# 2
# Novelty in Evolution

## 2.1 The Quest for Attention

Novelty is a central phenomenon in organizations and a central construct in theories on learning, change and adaptation. In evolutionary theories, novelty has been referred to as the implicit "lifeblood" (Levinthal 2008, p. 98), since it is the motivation for learning, the source of change and the reason for adaptation. As Witt stated: "For a proper notion of socioeconomic evolution, an appreciation of the crucial role of novelty, its emergence, and its dissemination, is indispensable" (Hodgson 1995, p. 473). However, it is also the ancestral "thorny problem" (Becker et al. 2006). Darwin never truly answered the question about the origin of change, and novelty remained excluded from the focus of evolutionary theories (Padgett and Powell 2012). With such a gap in the theory, early critiques of Darwin pointed out the difficulty of accounting for the new characters that appeared, as a result of variations and mutations (Muller and Wagner 1991). Moreover, the inability to define the nature of novelty appeared to some as a problem that challenged the entire theory. The quest for a deeper understanding of novelty is as old as the formulations of theories about the evolution of organisms (Winter 2004),



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and it is central to them, both conceptually and methodologically. However, it is far from being satisfactorily understood.

Historically, evolutionary studies have focused on adaptation and selection; that is, they focused on the change occurring from one state to another, rather than on the novelty stimulating change. This preference has resulted in a view of evolution that emphasised kinematics (i.e., the study of how things move or change), instead of dynamics (i.e., the study of why things change) (Fontana 2001). In addition, the questions concerning why and where the material of evolution emerged were relegated to the borders of the theory (Pigliucci 2008).

In line with the evolutionary perspective as such, the main stream in the social sciences has adopted Darwin's approach (Nelson and Winter 1982; Simon 1962; Hannan and Freeman 1989), and it has developed and diffused an "adaptionist program" that has largely prevented the analysis of novelty (Levinthal and Rerup 2006, p. 98). In fact, a consistent part of the literature in organization studies has investigated selection and reproduction within adaptation (Argote 2013; Argyris 1982; Cyert and March 1963; Hedberg et al. 1976; Levitt and March 1988; March and Olsen 1998; March and Simon 1958), whereas the processes regarding the emergence of novelty have remained widely unexplored.

In biology, jumps in evolution, which can be related to breakthrough novelty, are mainly referred to as "mutation". However, in the social sciences, since Schumpeter, who unsuccessfully searched for patterns and regularities in disruptive change, mutation has been more the "label for the inexplicable" (Becker et al. 2006, p. 357), rather than an explanation of the generation of novelty. In the literature on organizations, while some dynamics are sketched, an understanding of breakthrough novelty generation—that is, mutation—is still far to come. At the most, the main source of novelty has been considered as recombination (Levinthal 2006), even if it has been associated with several instances that differ in scope and nature, which has resulted in a confusing, if not inconsistent, picture.

A recent growing interest on the origins of change and on emergence, rather than on evolution and diffusion, has appeared both in biology (see the so-called evo-devo stream of research) and in the social sciences (e.g., Padgett and Powell 2012). In particular, in the social sciences, it has been striking to clarify the role of agency and how it challenges (or is compatible with) evolutionary theories. This focus can correspondingly illuminate our reasoning on the role of design and emergence.

This chapter addresses the core of evolutionary theories searching for conceptions of novelty that are typically assumed rather than clearly stated. Despite the fact that the evolutionary perspective is not the only viewpoint available in organization studies, it has fruitfully served as a unifying perspective for the diverse theories in organization (Stoelhorst 2008; Aldrich and Ruef 2006; Durand 2006). Moreover, it is the natural perspective when addressing change and its complementary and originating phenomenon; that is, novelty. A deeper investigation within the evolutionary theory and in its developments clarifies the nature and the peculiarities of novelty (as stated in biology), and to discuss how they adapt or differ in the context of organization studies.

This approach is important in order to distinguish the original conceptions of novelty from the ideas that resulted from the inclusion of the evolutionary perspective in organization studies, especially since such a process did not result in a univocal and unique viewpoint. In other words, an important passage for improving clarification is the discussion on how evolutionary theories in biology have been included in the social sciences, and how this has impacted the actual understanding of novelty. However, there is some confusion on several aspects of novelty and change, such as the role of randomness, the role of intent and will in human action, and the role of random variation and of purposeful adaptation, all of which make novelty the result of uncontrollable forces or the result of design. This makes it difficult to understand to what extent emergence and design are responsible for the generation of novelty, which is essential for a reasoning of their engineering. In fact, this chapter considers whether novelty is derived from randomness or purposeful planning in order to address what role emergence and design may have in novelty generation. Within evolutionary studies in the social sciences, this question has traditionally been translated into the question of to what extent novelty is the result of learning or selection; that is, if novelty is more related to a Lamarckian or Darwinian conception of novelty. This point is not just speculative, but it has important implications on the possibilities of generating novelty and controlling its production. For instance, if novelty is mainly related to evolutionary change and selection, then what is the role of organizational intent and design in this picture?

## 2.2 Novelty in Darwin's and Lamarck's Theories

"Evolution refers to the development of a form—an organism or other unit—from a simpler to a more complex or advanced state (*Shorter Oxford English Dictionary 2003*, Vol. 1: 876)" (Child 2012, p. xiv). The word comes from the Latin word *volvere*, meaning "to roll", which provides the idea of motion (Hodgson and Knudsen 2006b). However, the focus of evolutionary research has been on how the development occurs, and how novelty has been assumed. According to Child (2012, p. xiv), there is "a pre-existing form from which evolution proceeds [that] contains the rudiments of the parts of the evolved form". As such, novelty is both the ingredient and the result of adaptation. In other words, novelty is the material on which natural adaptation is built, and the effect of adaptation to specific environmental conditions. These two levels are closely connected, and they appear as two levels at which novelty can be considered: *Type A*, the *ingredient* novelty; and *Type B*, the *result* novelty.

Evolutionary literature has mainly addressed how the result of adaptation—Type B novelty—was provided by evolution. The focus is on the result of evolution, and typically, theories provide explanations of how a species has evolved into its observed condition. It is possible to identify two main explanations of evolution: the so-called Lamarckian and Darwinian explanations. They have animated the debate since their introduction, and they still build the main reference points for contributions in the evolutionary perspective. In biology, the debate as to how evolution of organisms occurs has centered on Darwin's theory of natural selection (Darwin 1859). Conversely, in the social sciences, whether the evolution of organizations follows a Darwinian or a Lamarckian perspective still stimulates lively discussions, and it is still the subject of open debate. Both of these perspectives need to be considered for understanding how organizations interact with their environments and the consequences of such interaction for their evolution (Child 2012). They are also important for the purpose of this book—the understanding of novelty in the organizational realm—since they illuminate the issue of novelty on two aspects.

First, despite that it is not the purpose of these theories, by explaining evolution, it also explains how (Type B) novelty is provided as a result of such a process. In fact, novelty is the complement of change; that is, it is other side of the same coin since it provides the novel element that combines with the existing one (Levinthal 2008). As such, evolutionary theories illustrate how novelty survives and affirms itself. Second, even though it does not directly address novelty, by explaining change they reveal a concept of novelty, accounting for its role and motivation for change (Type A).

Lamarck (1809) viewed evolution as learning, and believed that organisms change over time from simple to complex forms that are more suitable for the environment in which they live (Child 2012). His thesis claimed that organisms transmit to their offspring the characteristics that they develop during their lifetime. Such characteristics are the result of environmental adaptation. In this perspective: (1) novelty is *nurtured*, that is, generated over a lifetime by the more frequent use of features that are best suited to the environment (or their disuse); and (2) novelty is *inherited*, that is, it is passed on to the next generation.

Darwin (1859) maintained evolution as selection. The best-suited organisms that survive under certain environmental conditions have greater possibilities to pass on their given characteristics to the subsequent generation. These organisms will mate more often and their offspring will be stronger, thus increasing their chances of survival. From this perspective, organisms that derive from evolution are determined by the environment, which selects those that will survive and those that will become extinct through the variation-selection-retention (VSR) model. In this regard, there are three aspects to note (Smith 1993; Mayr 2001): (1) novelty identifies with the continuous production of variation concerning the *natural* uniqueness of each organism; (2) such variation is passed on to the offspring; and (3) there is a natural selection operating on such variation, after which only some organisms are retained. In other words, variation bestows a higher survival rate on organisms, and as a result, they will have a higher possibility of generating larger offspring that diffuse these beneficial variations into the entire species. The main sources of novelty and variety include (Hodgson 1997, p. 406): meiosis, that is, the recombination of genetic information of parents in sexual reproduction; and mutation, that is, damages, errors, insertion or deletion of segments of DNA. Such variations appear without any purpose and in absence of a cause that can be captured in present models or through available knowledge.

