's rectilinear tracts have been so extremely long that a 'species', throughout each of them, can transform itself in such way that many forms must be detected in it, that they ascribe to different species or

[1] "Hologenesis. New theory of evolution and geographic distribution of the living beings."

[2] The pagination always refers to this 2002 edition.

[3] "la specie viene ad essere costituita da tutto l'internodio che sta fra due successivi sdoppiamenti o, ad ogni modo, da tutto il tratto rettilineo d'evoluzione che s'è prodotto dopo l'ultimo sdoppiamento. Possiamo chiamare 'specie filetica' o 'filomero' (segmento di *phylum*) …"

even genera.''[4] ''Therefore, we have in the entire rectilinear tract the same 'phyletic species', but the latter is presented in successive development stages, and precisely like we always have the same individual in front of us, whether as an egg, embryo, young or adult stage.''[5] Here, like in other parts of Hologenesis and successive works, Rosa clearly advocated a strictly historical/genealogical species concept, and fully recognized the distinction between anagenesis and cladogenesis—a discrimination that is evanescent in modern Darwinism. Although discussed in more complex biological and philosophical contexts, Rosa's species concept is found in the ideas of recent authors, where the concept of species is developed as an individual entity, with genealogical properties (see discussion and references in Zunino and Palestrini, 1991; Papavero and Llorente-Bousquets, 1992; Luzzatto et al., 1997, 2000).

With regard to the speciation process, Rosa argued it was always a dichotomic event, which to him implied the ''mother species'' always went extinct. Interestingly, this concept was fundamental to Hennig.[6] Even though Rosa justified his rigid dichotomies by appealing to internal and nebulous causes, it must be highlighted that these dichotomies do not correspond to the product of a classificatory process of Platonic-Aristotelian origins. Rather, they coincide with the graphical transcription of a *biological process*, speciation, which for Rosa was always (and necessarily) binary. The process was considered to be constantly asymmetric, and at every speciation event it generated a ''precocious branch'' and a ''tardy branch''. The outcome of this was that genealogical trees should really be represented by asymmetrical graphs (see figure on p. 344; see also Rosa, 1915). Such principles decisively foreshadow Hennig's ideas on speciation and his ''deviation rule'', and also the criteria with which many of the phylogenetic trees appearing in Rosa's works were created (see fig. 70).

Rosa determined that phylogenetic trees must be translated into scalar classification schemes (see vertebrates' classification: table on p. 238), which not unreasonably may evoke (at least to me) some of Hennig's and cladism's concepts and operations. For example see Hennig's fig. 47 (1966, p. 150), in which the phylogenetic relationships of five Brachiopoda groups and their relative taxonomic ranks are schematized.

The similarity between Rosa's and Hennig's ideas appear even more evident if we consider that both authors graphed their conceptions of the relations between systematic groups (synchronic) and phylogenetic processes as dichotomic trees or Eulero-Venn diagrams. Rosa's figure (p. 308) can be compared with many of Hennig's schemes, such as fig. 45 (1966, p. 148), in which he summarized the concept of monophyly. Both authors represent complex phylogenesis models with diagrams whose general structure corresponds to that of Cantor's fractal (Rosa, p. 240, 344; Hennig, figs 64 and 65).

There has been extensive discussion of the relationship between Rosa's and Hennig's ideas, and more recently between Rosa's and L. Croizat's panbiogeographic ideas—sometimes in an excessively polemical manner (e.g. Croizat, 1962; Simonetta, 1994). La Vergata (1996, p. 75, note 132) reminds us how some of Hennig's Rosa ''assonances'' could have led to suppositions regarding a possible direct relationship between the thought of the father of cladistic science and that of the inventor of hologenesis. The relationship may be much stronger than what Hennig's bibliography indicates. According to Lanza (in La Vergata, 1996, p. 75, note 132), Hennig attended the University of Florence's Institute of Zoology at the time Giuseppe Colosi, one of Rosa's students and disciples, was teaching there, and ''it is quite improbable that he did not learn of Rosa's work.'' It is a fact that Hennig only quotes Rosa's (1899) publication, mostly underscoring that the principle of ''variability's progressive reduction'' had already been previously stated by Fechner (1873) (a source Rosa seems not to have known about). Then again, it is also true that Hennig appears to be unfamiliar with Mitchell's (1899) and Camp's (1923) works. As discussed by (Papavero and Llorente-Bousquets, 1993), these papers represent a current of thought decisively anticipating that of ''Phylogenetic Systematics''.

I personally believe that the history of Hennig's ideas does not require a *polemical* discussion. Unlike synapomorphies, new ideas are not always shared by monophyletic groups of thinkers. Phylogeny of thought can be analyzed in terms of autapomorphies, as well as synapomorphies, convergences, and parallelisms. Seeing the problem in this particular light, we should only be concerned with which concepts we are following, and why. For this reason, knowledge of the history of thought in biology, and in this specific case, Antonello La Vergata's work on Rosa's Hologenesis, is extremely relevant.

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[4]''i tratti rettilinei dell' evoluzione sono stati lunghissimi tantochè la 'specie' nel corso di ciascuno di essi può trasformarsi in misura tale da doversi distinguere in essa molte forme che essi [i paleontologi: Rosa non condivide questa posizione. MZ] attribuiscono a specie o anche a generi diversi.''

[5]''Abbiamo dunque in tutto il tratto rettilineo la stessa 'specie filetica' ma questa ci si presenta in successivi stadi di sviluppo, precisamente come abbiamo sempre davanti a noi lo stesso individuo, sia esso allo stato di ovo, di embrione, di giovane o di adulto.''

[6]In this paper, we will always and exclusively refer to Hennig's fundamental work in its 1966 English version.

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