PRINCIPIA **28**(2): 209–227 (2024) doi: 10.5007/1808-1711.2024.e98375
Published by NEL — Epistemology and Logic Research Group, Federal University of Santa Catarina (UFSC), Brazil.

CORRECTING RYLE'S MISTAKE: MOTOR REDUNDANCY AND THE EMBODIED INTELLIGENCE OF HABITS

JEFERSON HUFFERMANN

Department of Philosophy
UERN (Rio Grande do Norte State University), BRAZIL
jeferson.diello@gmail.com
https://orcid.org/0000-0001-8986-1912

Abstract. Embodied cognition and enactive approaches have criticized the associationist, also called mechanistic, view of habits. Motivated by the enactive account of habits and research on the field of Motor Control, I argue that Ryle was both wrong and right about habits and their relation to intelligent behavior. Ryle was wrong in claiming that habits fall short of intelligent behavior. But Ryle was also right, he correctly puts habits in a continuity that goes from dispositions in general to what he considers bonafide intelligent behavior or knowing-how. After some background, the Rylean distinction between habits and intelligent behavior is explored. I then move to Ryle's mistake and its roots, tacitly endorsing the idea of instinct as innate behavior. In doing so, he neglected that variability and modifiability are the rules and not the exceptions in behavior. Research on the phenomena of motor redundancy of animal behavior, the enactive account of habits, and a dynamic account of intelligence are mobilized to correct his mistake. My proposed account explains Ryle's mistake, why it is a mistake, and why it is an understandable mistake coming from someone with his perspective. The last section of the paper re-articulates the continuum between simple dispositions, habits, and highly skilled behavior. I reconceived the continuum of intelligence as including not only our habits, but all animal behavior.

Keywords: habits • intelligent behavior • know-how • motor redundancy • autonomist enactivism

RECEIVED: 30/06/2023 ACCEPTED: 21/12/2023

1. Introduction

The typical human experience is permeated by habitual activity, walking in the park, cooking dinner, and reading a relaxing book. Understanding habitual activity is crucial to understanding human life and behavior in different organisms. The mechanistic view of habits claims them to be mere automatisms. The position is well-defined in a comprehensive review of the literature made by the cognitive psychologists Wood and Rünger (2016, 292, italics added):

> Habits [...] are best understood as *learned automatic responses with specific features* (Wood et al. 2014). Two defining features of habit automaticity are

> (a) activation by recurring context cues and (b) insensitivity to short-term changes in goals (a.k.a., not goal dependent), including changes in the value of response outcomes and the response-outcome contingency.

According to this view, habits are inflexible automatic responses, they are learned, but not dependent on goals and activated by recurring context clues. Embodied cognition has criticized the mainstream mechanistic view of habits (Testa and Caruana 2020; Miyahara, Ransom, and Gallagher 2020; Miyahara and Robertson 2021; Ramírez-Vizcaya and Froese 2019). They point to the fact that, even though habits frequently unfold spontaneously in a manner that does not require constant rational-deliberative control, they are also too flexible to be mere automatisms. In anglophone philosophy, one of the central figures that defend a view of habits as learned automatic responses with specific features is Gilbert Ryle: 'It is of the essence of merely habitual practices that one performance is a replica of its predecessors' ([1949] 2009, 30). For that reason, his views are often criticized on this particular topic (Hutto and Robertson 2020; Miyahara, Ransom, and Gallagher 2020). However, little attention has been given to Ryle's reasoning, or to what he got right. In the present paper, I revisited Ryle's project with this goal in mind. My main motivation is to show the relevance of Ryle's philosophy to contemporary discussions. His thought helps one understand the theoretical roots of the mechanistic view and it is well-positioned to overcome it. I propose that Ryle was both right and wrong. Right about the continuity between simple dispositions and intelligent behavior, wrong about the lack of complexity of deceptively simple habits. Research on the motor control of behavior, the enactive approach to habits, and a dynamical systems account of intelligence are used to correct Ryle's mistake.