At the time when Lamarck and Darwin offered their contributions, neither molecular biology nor genetics had been considered. Accordingly they mainly based their theories on observations of morphological traits.[1] Both of their theories have been integrated and corrected in light of the development of certain disciplines (Pievani 2009). The concepts of genotype and phenotype have been used to discuss the differences between the Lamarckian and Darwinian perspectives, claiming that, at the core of the theories, there is the idea that novelty is phenotypic in the first perspective, while it is genotypic in Darwin's perspective. However, recent studies have shown that the picture is more complex. Thus, the challenge for research is not simply discarding one and adopting the other.

Since the theoretical and experimental work of August Weismann (1893) excluded the possibility of inheriting acquired (phenotypic) characters by human organisms, Lamarckism, as a general explanation of evolution, has been overshadowed in modern biology. Weismannism or neo-Darwinism is a contemporary perspective in biology, often confusingly labeled as "Darwinism", thus acknowledging genotypic variance as the only basis of evolution (Hodgson and Knudsen 2006b; Child 2012). This perspective helped establish the concepts of Lamarckism and Darwinism as irreconcilable opposites (Hodgson and Knudsen 2006a, b). However, Darwin (1859) never dismissed the idea of phenotypic adaptation and its inheritability. In addition, recent studies in biology have recovered the Lamarckian idea of phenotypic adaptation to the environment as complementing genotypic-based evolution. As a reference for this discussion, Table 2.1 presents the essential definitions in evolutionary theories.

Table 2.1 Evolutionary perspectives on novelty

| | Lamarckism | Darwinism | Weismannism or Neo-Darwinism | Darwinian pluralism |
|---|---|---|---|---|
| **Main reference** | Lamarck (1809) | Darwin (1859) | Weismann (1893) | Gould (2002) |
| **Evolutionary mechanism** | Learning | Selection | Selection | Learning and selection |
| **Type A novelty** | Acquired variation through frequency of use | Natural variations: no influence or control through behaviour | Natural variations: genetic encoding; No genotypic inheritance of phenotypic characters | Both acquired and natural variations: developmental encoding |
| **Type A novelty "reframed"** | Phenotypic novelty | Genotypic novelty | Genotypic novelty: meiosis and mutation | Both: Genotypic novelty: meiosis and mutation; Phenotypic novelty: phenotypic plasticity, epigenetic, behavioural novelty |
| **Type B novelty** | Biodiversity of extant species | | | |

## 2.3 The Sources of Novelty in Contemporary Evolutionary Biology

While several issues are still strongly debated, different perspectives in evolutionary biology share a Darwinian core, where natural selection is acknowledged to be, by far, the main mechanism of change (Pievani 2009), but not the exclusive one. Other causes also play a role, even if scholars diverge in their assessments of their relevance. The perspective that allows several possible causes to jointly explain evolution is labeled as "Darwinian pluralism" (Gould 2002). While the debate is rich and articulated, at least three main findings need to be considered.

First, research in biology has clarified that not all traits are only defined by the genotype. In fact, organisms adapt to their environments through phenotypic plasticity; that is, "the capacity of a single genotype to exhibit a range of phenotypes in response to variation in the environment" (Whitman and Agrawal 2009, p. 1). In other words, organisms accumulate silent genetic variations that can be activated in particular cases of environmental stimuli or stress. It has been shown that such traits influence subsequent evolution (Whitman and Agrawal 2009).

Second, epigenetics[2] clarified that genes build a complex network that reflects both the interactions and their structural proximity. Although the interactions of such genes build the phenotype, there are different ways to connect and position genes so that they may provide the same function. For example, a protein can be codified by several genes, and vice versa, genes can be responsible for generating several proteins. This opens to variations that are not genic but *epigenetic*, meaning that the change does not alter the genotype, but its activity. Such variations are relevant for evolution since research has shown that they are inheritable.

Third, another still disputed "add-on" to the Darwinian perspective that recalls the Lamarckian position is the so-called Baldwin effect. Baldwin accounted for variations in behaviour that affect survival and reproduction rates. Suppose that a species is threatened by a new predator and there is a behaviour that makes it more difficult for the predator to kill individuals of the species. The individuals who adopt the behaviour more quickly will obviously be at an advantage. Such behaviour is then passed on to the next generation through imitation and maternal instruction (not through genetic inheritance). Through this process, the behaviour becomes a part of the instinct or the culture of the species, which directly impacts their survival and reproduction rates.

In sum, the architecture of knowledge on evolution relies on a Darwinian core. However, the research on phenotypic plasticity and epigenetics has significantly expanded the thinking about organic evolution (Pigliucci 2005, p. 491). In this light, biological novelty originates at the level of genotypes, phenotypes, epigenetics and behaviour. Thus, evolution and novelty rely on a plurality of causes. Randomness and mutation are just some of the engines of change and the sources of novelty.

In light of the available studies, the two perspectives are therefore definitely complementary, rather than alternative (Hodgson 2013; Hodgson and Knudsen 2006a, b, 2010; Child 2012), and the debate regarding whether evolution is, in nature (or nurture), seems to be, in some sense, idle and outdated. Notwithstanding that the core of evolutionary theories is Darwinian, it is now equally clear that the environment plays a fundamental role in defining how evolution is deployed, within the range of possibilities structured and regulated by genes. In addition, the idea of the relationship between genotypes and phenotypes has moved away from the genetic blueprint (or genetic programme) that defines linear (or quasi-linear) mapping between genotypes and phenotypes. Rather, the concept of "developmental encoding" (as opposed to the classical one of genetic encoding) (Pigliucci 2010) seems to better capture genotypic changes as well as the interplay between genes, which is responsible for the development of features or parts (epistasis).

The "evo-devo" stream of research (formally known as "evolutionary developmental biology") studies the role of gene interactions in the production of novel features, such as feathers (Prum and Brush 2002), rather than gene modifications. Moreover, they recognise that the structure and function of genes set a "topology of possible" novelties and evolutionary paths (Fontana 2001) that may occur. This topology defines the proximities and interactions and builds another ingredient for novelty that can be switched on over time. Accordingly, they

**Table 2.2 Essential definitions and novelty sources in evolutionary theories**

| | |
|---|---|
| Genotype | "The set of genes of an individual; its genetic constitution" Durand (2006, p. 14). |
| Phenotype | "The total of all observable features of an individual (including his/her anatomical, physiological, biochemical, and behavioral characteristics) resulting from the interaction between the genotype the individual inherited and the environment s/he encounters" Durand (2006, p. 14). |
| Lamarck's evolutionary theory tenets | Environmental alterations—felt needs—new habits—use and disuse—acquired characters Liagouras (2013, p. 1281). |
| Darwin's evolutionary theory tenets | Variation—inheritance (replication)—selection and retention (interaction) Liagouras (2013, p. 1281). |
| Genome | The totality of genes carried by a single gamete Durand (2006, p. 14). |
| Gamete | A male or female reproductive cell (e.g., spermatozoon or egg) that carries half of the organism's full set of chromosomes (in sexual reproduction) Durand (2006, p. 14). |
| Meiosis[a] | "A special kind of cell division that occurs during the reproduction of diploid organisms to produce the gametes. The double set of genes and chromosomes of the normal diploid cells is reduced during meiosis to a single haploid set. Crossing-over and therefore recombination occurs during a phase of meiosis" Ridley (2004, p. 686). |
| Recombination[a] | "An event, occurring by the crossing-over of chromosomes during meiosis, in which DNA is exchanged between a pair of chromosomes. Thus two genes that were previously unlinked, being on separate chromosomes, can become linked because of recombination, and vice versa. Linked genes may become unlinked" Ridley (2004, p. 688). |

(continued)

**Table 2.2** (continued)

| | |
|---|---|
| Mutation[a] | "When parental DNA is copied to form a new DNA molecule, it is normally copied exactly. A mutation is any change in the new DNA molecule from the parental DNA molecule. Mutations may alter single bases, or nucleotides, short stretches of bases, or parts of or whole chromosomes. Mutations can be detected both at the DNA level or the phenotypic level" Ridley (2004, p. 686). |
| Phenotypic plasticity[a] | "The capacity of a single genotype to exhibit a range of phenotypes in response to variation in the environment" Whitman and Agrawal (2009). |
| Epigenetics[a] | Area of biology that studies the causal interactions among genes that build the phenotype; such interactions are inheritable and do not change the sequence of the DNA Waddington (1942). |
| Baldwin effect[a] | "The effect that learned behavior can have on evolution." "If learned behavior has a substantial effect on reproductive success or on fitness in general, a predisposition to learn the behavior and to benefit from it might be selected for" Wikipedia. |
| Epistasis[a] | "An interaction between the genes at two or more loci, such that the phenotype differs from what would be expected if the loci were expressed independently" Ridley (2004, p. 684). |

*Note* Highlighted with [a] the multiple sources of novelty

understand that novelty first *emerges* and then *becomes available* for evolution *when* it occurs within a "topology of possible" interactions among genes. Therefore, while the relative role of development, selection, and genotypic transmission is still disputed in biology, the debate animated by the evo-devo research has established that development, selection and genotypic transmission are intertwined and inseparable processes. As such, they should be included among the sources of novelty. Table 2.2 highlights the multiple sources of novelty that are recognised in biology (with a star).

