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Titolo	Emergence and Modularity in Life Sciences [[electronic resource] /] / edited by Lars H. Wegner, Ulrich Lüttge
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Descrizione fisica	1 online resource (XIV, 279 p. 62 illus., 46 illus. in color.)
Disciplina	570
Soggetti	Systems biology Philosophy and science Ecosystems Plant science Botany Systems Biology Philosophy of Science Plant Sciences
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Preface -- The Basics -- Is there anything new under the sun? -- Instability as the core of emergence -- Emergence and modularity in life sciences and beyond -- The emergence of sustainability -- From modules to emergent holistic properties in living organisms -- Modularity versus emergence: How to cope with complexity in whole plant physiology? -- Emergence in biomimetic materials systems -- Roots of complexity in the self-referential genetic code -- Brains emerging: on modularity and self-organization of neural development in vivo and in vitro -- Plants: Unitary organisms emerging from integration and self-organization of modules -- Ecology: Ecosystems and biodiversity -- Ultimate Integration -- Emergent properties and stability in hierarchical bio-systems: there is no privileged level of causation -- Emergence and sustainment of humankind on Earth: the categorical imperative -- Gaia – a holobiont-like system emerging from interaction.

This book focuses on modules and emergence with self-organization in the life sciences. As Aristotle observed so long ago, the whole is more than the sum of its parts. However, contemporary science is dominated by reductionist concepts and tends to neglect the non-reproducible features of complex systems, which emerge from the interaction of the smaller units they are composed of. The book is divided into three major parts; the essays in part A highlight the conceptual basis of emergence, linking it to the philosophy of science, systems biology and sustainability. This is subsequently exemplified in part B by applying the concept of emergence to various biological disciplines, such as genetics, developmental biology, neurobiology, plant physiology and ecology. New aspects of emergence come into play when biology meets the technical sciences, as revealed in a chapter on bionics. In turn, part C adopts a broader view, revealing how the organization of life follows a hierarchical order in terms of scalar dimensions, ranging from the molecular level to the entire biosphere. The idea that life is primarily and exclusively shaped by processes at the molecular level (and, in particular, by the information encoded in the genome) is refuted; rather, there is no hierarchy with respect to the level of causation in the cross-talk between the levels. In the last two chapters, the evolutionary trend toward ever-increasing complexity in living systems is interpreted in terms of the Gaia hypothesis sensu Lovelock: the entire biosphere is viewed as a functional unit (or 'holobiont-like system') organized to develop and sustain life on Earth.

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