In *The Concept of Mind*, Ryle aims at the accomplishment of two major tasks: (i) the dismantling of Cartesian (mind-body) substance dualism (ii) and the defense of the doctrine to replace it, his adverbial account of the mind. Ryle's adverbial account of the mind emphasizes the role of behavioral dispositions in real-life experiences; *doings* in ordinary life are what account for a person's perceptions, beliefs, and thoughts: "To talk of a person's mind [. . .] is to talk of the person's abilities, liabilities and inclinations to do and undergo certain sorts of things, and of the doing and undergoing of these things in the ordinary world" (2009, 22). For this reason, Alksnis and Reynolds (2021) characterize Ryle's position as a holistic and non-reductive approach to behaviorism.[1] Ryle is also described as an ordinary language philosopher (Tanney 2009; 2022). Ryle's philosophical methodology is concerned with "the informal logic of the employment of expressions" (Ryle 1953, 186), The concern is registering the logical relations of predicates being *exhibited* as they are being *used*. He says that "we argue *with* expressions and *about* those expressions in one and the same breath" (ibid). Not only the usage of the laymen, but expressions as employed in relevant intellectual

circles also matter in talking with and about them. The intellectual circles can be the origin of the expression, they can have theories that employ it greatly and they can make suggestions about how the expression should be used in everyday contexts. Ryle's account of the mind is grounded in what is exhibited while we make assessments about a person's perceptions, beliefs, and thoughts. According to him, we are ultimately talking about doings, actual behaviors, or behavioral tendencies.

Enactivism, in claiming that action is constitutive of cognition and not simply the effect of it (Varela, Thompson, and Rosch 2017; Hutto 2023), is closer to Ryle's positive project than the orthodoxy in analytical philosophy of mind. Enactivism is also compared to behaviorism by some (Alksnis and Reynolds 2021; Barrett 2019).[2] Regardless of their similarities to behaviorism and of the positive or negative connotation of the comparison, Ryle's project and enactive thinking can be compared and contrasted in their own terms. In section 2, I look at one aspect of Ryle's positive project, the distinction between dispositions in general, habits, and intelligent behavior. In section 3, I propose that Ryle's mistake was to consider habits to be single-track dispositions and that the mistake is rooted in tacitly endorsing the dichotomy between innate and acquired behavior. To show why it is a mistake, I look into the phenomena of motor redundancy of action. In section 4, I present the enactive account of habits. In section 5, I reconceived the continuum of intelligence as including all animal behavior, and as possibly including the behavior of other organisms (plants and single-cell life). To do that, I use the conceptual tools of an enactive account of know-how and of a dynamical systems account of intelligence.

2. Ryle's distinction between habits and intelligent behavior

Ryle (1949/2009) argues that mental predicates refer to sometimes possible, sometimes concrete actualizations of tendencies, powers, and proclivities; of dispositions:

> It is being maintained throughout this book that when we characterise people by mental predicates, we are not making untestable inferences to any ghostly processes occurring in streams of consciousness which we are debarred from visiting; *we are describing the ways in which those people conduct parts of their predominantly public behaviour*. True, we go beyond what we see them do and hear them say, but this *going beyond is not a going behind,* in the sense of making inferences to occult causes; it is going beyond in the sense of considering, in the first instance, the *powers and propensities of which their actions are exercises*. (39, italics added)

In Ryle's adverbial account of the mind, patterns of behavior over time, in response to an environment and social context, would be what accounts for cognitive performance and cognitive states in general. The ascription of intelligence, a particular motive or purpose, emotions or moods, does not hinge upon the agent undergoing

some inner process, but rather that she exhibits or is prone to exhibit some pattern of behavior in the relevant situation. Mental images might be associated with the performance of some cognitive tasks, such as in silently remembering a particular scene of a film, but they need not be the case for all mental activity. Rather, Ryle focuses on predominantly public actions and behavioral conduct. The mind (or mental predicates) is constituted by what we do, not something distinct from it: "when we describe people as exercising qualities of mind, we are not referring to occult episodes of which their overt acts and utterances are effects; we are referring to those overt acts and utterances themselves" (Ryle 2009, 14). Going beyond without going behind is the idea that we should look for explanations of mental phenomena in the abilities and environmental conditions enabling and constraining action. When we are talking about the mind, for Ryle, we are talking about a complex set of world-involving powers and propensities (dispositions).