## 2.4 The Inclusion of Evolutionary Theories in Organization Studies

Beyond the misunderstood contraposition between the Darwinian and Lamarckian perspectives, it is still discussed whether and how evolutionary theories can illuminate social phenomena. Darwin (1859, 1971) considered that his theory would be used to explain change in language, morality and social evolution (Hodgson 2005). In this regard, two factions can be identified: those who are against the inference of evolutionary biology in the social sciences (e.g., Dugger 1981; Fracchia and Lewontin 1999; Liagouras 2013; Brown 2012), and those advocating such inference. Among the latter are the supporters of "Generalised Darwinism" (Hodgson 2005, Hodgson and Knudsen 2006a, b, 2010; Aldrich et al. 2008; Stoelhorst 2008), who produced extensive and accurate arguments in favour of their perspective.

The core of the debate concerns the possibility of broadening the explicatory power of Darwinian concepts from biology (Lewontin 1970) to different domains and levels of life (Hodgson 2002). On the one hand, some authors (e.g., McKelvey 1982; Shepherd and McKelvey 2009; O'Mahoney 2007) adopted evolutionary concepts to build theoretical interpretations of the social phenomena by drawing analogies. On the other hand, Generalised Darwinists argued that Darwinism should not be imported into the social sciences as a precise and peculiar explanation for those dynamics and thus, one should speculate on the equivalent of meiosis or a gene. The details of socio-economic evolution may differ from biological evolution. In addition, since the Generalised Darwinists agree that the Darwinian framework is not enough to explain life in complex systems, they require the development of specific and ad hoc theorizing (Hodgson

2013). However, Generalised Darwinists also claim that, at a higher level of abstraction, evolving systems share an "ontological communality" (Aldrich et al. 2008, p. 579) that allows Darwinian tenets to describe evolution within a wide variety of domains (Campbell 1965; Hodgson 2003; Hodgson and Knudsen 2004; Hodgson 2005; Stoelhorst 2008).

At the heart of this higher-level framework are the principles of variation, selection and retention as well as the concepts of interactors and replicators (Hodgson 2002; Hodgson and Knudsen 2010; Aldrich et al. 2008).[3] An interactor is "an entity that interacts as a cohesive whole with its environment in such a way that this interaction causes replication to be differential", while a replicator is "an entity that passes on its structure largely intact in successive replications" (Hull 1989, p. 96).

Several attempts have been made to deploy the interactor and replicator distinction. Some authors have viewed routines as replicators (Aldrich and Ruef 2006; Hodgson and Knudsen 2004; Nelson and Winter 1982) to the extreme they have been considered as "*the* organizational replicator" (Warglien 2002, p. x). Conversely, there is more divergence in the identification of relative interactors; that is, actions performed in light of a routine (Breslin 2008) or how firms provide a locus of change for replicators through interactions with other replicators (Hodgson and Knudsen 2004). Others have seen artefacts (typically technological artefacts) as interactors, and ideas, knowledge (Murmann 2003) and techniques (Mokyr 2000) as replicators. Furthermore, replicators have been recognised (Warglien 2002) in the following: double interacts (Weick 1969), comps (McKelvey 1982), rules and procedures (Levitt and March 1988) and strategies (Axelrod and Cohen 2000).

Hodgson and Knudsen (2006a, b) found that replicator/interactor identification was critical for distinguishing between imitation/contagion and replication/inheritance (Breslin 2011). This distinction reveals that "true retention", which requires the copying of the knowledge and capacities underlying the routine, only occurs in the second case (Aldrich et al. 2008). As such, the replicator/interactor identification defines two different levels of depth in which novelty builds organizational life, and two different dynamics of transmission to the offspring.

However, for the acceptance of Generalised Darwinism, the interactor and replicator concepts have been particularly problematic (Nelson 2006). In fact, extant empirical evidence has been able to provide only a poor understanding of this "true retention"; that is, when and to what extent the reproduction of an action implies the acquisition of its knowledge base is arguable. Moreover, in the spirit of the Generalised Darwinian approach, such a distinction is only necessary if justified by empirical grounds in the field (Nelson 2006), which Hodgson and Knudsen (2006a, b) indicated. When this is lacking, the identification of replicators—for example, in routines—seems to follow the thoughts of analogical speculation more than those of empirical specificity revealing evolutionary dynamics. As a result, the same issues emerge as those of validity.

The field of social sciences still lacks a clear, empirical grounded theory regarding the link between what they identified as replicators and interactors, as there is in biology between genotypes and phenotypes. As a result, the validity of this interpretation needs further assessment and empirical investigation. Moreover, the issue whether routines are interactors or replicators, and if these two concepts are actually meaningful for the social realm, remains fundamentally inscrutable, thus requiring further empirical evidence (Nelson 2006).[4]

Finally, the social sciences display some peculiarities whose consistence and implications have not yet been completely grasped. For example, inheritance in social systems implies an active role of the replicating entity that differs from the passive attitude of an offspring inheriting the parents' genes (Liagouras 2013). An investigation of such peculiarities has also been suggested by Generalised Darwinists, as details of the socio-economic evolution. However, they cannot assess whether these details should be consistently included in the framework and how they would change the Darwinian classical perspective.

## 2.5 Darwinian or Lamarckian Evolution in the Social Sciences?

In general, evolutionary theories have been used in organization studies to build a broad framework for understanding change. In many studies, the term *evolution* is used with some "gravitas", as if it meant something important. However, without further specification, this meaning quickly vanishes when attempting to understand the concept (Hodgson 2013, p. 974). Only recently, the debate has pushed towards a more careful specification regarding the nature of the evolutionary perspective (Lamarckian vs. Darwininan), which has sometimes assumed a challenging/provoking character (Durand 2006; Hodgson and Knudsen 2006a, b, 2007; Nelson 2007; Aldrich et al. 2008; Hodgson 2013; Liagouras 2013).

Comparatively, few studies have cited Lamarck with respect to Darwin (Hodgson and Knudsen 2007). However, several of the most prominent social scientists have adopted the Lamarckian view to describe socio-economic evolution. Actually, evolutionary theories have been introduced and understood in economics and management through the book by Nelson and Winter (1982), in a way that is more Lamarckian than in most evolutionary theories in biology (Cyert and March 1992, p. 224). Moreover, as other eminent bearers of such perspective, Hodgson and Knudsen (2006a, b) mentioned Simon (1981), McKelvey (1982), Hirshleifer (1982), Boyd and Richerson (1988), Hayek (1988) and Robson (1995). As such, a Lamarckian perspective of socio-economic evolution has become more popular (Hodgson and Knudsen 2006a, b, 2010), even if it is unclear whether these authors, by mentioning Lamarck, also meant to exclude the Darwinian perspective on evolution (Hodgson and Knudsen 2006a, b). For example, a later debate (Nelson 2007) clarified that, in Nelson and Winter (1982), the Darwinian perspective was meant to be implicit (Hodgson and Knudsen 2010, p. ix).

The debate is also accurate when addressing the adoption of labels. As stated in Sect. 2.3, recent developments in biology support a pluralism of causes that jointly explain evolution. In biology, such pluralism has labeled as “Darwinian”, the main evolutionary dynamics of natural selection. However, the adoption of a similar label in the social sciences would not be justified by the same empirical ground. However, in the social sciences, the role and the relevance of selection and adaptation is so highly debated (Nelson 2006; Breslin 2011; Liagouras 2013; Hodgson 2013; Hodgson and Knudsen 2010; Aldrich et al. 2008) that some have provocatively suggested substituting Darwinism with Lamarckism in every label (Liagouras 2013). At the present state of research, social evolution is undoubtedly both Darwinian and Lamarckian (Levinthal 1991; Amburgey et al. 1993; Amburgey and Singh 2005), regardless of the label that is adopted. In this regard, addressing the prevalence of one or the other is more an exercise of the mind than evidence of the facts.

