Lecture Notes in Morphogenesis
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Salvatore Tedesco *Editors*

Glossary of Morphology

Springer

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Lecture Notes in Morphogenesis is an interdisciplinary book series which aims to face the questions of emergence, individuation and becoming of forms from several different points of view: those of pure and applied mathematics, of computational algorithms, of biology, of neurophysiology, of cognitive and social structures. The set of questions above concerns all the manifestations of Being, all the manifestations of Life. At the heart of contemporary embryogenesis lies an essential question: How can form emerge from the constant, chaotic flow? How can a sequence of purely informational elements — an a-signifying combination of chemical substances organized in the DNA molecule — evolve into the highly complex and structured forms of the living organism? A similar question can be asked when we deal with the morphogenesis of vision in neural systems and with the creation of evolving synthetic images, since digital technology makes possible the simulation of emergent processes both of living bodies and of visual forms. Finally the very idea that abstract structures of meaning could be captured in terms of morphodynamic evolution opens the door to new models of semiolinguistics, semiotic morphodynamics, and cognitive grammars. An entire heritage of ideas and concepts has to be reconsidered in order to face new and challenging problems: the theoretical framework opened by Goethe with the introduction of the word "Morphogenesis" is developed by D'Arcy Thompson in "On Growth and Form", it is reorganized with new theoretical insights by the classical structuralism of Levi-Strauss and formalized by the dynamical structuralism of René Thom. The introduction of the post-structuralists ideas of individuation (in Gilbert Simondon and Gilles Deleuze) and plasticity of structures builds a bridge to contemporary problems of morphogenesis at a physical, biological, social and transindividual level. The objective of this book series is to provide suitable theoretical and practical tools for describing evolutionary phenomena at the level of Free boundary problems in Mathematics, Embryogenesis, Image Evolution in Visual Perception, Visual Models of Morphogenesis, Neuromathematics, Autonomy and Self-Organization, Morphogenetic Emergence and Individuation, Theoretical Biology, Cognitive Morphodynamics, Cities Evolution, Semiotics, Subjectivation processes, Social movements as well as new frontiers of Aesthetics. To submit a proposal or request further information, please use the PDF Proposal Form or contact directly: *Dr. Thomas Ditzinger (thomas.ditzinger@springer.com)*

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Rhythm

Alessandro Bertinetto

Definition. The word derives from the Latin *rhythmus* and the Greek ῥυθμός, akin to ῥέω "to flow". It means the temporal ordered succession of FORMS of movement, which can be aurally or visually perceived (see PATTERN). By extension, it means the regularity with which a PHENOMENON occurs and an organism develops as well as the more or less rapid and intense development of the phases of an activity. Figuratively, it refers to the regular succession of static spatial FORMS such as ornamental motifs and architectural volumes. Since Aristoxenus (IV Century B.C.), theories of RHYTHM have been elaborated primarily in connection with poetry and, especially, with poetic metrics where it indicates the regular alternation, in a verse, of accented and unaccented syllables. Together with and harmony, it is one of the three most important elements of music and means "the systematic patterning of sounds in terms of timing, accent, and grouping" (Patel 2008, p. 96). As such, it is part of the sonic structure of a language and rhythmic skills are part of a speaker's competence in her language.

Philosophical Accounts. As a FORM of order of events in time and/or SPACE, RHYTHM contrasts on the one hand with kinetic chaos and on the other with kinetic continuum, which are respectively too varying and too unvaried to be considered ordered. Following Hamilton (2011), three main philosophical explanations have been given of RHYTHM. A static or *intellectualistic* account and a *dynamic account* articulated into the *humanist* and the *organicist* account.

1. The intellectualistic account conceives of RHYTHM as abstract order-in-time, i.e. as a PATTERN of stressed and unstressed sounds and silences. Defining RHYTHM as "the way in which one or more unaccented beats are grouped in relation to an accented one" (Cooper and Meyer 1960, p. 6), it identifies RHYTHM and metre. This view is largely dominant in musicology.

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2. Dynamic accounts generally see RHYTHM as "order within movement" (Plato 1970, Book ii, p. 665), i.e. as the dynamic event occurring within the self-repeating schema provided by the metre (Grüny 2014, p. 193). More precisely, it is "the imposition of accent on sequences of sounds or movements, creating non-periodic phenomena usually within a periodic, repetitive (metrical) framework" (Hamilton 2011, p. 26). (a) The *humanistic* dynamic account stresses the participation of human actions and movement in the production of RHYTHM. Natural phenomena such as the sound of hooves from a running horse or the rattling produced by the movement of a train are experienced as rhythmic when expectations about continuation of PATTERNS are generated and projected onto a regular succession. In this sense, "the essence of rhythm is the preparation of a new event by the ending of a previous one" (Langer 1953, p. 126). Since expectations produce tension and release in those who feel them, RHYTHM is then understood as an energetic-participative PHENOMENON. (b) The *organicist* dynamic account elaborates on two related core ideas: the view of RHYTHM as an order that cannot be abstracted from the thing or event (Hasty 1997, p. 6) and the rooting of RHYTHM in the BODY (Storr 1992, p. 33). Thus, the origins of RHYTHM are traced "in both phylogenetic and ontogenetic terms, to human awareness of pulse or breathing, and the alternation of tension and relaxation characteristic of such bodily processes" (Hamilton 2011, pp. 28, 29). RHYTHM is therefore understood as that "ordered variation of changes" (Dewey 1934, p. 158), i.e. as that tension between change and stability or continuity through change that not only pervades literary, musical, plastic, and architectural arts, but is also located in *nature* in the first place. In this sense, "[r]hythm is a universal scheme of existence, underlying all realization of order in change" (Dewey 1934, p. 158). It inheres the cycles of LIFE: season changes, day and night alternation, birth and death, migration cycles, etc. The constant RHYTHM of undergoing and acting regulates the relation between individuals and the environment. This view of RHYTHM is the most interesting for MORPHOLOGY and is consistent with the scientists' thesis according to which "[n]o matter where you look in nature, rhythms are to be found. They involve all levels of the hierarchy of organic LIFE from the molecular to the ecological, from the oscillations in enzyme activity to the recycling of carbon and nitrogen in the biosphere: "The whole pattern [of nature] is of cycles within cycles within cycles" (Medawar and Medawar 1983). Even if a RHYTHM is too slow to be detected directly, evidence of it may still be obvious. Tree rings, the grooves in a ram's horns and the stripes in a seashell all are indications of rhythmic growth, in this case, the rhythmic deposition of material" (Flannery 1990, p. 118).

Philosophical speculations such as Klages' (1974) and Deleuze and Guattari's (1987) elaborate on the ORGANIC account of RHYTHM, respectively, defending that rhythmic PATTERNS ("rhythms of cosmic life") govern the universe and extending rhythmic organization, as continuity within variation, to anorganic nature.

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