However, not all dispositions are made equal. The distinction between habits and intelligent behavior serves the purpose of differentiating the various types of dispositions that we refer to when referring to a person's behavior. Intelligent behavior is understood in terms of adaptive skills and knowing-how, in opposition to habits, understood in terms of simpler dispositions, automatic responses to specific contexts. Skills 'are certainly second natures or acquired dispositions, but it does not follow from this that they are mere habits. Habits are one sort, but not the only sort, of second nature' (Ryle 2009, 30). Habits would be acquired dispositions of lesser complexity, while intelligent behavior (knowing-how) is highly complex. Habits and skills would belong to the same class, acquired dispositions, or second natures, but they are sufficiently distinct. Habits are similar to other dispositions of the natural world, like the solubility of salt in water, in the fact that they are not displays of intelligence. Habits are characterized as "single-track dispositions" (2009, 30). The agent enacting them "does not exercise care, vigilance, or criticism" (ibid). To understand the difference, Ryle draws attention to the ways in which we acquired those second natures. Habits would be the result of drills or conditioning, understood as "the imposition of repetition" (ibid). Skillful or intelligent behavior would be more responsive to the situation, being flexible enough for adaptation, learning, and subsequent improvement: "It is of the essence of merely habitual practices that one performance is a replica of its predecessors. It is of the essence of intelligent practices that one performance is modified by its predecessors. *The agent is still learning*" (2009, 30, italics added). The acquisition of skills is the result of training, instead of conditioning. In training, every single performance contributes to the maintenance and improvement of skill, to intelligent learning: "Drill dispenses with intelligence, training develops it." (2009, 31). Notice, the difference between habits and intelligent behavior is not in terms of mere movements versus intentional action, or in the relevance of the social environment, but in terms of their dispositional complexity. The mere habit of smoking, for

instance, is already embedded in social constraints:

> My being a habitual smoker does not entail that I am at this or that moment smoking; it is my permanent proneness to smoke when I am not eating, sleeping, lecturing or attending funerals, and have not quite recently been smoking (Ryle 2009, 31)

He uses the example of the habit of smoking to highlight that habits, as is the case for all dispositions, have an unlimited variety of instantiations. Dispositions have something akin to law-likeness: "To possess a dispositional property . . . is to be bound or liable to be in a particular state, or to undergo a particular change, when a particular condition is realised" (ibid). But there is an inherent openness in dispositions due to the fact that their instantiation is context-dependent: "There are many dispositions the actualisations of which can take a wide and perhaps unlimited variety of shapes" (2009, 32). In the case of humans and other gregarious animals, the context is going to include social factors. His point seems to be that one should not confuse this with intelligence. Being a single-track disposition does not mean that the space of possible instantiations is limited. A smoker might not smoke at a funeral out of respect for the ceremony, they might smoke more under stressful periods, less when there is a newborn living in the household (even if the situation is new and very stressful). But they are still a smoker, due to the fact that there is a propensity to smoke when certain conditions are met.[3]