## 2.6 Common Misunderstandings on Evolution and Novelty

This passionate debate is the result of the fact that, simplistically, the Lamarckian and the Darwinian evolutionary explanations have been imported into organization theories in the form of a debate regarding “whether the forms that organizations take are the outcome of environmental selection or of adaptation resulting from strategic choices made by organizational decision makers” (Child 2012, p. xv). Such debate concerns the entire evolutionary process of variation, selection and retention, and it is mirrored in the idea of novelty as randomly generated or purposefully pursued. However, this perspective reflects two misunderstandings about evolutionary theories that have spread in organization studies (Durand 2006; Aldrich et al. 2008). In fact, the underlying conceptualisations of evolution and the related use of the Lamarckian and Darwinian labels are only loosely grounded in the actual work of these authors (Durand 2006; Hodgson and Knudsen 2006a, b, 2010).

First, Lamarckian and Darwinian theories have been represented as opposite, rather than complementary, mechanisms of evolution (Hodgson and Knudsen 2006a, b), building on the concept of blind versus intentional evolution. This false opposition is based on the following trains of thought (Durand 2006): (1) Darwin's theory allows for variation, as a random endowment of nature, and it places all explanatory power in environmental selection; and (2) Lamarck's theory conceives evolution as a process of intentional and intelligent adaptation to changes occurring in the environment. Typically, contributions favouring one or the other side develop their arguments at two different levels of analysis (Child 2012). For example, Darwinists focus on entire populations of organizations and investigate the economic and institutional features of a particular environment that push organizations towards conformity. Such pressures are unavoidable and non-negotiable for organizations. Conversely, Lamarckians focus on individual organizations and on decision/routine behaviours in particular, to live, adapt and creatively change their environment. As experience accumulates, their common tendency is to retreat on consolidated ways of performing certain actions. In addition, the very notion of strategy is premised on the ability to proactively intervene in the environment (Child 2012; Abatecola 2014; Cafferata 2010; Durand 2006; Dagnino 2006).

Second, the acceptance of evolution, as designed progress and improvement, is widespread in management (Durand 2006). As a result, the inevitability of progress towards something good is taken for granted (Solari 1996). In addition, inserting the organism's evolution in this path of inevitable progress is what "intelligence" attempts to achieve.

As for the first misconception, the Lamarckian and Darwinian perspectives build an integrated framework to understand evolution in which both elements of variation, given in nature or acquired during lifetime or through culture, are included. In addition, Darwin never denied intentionality or intelligence (Hodgson and Knudsen 2006b). In his view, intentionality and intelligence were both part of evolution and the result of the same evolutionary process (Hodgson and Knudsen 2006a). As Durand (2006) indicated, it is possible to refer some elements of organization theories to Darwin or Lamarck, but it is normal that the theories include both.

As for the second misconception, the notion of the "survival of the fittest" is often mistakenly interpreted as conveying progress in evolution (Stoelhorst 2008) and the positive role of selection that only retains good and useful novelties (Gould 2002, p. 139). This was originally introduced by Herbert Spencer, not by Darwin, since he never saw evolution as progress. Nevertheless, this conception was labeled as "Social Darwinism" (Durand 2006). Moreover, the idea of evolution as progress also acquired an inevitability character. Since the first adoption of the word "*evolution*" by the German biologist Albrecht von Haller in 1744, it has been "associated with a specifically directional and predestined" final status (Hodgson and Knudsen 2006b, p. 2); that is, the final "natural step in an historical path" (March 1994, p. 39). The first adoption of this word regarded the changes of the human embryo into a complete human being (Hodgson and Knudsen 2006a; March 1994). Originally, evolution meant change towards greater capabilities, elaboration, beauty and being environmentally fit (March 1994). Evolution is often seen as a set of developments, which are "unfolding toward a destiny that is implicit in the unit that is developing or in its environment or both" (March 1994, p. 40). They also portray such evolution as the invention of human actors that typically follow their rational choice. Contributions illustrating the elaboration of technologies from vague ideas to well-shaped and profitable products (or narratives celebrating the life of great entrepreneurs or historical heroes) reflect this conception of evolution (March 1994, 2010; March and Weil 2005).

In sum, it is useful to remove two common misunderstandings on evolution, which might also be transferred to novelty. Novelty in evolution should not be conceived as deriving either from selection at the system level, which organizations cannot impact, or intentionality at the organizational level; rather, it stems from both of these dynamics. In addition, novelty does not convey evolutionary progress along a designed path, even though this vision has widely grounded the perspective on evolution in the social sciences. I will discuss alternative conceptualisations of evolution and of novelty in the subsequent sections.

## 2.7 Blind and Intentional Variation

Although Herbert Spencer introduced Darwin's evolutionary VSR model in 1898 to study organised systems, which is also responsible for several misunderstandings that are still being shed (Aldrich and Ruef 2006), one of the most widely diffused models of socio-cultural evolution is the VSR model developed by Campbell (1960, 1969) (Romanelli 1999; Durand 2006). In this regard, variation concerns the availability of diverse manifestations, selection concerns "the differential elimination of certain types of variations", and retention concerns the preservation, duplication or modified reproduction of selected variations (Aldrich and Ruef 2006, p. 17). Variation, selection and retention are useful starting points for understanding evolution (Aldrich and Ruef 2006), rather than analytical categories for describing evolution.[5] However, within this model, an interesting distinction has been drawn which is useful for understanding novelty.

Campbell distinguished between *intentional* and *blind* variation. Intentional variation "occurs when people actively attempt to generate alternatives and seek solutions to problems", while blind variation "occurs independently of conscious planning" (Aldrich and Ruef 2006, p. 17). The dualism of the Lamarckian and Darwinian views described in the previous sections is reflected in the duality of these concepts, which is responsible for the generation of emergent or designed novelty.

In favour of blind variation, Campbell (1969, p. 81) stated: "Too often, in contemporary social science, analysis stops when it is traced back to individual motives, as though these were the prime movers, the uncaused beginning of causal sequences", due to the neoclassical conception of decisions resulting from the determinateness of fixed preference functions (Hodgson 1997, p. 407). However, "design emerges without a seeing designer" (Vanberg 2004) (Hodgson and Knudsen 2006b, p. 11) that plans it at a higher level (March 1994).[6] This also downsizes the role of a superior designer as well as the limitedly rational decision-making individual.

In a later contribution, Campbell affirmed the equal value of blind and deliberate variations. On the one hand, it is possible to argue that "deliberate" or "intelligent" variations are better than blind variation, since they can be pre-selected. On the other hand, Campbell (1987) added that, if deliberate variation was the only one or the predominant one, then the future would be very limited, since humans do not dispose of all of the necessary knowledge to design their future, and their knowledge is path dependent. In fact, their capacity of foresight reflects acquired knowledge and experience (Romanelli 1999), and it is restricted to the implications of previously achieved wisdom (Campbell 1965, p. 28). For example, when genuine innovations are assessed, humans are unable to define their probability of success or failure since they did not acquire the knowledge to do so (Hodgson and Knudsen 2006b, p. 11).

For Campbell (Durand 2006, p. 62), blind variation is the most plausible version of evolutionary variations, since "blind variations surpass human individuals and agencies" (Campbell 1969, p. 74).[7] In an even stronger perspective on the poor role of intentional human action, blind variation occurs through mistakes and accidental learning (Levinthal and Rerup 2006). As such, on the one hand, novelty deriving from blind variation should be understood in terms of novelty potentially providing greater impacts (both in the positive and negative sense), since it is not subject to human limited knowledge and understanding of reality. It could also be "wiser" than intent, since it provides adaptive challenges that are unforeseen or unwanted by rational agents. Studies that could be mentioned within this logic include the garbage can decision model of Cohen et al. (1972) or the change dynamics in the population ecology perspective of Hannan and Freeman (1989). On the other hand, the higher potential of the blind type of novelty also concerns higher risk, since novelty, which is hardly included in organizational knowledge, is also rarely perceived and adequately managed. In addition, it will most likely end up being inconclusive and dispersive.

Finally, Campbell did not use the term *random* to qualify variation, since he did not want to confuse the precise process of randomization in statistics with the less precise variation dynamics (Aldrich and Kenworthy 1999, p. 22). Instead, he preferred the term *blind* or *haphazard* to highlight the absence of "self-conscious planning or foresightful action" (Campbell 1965, p. 28). He also stressed that the theory of evolution does not necessarily require being entrusted to "self-conscious planning or foresightful action", since it would be severely limited from agents' present knowledge and from the possibility of building more knowledge.

## 2.8 Emergence

### 2.8.1 Meaning and Operationalization

Blind variation in the Campbellian theory of evolution finds expression in the phenomenon of emergence (Van de Ven et al. 2008). According to Seidel and Greve (2016, p. 2), emergence is an easily understood and intuitive concept, meaning the act of something coming into existence or appearance. The word *emergent* was first suggested by Lewes (1875), who distinguished between "resultant" and "emergent" compounds produced through chemical reactions (Hodgson 1997; Garud et al. 2015, Chap. 1). A "resultant" compound can be predicted from its chemical components, while an "emergent" compound is irreducible to its component parts. Morgan (1927) introduced the concept of emergence to the theory of evolution to account for discontinuities that introduce novelty and change into the evolutionary process. He also explained that, in the adjective *emergent*, "the emphasis is not on the unfolding of something already in being but on the outspringing of something that has hitherto not been in being" (Morgan 1927, p. 112, quoted in Hodgson 1997, p. 405). In organization studies, the concept of emergence is well established (Garud et al. 2015), as in the notion of emergent strategy (Mintzberg and Waters 1985), which facilitated a deeper appreciation of the unplanned change in practices and processes of strategising over deliberate planning (Chia and Holt 2009).

Like blind variation, neither blindness nor emergence is meant to be a synonym of randomness. Nevertheless, the diffused association of emergence with randomness derives from and can be intended as a first attempt to operationalise the concept. In fact, referring emergence to randomness is equal to making at least one of the following two assumptions (Van de Ven et al. 2008): (1) that the source of novelty is external to the system under scrutiny; or (2) that the source of novelty is internal, but its factors and dynamics are unidentifiable and impossible to relate in terms of patterns of relation. These refer to two different views, which are often confused under the umbrella labels of "emergence" and "blind variation". At this point, let us consider them one at a time.

If emergence is an *exogenous* phenomenon (i.e., Case 1), as Feyerabend explained, then the temptation is to think that the definition of a lower micro- (or higher macro-) level of analysis and the identification of the elements at that level may entirely explain the emergent properties (Hodgson 1997). Such reductionism, however, may fail to achieve complete satisfaction and, as a result, may proceed without an end. In this view, emergent novelty is exogenous. Conversely, in the second assumption (i.e., Case 2), emergence is considered to be *endogenous*, and novelty is due to an "uncaused cause", which is the manifestation of the indeterminateness of evolution; that is, it embodies "the self-transforming" "of a system over time through endogenously generated change" (Hodgson 1997). This distinction is useful for grasping the different stances on emergent novelty in the literature and provides a clear and simple framework for categorising studies; thus, it will be adopted in the next chapter. In fact, for the purposes of simplicity and convention, when reviewing the literature, the distinction between endogenous and exogenous emergence will be maintained.

However, a more fine-grained observation of evolution shows that endogenous and exogenous novelties are often difficult to isolate and that limiting our definition of emergence to a distinction between exogeneity and endogeneity might be simplistic. On one hand, the distinction between endogenous and exogenous emergent novelty provides structure to our understanding. However, on the other hand, it responds more to our need or tradition of scientific research (i.e., setting levels of analysis and focusing on what occurs at each level, while everything else is "on hold") than to the nature of the phenomenon. Hodgson (1997, p. 404) claims that if we were to start with the phenomenon, then we would argue that parts, wholes, individuals, systems and institutions "mutually constitute and condition each other, and none has analytical priority", and that one should "accept multiple levels of analysis, each with their own partial autonomy".

Despite its apparently intuitive meaning and simple and useful operationalisation, emergence has a complex nature that derives primarily from the several different and unrelated views on it that coexist.

### 2.8.2 Emergence Within Different Causal Frameworks

With respect to emergence, different people understand things in different ways, resulting in distinct and very different epistemological and philosophical positions. Clarifying these perspectives by distinguishing how the world is conceived and how causality is intended may help to sort out the different meanings and conceptions of emergence (Stacey et al. 2000; Garud et al. 2015, Chap. 1).

The framework offered for understanding different positions builds on Stacey and colleagues' (2000) causal framework. The first distinction we need to introduce is whether we consider, as Prigogine (1997) suggested, the future to be given or to be under perpetual construction. In other words, the world can be either determined or undetermined (i.e., it can produce either determined or undetermined outcomes). The other variable comprises the outcomes of action and evolution (Facchini 2008).[8] These include optimal arrangements, sub-optimal outcomes, and moving outcomes that stress the system's continuous and unstoppable transformation, according to which there is no (meaningfully identifiable) end state. These two dimensions serve as the basis for Table 2.3.

Three causal frameworks seem the most relevant for our discourse. The first of these is the natural law framework, within which the world proceeds towards determined outcomes according to the laws of nature.

**Table 2.3** Emergence and novelty in different causality frameworks

| Causal frameworks | Determined world | Undetermined world | Outcome | *emergence* | *novelty* | *examples* |
|---|---|---|---|---|---|---|
| ***Natural Law framework*** | *x* | | Optimal arrangement | None: emergence is apparent and temporary, will be removed by knowledge discovery | None: there is correction rather than novelty along the process of "getting laws right" | Organizations in scientific management |
| ***Formative framework*** | *x* | | End form | Emergence concerns actor's search paths only | "pre-determined" novelty | Organizations in systems theory; NK models in strategy |
| ***Transformative framework*** | | *x* | Continuous and transformed form | Emergence is continuous and concerns both the sphere of actor's knowledge and the world | Undetermined genuine novelty | Complexity theory, actor-network theory |

Here, there is no room for emergence as it derives from uncaused causes. Emergence exists only in the eyes of the human agent who needs to discover all of the laws of nature and whose expectations do not reflect these laws completely. However, emergence is temporary and a product of human limits and human time, though it does not exist as such. Novelty is temporarily exogenous, meaning that it lies beyond the attention of the agent but is gradually included in his consideration as his knowledge and understanding of the world progresses. Within this framework, we can position scientific management's views of organizations or strategic management's rationalist view (e.g., Gavetti and Levinthal 2000).

The second framework of interest is the formative framework, according to which the world originates from the interaction of elements from the micro to the macro and ends in pre-determined possible end states. However, the path that is actually taken depends on interaction and is not designed in advance. Here, novelty appears as the result of unknown laws and processes but reflects a hidden order that needs to be discovered. Emergence exists in terms of paths, not outcomes, which are pre-determined. This perspective on emergence can be illustrated in the way in which Kauffman's NK models have been imported into organization studies (Ganco and Hoetker 2009): solutions are given on the landscape, but paths are defined by organizations. Other agent-based models, such as the Schelling (1969) segregation model, also display this conception of emergence.

Third, the transformative framework proposes that the world originates through interaction and that there is no end state or range of possible outcomes that can be selected; instead, possibilities are open and indeterminate. From this perspective, emergence is continuous, generative and transformative. All elements of interaction play a role in co-creating reality. Novelty is, therefore, unknown and undetermined for both the single agents, who cannot gain the system perspective, and the system, which evolves to unknown states. Novelty derives from an uncaused cause and can only be understood through several levels of analysis; however, an understanding of the past does not provide direct knowledge on how the future will unfold. The Actor-Network Theory (Callon 1986; Latour 1987) displays this kind of emergence and novelty.

## 2.9 Agency

As described in the previous section, there are at least three different frameworks within which emergence can be understood and which display different assumptions concerning causality and dynamics. Now, the relevant question for the social sciences is: Within these frameworks, and in relation to emergence, what room is there for intentionality and human decision? In other words, how does blind variation interact with intended variation?

As stated by Campbell (1965), blind variation does not imply the absence of conscious choice or deliberate decision. Instead, agents adopt intelligent strategies to make decisions in contexts in which they are unable to accurately predict the outcomes of their actions (Romanelli 1999; Bradie 2001; Simonton 2011). In other words, they build internally coherent interpretations of the situation, despite being unable to assess the truthfulness or external validity of these interpretations (Frigotto and Rossi 2015). These intelligent strategies lead agents through events in the absence of an overview of the system's dynamics. The resulting intelligent decisions derive from blindness (Durand 2006). In this sense, *blind* is not a synonym for *random* (meaning that the variations are "uncaused"); rather, it is used in the sense that the variations display no connection to the agent's design, understanding or plan, even if the agent him/herself may play an active role in the performance of such variations (Ruse 1986, p. 80; Simonton 2011, p. 160).

Aldrich and Ruef (2006, p. 18) noted that sociologists and organizational scholars often interpret the interaction between intentional and blind variation in terms of *agency*. They also understand this link in terms of whether actors are free to make autonomous decisions and, as the result of a good mapping of actions into consequences, are able to choose the consequences of their actions.