Truly intelligent behavior is more heterogeneous and robust: "the higher-grade dispositions of people with which this inquiry is largely concerned are [. . .] indefinitely-heterogeneous" (2009, 32). Ryle examples included a soldier hitting the bull's eye in target shooting and Jane Austin showing the specific kind of pride of the heroine of *Pride and Prejudice*. In both cases, what makes the behavior intelligent or skillful is their flexibility and reliability, i.e., their success under different conditions, be it actual or possible. Knowing how to hit the bull's eye requires being able to hit it in a range of adverse conditions or contrafactual scenarios: "even if the wind strengthens, the range alters and the target moves" (Ryle 2009, 33); it can't be mere luck. Knowing how to show the intended prideful nature of the fictional character Elizabeth Bennett required Jane Austin "to represent her actions, words, thoughts, and feelings in a thousand different situations" (Ryle 2009, 32); it can't be a simple description. Intelligence is not something extra added on to some type of doings, it is a feature of complex types of doings. However, if part of what determines the space of possible instantiations of dispositions such as smoking is the volition of the agent and the attunement to social norms and conventions, it is strange to deny that there is some form of control or regulation in their doing. The actions of smokers as smokers are not as automatic as the idea of a replica of past actions suggests. Being of the same class, acquired dispositions or second natures, Ryle at the same time distinguishes

habits from skills (knowing-how) and puts them in a continuum between dispositions of varying degrees of complexity: 'Knowing *how*, then, is a disposition, but not a single-track disposition like a reflex or a habit' (2009, 34). He seems to suggest that the flexibility in the smoking habit of smokers is due only to the social dependence of the disposition's instantiation, not on some intelligence on the part of the agent. Therefore, in such a continuum, smoking is closer to dispositions like breakability than to dispositions like writing a novel. But it remains hard to grasp why not smoking at a funeral is not an intelligent capacity, since "intelligent capacities ... are dispositions admitting of a wide variety of more or less dissimilar exercises." (Ryle 2009, 43). In the next section, I argue that Ryle is mistaken in his assessment of habits as constituted of actions that are an exact replica of past actions because no action is an exact replica, animal behavior has a variability not accounted for in his characterization.

3. Ryle's mistake, its roots, and the context-sensitivity of motor control

Ryle's mistake was that no action, in humans or other animals, is an exact replica of past actions, and Ryle's mistake is rooted in the dichotomy between acquired and innate behavior. The Rylean characterization of habits and intelligent behavior as second natures or acquired dispositions is not incidental. The idea of a "second nature" in Ryle's thought leads to a contrast with what would be a "first nature". The idea that some characteristics of an organism are consequences of their intrinsic nature while others are the result of the interaction with the environment and their upbringing appears throughout Western thought. This would be the contrast between first and second nature. One possible interpretation is in terms of a dichotomy between innate and acquired. There is an association of innateness with characteristics that are rigid, automatic, and independent of experiences. The other side of the dichotomy would be the acquired characteristics, flexible, learned, rationally controlled, and dependent on experiences. The latter half of the 19th and the turn of the 20th century saw the rise of the idea of innate behavior under the guise of the notion of instinct (Griffiths and Linquist 2022).[4] Part of the theoretical discussion at the time was exactly the relation between the learned behaviors of animals and the inheritable nature of instinct. Darwin, for instance, was a defender of innate behaviors in the form of inheritable instincts: "If we suppose any habitual action to become inherited — and I think that this does sometimes happen — then the resemblance between what *originally* was a *habit* and an *instinct* becomes so close as not to be distinguished" (Darwin 1859, 187, italics added).

The evolution of instinct, of how behaviors become automatic and inheritable,

was a valid research topic. The topic became central to psychology at the beginning of the 20th century, as noted by the experimental and physiological psychologist Zing Yang Kuo: "Although the theory of instincts is as old as the history of psychology, it is only recently that they have been applied so universally in nearly all of the fields of psychology' (Kuo 1921, 645). Ryle's view of (non-intelligent) habitual behavior as rigid and automatic is reminiscent of the idea that repeated patterns of behavior become stabilized in automatic responses inherited as innate behaviors (instincts in the restricted sense used here). Instinct was one of the main concepts being debated in both human and animal psychology at the time.[5] Habits are clearly not instincts for Ryle, but they do have similarities with the psychological view at the heart of early 20th century psychology. The idea of innate behaviors as inheritable automatic responses makes it plausible to suppose that some acquired human actions can become automatic responses as the behavior stabilizes (becomes a habit).