However, the issue of agency is not limited to variation. For example, selection is traditionally differentiated into external selection, which concerns "forces external to an organization that affect its routines and competencies", and internal selection, which concerns "forces internal to an organization that affect its routines and competencies" (Aldrich and Ruef 2006, p. 17). This distinction carries the implicit and general implication that, while human agents can control and design internal forces, they have a more difficult time impacting external forces. A more precise approach considers whether an agent (or an organization) has or can develop a project/design through which he/she may try to control such external influences. Similar considerations can be built with respect to retention. More generally, the issue of agency concerns the extent to which intention is involved through the variation, selection and retention process, especially in terms of the possible measures of control and design over its various components and dynamics.

Table 2.4 illustrates how agency combines with emergence and to what extent human agents can play a role and exert influence within the different causal frameworks.

In natural law causality, actors' actions involve trying to comprehend the laws of nature in order to make various elements fit and align with these laws. Actions can be intentional and purposeful, since an actor can exploit natural laws to reach chosen goals. Within this framework, the future is knowable, and actors can act upon it. Consequences follow a more or less hidden order, which it is the actor's duty to unveil. Time is irrelevant for the system, as nature and its laws are eternal and the future is a repetition of the past; however, time exists for actors until they complete their knowledge. In this framework, if the chosen goal is not reached, the failure is a reflection of the agent's imperfect knowledge.

In formative causality, actors' actions consist of trying to define a satisficing search path within a world on which actions have no influence. Actions can be intentional and purposeful, as the actor can search for and select among solutions to realise chosen goals. Solutions are designed at the system level, where the actor cannot act; however, they can still be reached. Time exists for the actor only, who spends his time searching in a chosen direction and because he forgets previously uncovered solutions over time. In this framework, if the best goal is unlikely to be reached, this is a reflection of both the agent's choice of a wrong searching strategy and his lack of knowledge.

In transformative causality, the actor plays an active role in the formation of the world, and not only in its discovery or exploration. Intention and control are potentially better expressed here because the system has no determinate parts; rather, the system is built by several

**Table 2.4 Agency in different causality frameworks**

| | Action | Can agent's intention control and design the outcome? | Future | Time |
|---|---|---|---|---|
| *Natural Law framework* | Effort of "getting it right", aligning, fitting | The actor can exploit natural laws to reach chosen goals | KNOWABLE FUTURE: discover hidden order; if-then rules | Time is irrelevant at the system level: past, present and future are the same<br>Time exists for the actor until he completes his knowledge |
| *Formative framework* | Effort of defining a satisficing search path, the actor cannot impact on the definition of the world | The actor can search solutions and select among them to approach chosen goals | KNOWABLE FUTURE: search and select good solutions among already designed outcomes | Time exists for the actor who decides to spend time to search in some direction and because he forgets distant solutions |
| *Transformative framework* | Effort of participating into the formation of the world | The actor can impact on the formation of the world, and can try to direct it towards chosen goals | UNKNOWABLE FUTURE:<br>solutions form over time through interaction | Time plays a role for both the system and the actor |

interacting forces, which the actor must take into account in order to reach his goal. With respect to the possibility of actually reaching goals, the management discourse has been too simplistic in claiming that managers can choose strategic directions for their organizations. In fact, managers' choices are limited by the fact that other managers are trying to influence both them and the dynamics of their interaction in order to foster their own selected goals. In other words, what emerges is not the product of the simple choice of one manager, but, rather, is related to the conflicting constraints that several managers place on one another (Stacey et al. 2000, p. 117). In this framework, time is also relevant for the system, as it articulates the perpetual construction of the future. In fact, the future is unknowable in nature, as it takes form through continuous interaction without a range of pre-defined possibilities. In this framework, if a goal is not reached, it is likely due to the system interactions producing an evolution very different from those produced in the past, which builds the basis for the agents' system of knowledge and expectations. Here, novelty is due not to the agents' limits, but to the nature of the system.

## Notes

1. Darwin (1859) wrote that the eye of the evolutionist should distinguish superficial analogies, appearing since two organisms share the same environment (e.g., they live in the water), from deep homologies (i.e., ancestral physical structures that two organisms share) to reveal a type of kinship (Pievani 2010).
2. In 1942, Conrad Waddington used the term *epigenetics* to describe the area of biology that studies the causal interactions among genes that build the phenotype. Such interactions are inheritable, and they do not change the sequence of the DNA.
3. Some authors adopting the VSR framework referred to the term *Universal Darwinism*, coined by Dawkins (1976). Hodgson (2005) noted that, while Generalised Darwinism refers to this idea of a higher-level framework based on an ontological similarity among systems of life, Universal Darwinism has typically been associated with a "gene-centered view of biological evolution" (Breslin 2011, p. 220).

4. In an attempt to solve this issue, Winter proposed broadening the replicator concept entrusted to routines to "quasi-genetic traits" in order to identify any traits displaying enough stability to accumulate feedback from the environment (Cohen et al. 1996).
5. It is not easy to use these categories analytically. For example, considering variation, it is difficult to empirically identify instances of variation, the reason of which is twofold. First, according to the level of analysis adopted, some instances may be considered as both instances of variation and selection. In general, "variation operates at a component level", while selection "operates at macro-levels" (Durand 2006). Examples of selection are the diffusion of variations between social groups, the imitation of individual practices, and the definition of education programmes as well as rational decision-making principles (Durand 2006). However, by changing the level at which the observer considers evolution, some instances may be considered elements of variation or selection. For example, from the perspective of populations, phenotypical plasticity provides variation, whereas in a study on the genotype-phenotype link, it is the result of selection. Second, variation, defined as the availability of diverse manifestations, can hardly be separated from selection or retention. In fact, variation does not only concern an initial stage of evolution in which it is self-contained and isolated. Conversely, variation is embedded in selection and retention through the transformation occurring in the entire evolutionary process. This is the reason why this book did not identify novelty with evolutionary variation. To illustrate this point, consider, for example, the case of routines. Routines change when they are performed. Thus, they produce variation by nature; but they can also be considered as the result of the process of selecting alternative possible routine performances. In sum, the VSR model can be used analytically with some caution, and novelty concerns changes appearing as variations and also as transformations appearing through selection and retention.
6. As Cafferata (2009) noted, theories of evolution are not necessarily against the existence of a creator that is identified with God. Evolutionary theories do not need to conceive the existence of God to justify the existence of organisms and the universe. However, they leave open the possibility of the existence of God in a twofold sense. The first concerns the *sense* of the existence of organisms and the universe, while the second concerns the *modus*; that is, the way in which the creation may have occurred that is nowadays explained "in many and complex ways (Martini, C.M. 2009, 9)" (Cafferata 2009, p. 52).

7. Another way blind variety occurs is through mistakes and accidental learning (Levinthal and Rerup 2006).
8. Stacey et al. (2000) interpret this in terms of the reason for moving into a future that is determined or undetermined. They interpret the causality framework as classifying different kinds of teleology. Teleology is the branch of philosophy concerned with the "why" question—that is, why do organisms exist the way they do?—and that builds answers by assuming that organisms exist in a certain way because they serve a certain purpose or realise a certain goal. The concept of teleology is controversial in evolutionary studies because it almost exclusively assumes an Aristotelian stance, claiming that purposes and goals are defined by a final cause that, since Thomas Aquinas, has been interpreted as God. Referring primarily to Darwin, several scholars in biology have chosen to exclude teleology from the scientific realm and confine it to metaphysical discourses. Stacey et al. (2000) introduce teleology in their framework because they build it from the perspective of the human actor, whose behaviour is purposeful in nature. By contrast, I will introduce considerations of the human actor's role and perspective in the section where I address agency. Here, I retain the framework as a structure for a broader reasoning of causality, which is related to an agent's external intentionality, which, in the Christian teleological approach, is God, or to his internal functionality, or efficient cause, which is the outcome of non-purposeful and unintentional natural selection.

## References

Abatecola, Gianpaolo. 2014. Research in Organizational Evolution. What Comes Next? *European Management Journal* 32 (3): 434–443.

Aldrich, Howard E., and A.L. Kenworthy. 1999. The Accidental Entrepreneur: Campbellian Antinomies and Organizational Foundings. In *Variations in Organization Science: In Honor of David T. Campbell*, ed. J.A.C Baum, and B. McKelvey, 19–33. Thousand Oaks, CA: Sage.

Aldrich, Howard E., and Martin Ruef. 2006. *Organizations Evolving*. London: Sage.

Aldrich, Howard E., Geoffrey M. Hodgson, David L. Hull, Thorbjørn Knudsen, Joel Mokyr, and Viktor J. Vanberg. 2008. In Defence of Generalized Darwinism. *Journal of Evolutionary Economics* 18 (5): 577–596.

Amburgey, Terry L., and Jitendra V. Singh. 2005. Organizational Evolution. In *The Blackwell Companion to Organizations*, ed. J.A.C. Baum, 327–343. Malden, MA: Blackwell.

Amburgey, Terry L., Dawn Kelly, and William P. Barnett. 1993. Resetting the Clock: The Dynamics of Organizational Change and Failure. *Administrative Science Quarterly* 38 (1): 51–73.

Argote, Linda. 2013. *Organizational Learning: Creating, Retaining and Transferring Knowledge*. New York: Springer.

Argyris, Chris. 1982. *Reasoning, Learning, and Action: Individual and Organizational*. San Francisco: Jossey-Bass.

Axelrod, Robert, and Michael D. Cohen. 2000. *Harnessing Complexity*. New York: Free Press.

Becker, Markus C., Thorbjørn Knudsen, and James G. March. 2006. Schumpeter, Winter, and the Sources of Novelty. *Industrial and Corporate Change* 15 (2): 353–371.

Boyd, Robert, and Peter J. Richerson. 1988. *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.

Bradie, Michael. 2001. The Metaphysical Foundation of Campbell's Selectionist Epistemology. In *Selection Theory and Social Construction: The Evolutionary Naturalistic Epistemology of Donald T. Campbell*, ed. Cecilia Heyes and David L. Hull, 35–53. New York: State University of New York Press.

Breslin, Dermot. 2008. A Review of the Evolutionary Approach to the Study of Entrepreneurship. *International Journal of Management Reviews* 10 (4): 399–423.

Breslin, Dermot. 2011. Reviewing a Generalized Darwinist Approach to Studying Socio-economic Change. *International Journal of Management Reviews* 13 (2): 218–235.

Brown, Christopher. 2012. Transmutability, Generalised Darwinism and the Limits to Conceptual Integration. *Cambridge Journal of Economics* 37 (1): 209–225.

Cafferata, Roberto. 2009. *Management in Adattamento: Tra Razionalità Economica e Imperfezione Dei Sistemi*. Bologna: Il Mulino.

Cafferata, Roberto. 2010. L'impresa Che Diventa Sistema: Una Lettura Nel Duecentenario Darwiniano. *Sinergie* 81 (10): 51–76.

Campbell, Donald T. 1960. Blind Variation and Selective Retentions in Creative Thought as in Other Knowledge Processes. *Psychological Review* 67 (6): 380–400.

Campbell, Donald T. 1965. Variation and Selective Retention in Socio-Cultural Evolution. In *Social Change in Developing Areas: A Reinterpretation of Evolutionary Theory*, ed. Barringer HR, Blanksten GI, Mack RW, 19–49. Cambridge: Schenkman Publishing Company.

Campbell, Donald T. 1969. Variation and selective retention in sociocultural evolution. *General Systems* 14: 69–85.

Campbell, Donald T. 1987. Selection Theory and the Sociology of Scientific Validity. *Evolutionary Epistemology*, 139–158. The Netherlands: Springer.

Chia, Robert C.H., Holt, Robin. 2009. *Strategy without design: The silent efficacy of indirect action*. Cambridge: Cambridge University Press.

Child, John. 2012. *The Evolution of Organizations*. Cheltenham: Edward Elgar.

Cohen, Michael D., James G. March, and Johan P. Olsen. 1972. A Garbage Can Model of Organizational Choice. *Administrative Science Quarterly* 17 (1): 1–25.

Cohen, Michael D., Roger Burkhart, Giovanni Dosi, Massimo Egidi, Luigi Marengo, Massimo Warglien, and Sidney Winter. 1996. Routines and Other Recurring Action Patterns of Organizations: Contemporary Research Issues. *Industrial and Corporate Change* 5 (3): 653–698.

Cyert, Richard M., and James G. March. 1963. *A Behavioral Theory of the Firm*. Englewood Cliffs: Prentice Hall.

Cyert, Richard M., and James G. March. 1992. *A Behavioral Theory of the Firm*. Cambridge: Blackwell Business.

Dagnino, Giovanni Battista. 2006. Il Paradigma Evolutivo in Strategia d'Impresa: Approccio Controverso o Solida Prospettiva Conoscitiva? *Economia e Politica Industriale* 4: 103–132.

Darwin, Charles. 1859. *On the Origin of Species*. London: John Murray.

Darwin, Charles. 1971. A Biographical Sketch of an Infant. *Developmental Medicine and Child Neurology* 13 (s24): 3–8.

Dawkins, Richard. 1976. *The Selfish Gene*. Oxford: Oxford University Press.

Dugger, William M. 1981. Sociobiology for Social Scientists: A Critical Introduction to EO Wilson's Evolutionary Paradigm. *Social Science Quarterly* 62 (2): 221.

Durand, Rodolphe. 2006. *Organizational Evolution and Strategic Management*. London: SAGE.

Facchini, Fiorenzo. 2008. *Le sfide dell'evoluzione: In armonia tra scienza e fede*, vol. 458. Milano: Jaca Book.

Fontana, Walter. 2001. "Novelty in Evolution. Green Paper for Bioevolutionary Advanced Concepts for NASA, BEACON.

Fracchia, Joseph, and Richard C. Lewontin. 1999. Does Culture Evolve? *History and Theory* 38 (4): 52–78.

Frigotto, Maria Laura, and Alessandro Rossi. 2015. An Explanatory Coherence Model of Decision Making in Ill-Structured Problems. *Mind & Society* 14 (1): 35–55.

Ganco, Martin, and Glenn Hoetker. 2009. NK Modeling Methodology in the Strategy Literature: Bounded Search on a Rugged Landscape. *Research Methodology in Strategy and Management* 5: 237–268.

Garud, Raghu, Barbara Simpson, Ann Langley, and Haridimos Tsoukas. 2015. *The Emergence of Novelty in Organizations*. Oxford: Oxford University Press.

Gavetti, Giovanni, and Daniel A. Levinthal. 2000. Looking Forward and Looking Backward: Cognitive and Experiential Search. *Administrative Science Quarterly* 45 (1): 113–137.

Gould, Stephen Jay. 2002. *The Structure of Evolutionary Theory*. Harvard: Harvard University Press.

Hannan, Michael T., and John Freeman. 1989. *Organizational Ecology*. Cambridge: Harvard University Press.

Hayek, Friedrich A. 1988. *The Fatal Conceit: The Errors of Socialism,* ed. William W. Bartley III. Chicago: University of Chicago Press.

Hedberg, Bo L.T., Paul C. Bystrom, and William H. Starbuck. 1976. Camping on Seesaws: Prescriptions for a Self-Designing Organization. *Administrative Science Quarterly* 21: 41–65.

Hirshleifer, Jack. 1982. Evolutionary Models in Economics and Law: Cooperation versus Conflict Strategies. *Research in Law and Economics* 4: 1–60.

Hodgson, Geoffrey M. 1995. The Evolution of Evolutionary Economics. *Scottish Journal of Political Economy* 42 (4): 469–488.

Hodgson, Geoffrey M. 1997. Economics and the return to Mecca: the recognition of novelty and emergence. *Structural Change and Economic Dynamics* 8: 399–412.

Hodgson, Geoffrey M. 2002. Darwinism in economics: from analogy to ontology. *Journal of evolutionary economics* 12 (3): 259–281.

Hodgson, Geoffrey M. 2003. Darwinism and Institutional Economics. *Journal of Economic Issues* 37 (1): 85–97.

Hodgson, Geoffrey M. 2005. Generalizing Darwinism to Social Evolution: Some Early Attempts. *Journal of Economic Issues XXIV* 4: 899–914.