But why would Ryle's idea of habits as exact replicas of past actions be a *mistake*? The apparent distinction between simple habit and intelligent behavior is not a dichotomy, because there is no action whose instantiation is an *exact* replica of the past. There is always some degree of spontaneity in complex biological systems—my focus here is on Metazoans, what we commonly refer to as animals—because the systems are always adapting and fine-tuning their relation to their environment. To show the mistake in Ryle's characterization is sufficient to show the variability and context-sensitivity of behavior. Individual organisms display significant motor variability in purposeful action (Latash 2010; 2012). The field of Motor Control studies how the nervous system of an animal interacts with the rest of the body and parts of the environment to produce purposeful actions. Among the pioneers of the field was the Soviet neurophysiologist Nikolai Aleksandrovich Bernstein. His work provides systematic accounts of how the human Central Nervous System (CNS) controls the musculoskeletal system (mainly the coordination of joints and muscles) in voluntary actions, like moving our hand in the direction of a specific target. He formulated what became known as the problem of motor redundancy (Bernstein 1967). The redundancy refers to the fact that the CNS selects the patterns of activation of the joints and muscles of the musculoskeletal system from an almost infinite number of different joint-muscle activation patterns that would all equally lead to the achievement of the task. The main problem with motor redundancy is how to account for the selection of *one* pattern from almost infinite possibilities. Humans and other animals have higher degrees of freedom in the execution of a task than what would be expected if one assumes an optimizing view of behavior, where the CNS selects the optimal coordination of joints and muscles. One way of understanding the phenomena is in terms of abundance, rather than redundancy (Latash 2012). The variety of equally effective ways an animal can complete a task can be understood as sets of equally satisfying solutions that are selected based on time and energy constraints. Another

aspect relevant to understanding the selection patterns is the actual state of the particular system, meaning, the history of the individual animal and both the plasticity and sedimentation of their neuromuscular pathways. The main idea is that there is no CNS selection of optimal solutions to behavior tasks, rather, the organism adapts to the situation here-and-now and all equally adaptable solutions are equal in regard to the task at hand. Bernstein himself did not advocate for the idea of one unique optimal solution. One of his first contributions to the field was the now classical study of professional blacksmiths cutting metal with a chisel and hammer (Bernstein 1930). Employing an original motion analysis, he discovered a co-variation between the high variability of their joints' angle across motions and a low variability of hammer trajectory. The hammer had a similar trajectory across different joints-muscles-hammer patterns. The blacksmiths showed what comes to be labeled "repetition without repetition": the movements follow prototypical patterns required for the completion of a task, but the exact sequence of actual movements does not overlap substantially (Bernstein 1967). Bernstein did not find a process of automatization in the direction of an optimal kinetic pattern. Motor tasks are solved with variable means, no action is an exact replica of past actions. Ryle could reply to this objection by pointing out the intelligence required for cutting metal, after all, the activity Bernstein analyzed was of professional blacksmiths, the case would be analogous to the soldier hitting the bull's eye. Therefore, it does not fall under his characterization of habit. However, several tasks executed by humans and other animals involve motor redundancy, and a number of later studies provided evidence for variable solutions, even after extensive practice (Jaric and Latash 1999; Latash, Kang, and Patterson 2002; Yang and Scholz 2005). Extensive practice does not lead to the complete automatization of behavior, a degree of spontaneity always remains. Variability related to context-sensitivity is the norm of animal behavior, not the exception. Several factors can be relevant to the explanation of why that is, such as the plasticity of the CNS and the high degree of complexity in the CNS-musculoskeletal-environmental coupling. But the results remain: no two actions are exactly the same. The deceptively simple task of purposely raising our hand and pointing to a specific direction involves the complex coordination of CNS, joints, and muscles; agents employ variable solutions to the realization of a task, and those solutions make sense taking into consideration their histories and the particularities of the situation. Ryle's views on behavior are still too rigid and in need of correction. Thankfully, the enactive account of habits is well-positioned to do that.