Hodgson, Geoffrey M. 2013. Understanding Organizational Evolution: Toward a Research Agenda Using Generalized Darwinism. *Organization Studies* 34 (7): 973–992.
Hodgson, Geoffrey M., and Thorbjørn Knudsen. 2004. The Firm as an Interactor: Firms as Vehicles for Habits and Routines. *Journal of Evolutionary Economics* 14 (3): 281–307.
Hodgson, Geoffrey M., and Thorbjørn Knudsen. 2006a. Dismantling Lamarckism: Why Descriptions of Socio-Economic Evolution as Lamarckian Are Misleading. *Journal of Evolutionary Economics* 16 (4): 343–366.
Hodgson, Geoffrey M., and Thorbjørn Knudsen. 2006b. Why We Need a Generalized Darwinism, and Why Generalized Darwinism Is Not Enough. *Journal of Economic Behavior & Organization* 61 (1): 1–19.
Hodgson, Geoffrey M., and Thorbjørn Knudsen. 2007. Evolutionary Theorizing Beyond Lamarckism: A Reply to Richard Nelson. *Journal of Evolutionary Economics* 17 (3): 353–359.
Hodgson, Geoffrey M., and Thorbjørn Knudsen. 2010. *Darwin's Conjecture: The Search for General Principles of Social and Economic Evolution*. Chicago: University of Chicago Press.
Hull, David L. 1989. *The Metaphysics of Evolution*. New York: SUNY Press.
Lamarck, Jean B. 1809. *Philosophie Zoologique*. Paris: Dentu.
Levinthal, Daniel A. 1991. Organizational Adaptation and Environmental Selection-Interrelated Processes of Change. *Organization Science* 2 (1): 140–145.
Levinthal, Daniel A. 2006. The Neo-Schumpeterian Theory of the Firm and the Strategy Field. *Industrial and Corporate Change* 15 (2): 391–394.
Levinthal, Daniel A. 2008. Explorations in the Role of Novelty in Organizational Adaptation: An Introductory Essay. In *Explorations in Organizations*, ed. J. G. March, 95–103. Stanford: Stanford Business Books.
Levinthal, Daniel A., and Claus Rerup. 2006. Crossing an Apparent Chasm: Bridging Mindful and Less-Mindful Perspectives on Organizational Learning. *Organization Science* 17 (4): 502–513.
Levitt, Barbara, and James G. March. 1988. Organizational Learning. *Annual Review of Sociology* 14 (1): 319–340.
Lewontin, Richard C. 1970. The Units of Selection. *Annual Review of Ecology and Systematics* 1 (1): 1–18.

Liagouras, George. 2013. Lost in Translation: Why Generalized Darwinism Is a Misleading Strategy for Studying Socioeconomic Evolution. *American Journal of Economics and Sociology* 72 (5): 1255–1286.
March, James G. 1994. *A Primer on Decision Making: How Decisions Happen*. New York: Simon and Schuster.
March, James G. 2010. *The Ambiguities of Experience*. Cornell: Cornell University Press.
March, James G., and Herbert A. Simon. 1958. *Organizations*. New York:Wiley.
March, James G., and Johan P. Olsen. 1998. The Institutional Dynamics of International Political Orders. *International Organization* 52 (4): 943–969.
March, James G., and Thierry Weil. 2005. *On Leadership*. Malden: Blackwell.
Mayr, Ernst. 2001. *What Evolution is*. New York: Basic Books.
McKelvey, Bill. 1982. *Organizational Systematics—Taxonomy, Evolution, Classification*. California: University of California Press.
Mintzberg, Henry, and James A. Waters. 1985. Of Strategies, Deliberate and Emergent. *Strategic Management Journal* 6 (3): 257–272.
Mokyr, Joel. 2000. Evolutionary Phenomena in Technological Change. In *Technological Innovation as an Evolutionary Process*, 52–65. New York: Cambridge University Press.
Muller, Gerd B., and Gunter P. Wagner. 1991. Novelty in Evolution: Restructuring the Concept. *Annual Review of Ecology and Systematics* 22: 229–256.
Murmann, Johann Peter. 2003. *Knowledge and Competitive Advantage: The Coevolution of Firms, Technology, and National Institutions*. New York: Cambridge University Press.
Nelson, Richard R. 2006. Evolutionary Social Science and Universal Darwinism. *Journal of Evolutionary Economics* 16 (5): 491–510.
Nelson, Richard R. 2007. Comment on: Dismantling Lamarckism: Why Descriptions of Socio-Economic Evolution as Lamarckian Are Misleading, by Hodgson and Knudsen. *Journal of Evolutionary Economics* 17 (3): 349–352.
Nelson, Richard R., and Sidney G. Winter. 1982. *An Evolutionary Theory of Economic Change*. Cambridge: Harvard University Press.
O'Mahoney, Joseph. 2007. The Diffusion of Management Innovations: The Possibilities and Limitations of Memetics. *Journal of Management Studies* 44 (8): 1324–1348.

Padgett, John F., and Walter W. Powell. 2012. *The Emergence of Organizations and Markets*. Princeton: Princeton University Press.
Pievani, Telmo. 2009. *La Teoria dell'evoluzione Oggi: La Riscoperta Del Pluralismo Darwiniano*. Lectio Magistralis. Potenza: Università degli Studi della Basilicata.
Pievani, Telmo. 2010. *La Teoria dell'evoluzione*. Bologna: Il Mulino.
Pigliucci, Massimo. 2005. Evolution of Phenotypic Plasticity: Where Are We Going Now? *Trends in Ecology & Evolution* 20 (9): 481–486.
Pigliucci, Massimo. 2008. What, If Anything, Is an Evolutionary Novelty? *Philosophy of Science* 75 (5): 887–898.
Pigliucci, Massimo. 2010. Genotype–Phenotype Mapping and the End of the 'Genes as Blueprint' Metaphor. *Philosophical Transactions of the Royal Society of London B: Biological Sciences* 365 (1540): 557–566.
Prigogine, Ilya. 1997. *The End of Certainty*. New York: Free Press.
Prum, Richard O., and Alan H. Brush. 2002. The Evolutionary Origin and Diversification of Feathers. *The Quarterly Review of Biology* 77 (3): 261–295.
Ridley, Mark. 2004. *Evolution*. Malden, MA: Blackwell.
Robson, Arthur J. 1995. The Evolution of Strategic Behaviour. *Canadian Journal of Economics* 28: 17–41.
Romanelli, Elaine. 1999. Blind (but Not Unconditioned) Variation: Problems of Copying in Sociocultural Evolution. In *Variations in Organization Science: In Honor of Donald T. Campbell*, ed. Joel A. C. Baum and Bill McKelvey, 79–91. Thousand Oaks, CA: SAGE.
Ruse, Michael. 1986. *Taking Darwin seriously: A naturalistic approach to philosophy*. New York, NY: Basil Blackwell.
Schelling, Thomas C. 1969. Models of segregation. *The American Economic Review* 59 (2): 488–493.
Shepherd, Jill, and Bill McKelvey. 2009. An Empirical Investigation of Organizational Memetic Variation. *Journal of Bioeconomics* 11 (2): 135–164.
Siedel, Marc-David L., and Henrich R. Greve. 2016. *Emergence: Research in the Sociology of Organizations*. Bingley: Emerald Group.
Simon, Herbert A. 1962. The Architecture of Complexity. *Proceedings of the American Philosophical Society* 106 (6): 467–482.
Simon, Herbert A. 1981. *The Sciences of the Artificial*. Cambridge: MIT Press.
Simonton, Dean Keith. 2011. Creativity and Discovery as Blind Variation: Campbell's (1960) BVSR Model After the Half-Century Mark. *Review of General Psychology* 15 (2): 158.

Smith, John Maynard. 1993. *The Theory of Evolution*. Cambridge: Cambridge University Press.

Solari, Luca. 1996. Le teorie evolutive. In *Manuale di organizzazione aziendale*, ed. G. Costa and R.C.D. Nacamulli. Torino: UTET.

Stacey, Ralph D., Douglas Griffin, and Patricia Shaw. 2000. *Complexity and Management: Fad or Radical Challenge to Systems Thinking?* London: Routledge.

Stoelhorst, Jan-Willem. 2008. Why Is Management Not an Evolutionary Science? Evolutionary Theory in Strategy and Organization. *Journal of Management Studies* 45 (5): 1008–1023.

Van de Ven, Andrew H., Douglas E. Polley, Raghu Garud, and Sankaran Venkataraman. 2008. *The Innovation Journey*. Oxford: Oxford University Press.

Vanberg, Viktor J. 2004. The Rationality Postulate in Economics: Its Ambiguity, Its Deficiency and Its Evolutionary Alternative. *Journal of Economic Methodology* 11 (1): 1–29.

Waddington, Conrad H. 1942. Canalization of Development and the Inheritance of Acquired Characters. *Nature* 150 (3811): 563–565.

Warglien, Massimo. 2002. Intraorganizational Evolution. In *The Blackwell Companion to Organizations [Organizational Evolution]*, ed. J.A.C. Baum. Malden: Blackwell.

Weick, Karl E. 1969. *The Social Psychology of Organizing*. Reading: Addison Wisley.

Weismann, August. 1893. *The Germ-Plasm: A Theory of Heredity*. London: Walter Scott and Scribner's Sons.

Whitman, Douglas W., and Anurag A. Agrawal. 2009. What Is Phenotypic Plasticity and Why Is It Important? In *Phenotypic Plasticity of Insects: Mechanisms and Consequences*, ed. D.W. Whitman, and T.N. Ananthakrishnan, 1–63. Enfield: Science Publishers.

Winter, Sidney G. 2004. Specialised Perception, Selection, and Strategic Surprise: Learning from the Moths and Bees. *Long Range Planning* 37 (2): 163–169.

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