4. The enactive account of habits.

Autopoietic Enactivism, Autonomist Enactivism, or the Enactive Approach to Cognitive Sciences (EA) is an ongoing project of naturalization of the mind. According to the tradition, cognitive performance relates to the adaptive (Di Paolo 2005), and not necessarily optimal (Thompson 2007: 159), self-manutence and self-regulation of organisms in their coupling with the environment. I am going to focus on this section on one aspect of EA, their account of habits (Egbert and Barandiaran 2014; Di Paolo et al 2017; Ramírez-Vizcaya and Froese 2019; Di Paolo 2019). EA claims that humans and other organisms with complex nervous systems are *sensorimotor agents*, a form of life constituted "as self-sustaining, habitual organizations in the structural and functional interrelations between their acts, skills, and dispositions" (Di Paolo et al 2017, 7). In a sense, the proposal is a return to William James' idea that "*animals are bundles of habit*" (1890, 104, italics added). But then, what are habits? They are characterized as "self-sustaining precarious patterns of sensorimotor activity" (Di Paolo et al 2017, 177). The characterization as "self-sustaining" refers to the idea that habits are cause and effect of their own enactment. The repeated behaviors forming our habits stabilize in habitual identities or ways of life that the organism strives to maintain.[6] The connection between habits and the formation of self-sustaining recurring activity is also present in John Dewey's account of the relation between the will, habits, and the self:

> All habits are demands for certain kinds of activity; and they constitute the self. In any intelligible sense of the word will, they are *will*. They form our effective desires and they furnish us with our working capacities. (Dewey 1930, 25)

Survival is not the only driving force of sensorimotor agents: "[s]ome actions are as effective as others are in terms of their biological purpose, but they are preferred because they are habitual and comfortable" (Di Paolo et al 2017, 143). EA provides an organicist view of habits (Barandiaran and Di Paolo 2014), where habits are part of the overall self-organization over time of living systems, they relate to the ways in which the organism aims at thriving (and not only surviving) in the place *in-habit* by it. In the human case, the socio-material environment is constituted by cultural institutions and social normativity. The precarious nature of the self-sustaining patterns of activity refers to the fact that ' 'if the habitual scheme is not enacted with sufficient frequency, the structures supporting it start to lose the properties that enable it. Eventually, the capability to enact the scheme degrades and disappears" (Di Paolo et al 2017, 144). Our habits are carved in us, however, it is possible to grow out of habits by not enacting them, be it by making deliberate choices or by lacking the support structures. For instance, one can lose limbs and have permanent brain injuries, those

changes can predispose reenactment of a certain behavior while preventing the reenactment of other behaviors. The self-sustaining precariousness highlights the importance of material structures enabling the exercise of our habits (the musculoskeletal system, neural networks in the brain, physical structures of the environment, tools, and other agents).

Habits self-sustain in being repeatedly enacted. Situations "call for" habits, they generate the propensity for specific behavior. When positioned in a suitable situation for the enactment of a specific habit, the agent finds herself in a readiness-to-act disposition the more reinforced and sedimented the action. Habits are recursively individuated,[7] as I often run in the park in the mornings the more I adjust to it, which includes my physiology and the fact that the sneakers mold into my feet. In habitual behavior, the patterns of activity are temporarily stable, or metastable: "They [habits] are metastable relations between organic and environmental processes poised between blind automatism and unpredictable spontaneity" (Di Paolo et al 2017, 177). To quickly respond to the environmental tasks put forward by environmental situations, the networks of habits retain "a residue of dynamic criticality without which they would simply be unchangeable automatisms" (Di Paolo et al., 2017, 102). The enactive approach also puts forward the proposal that habits form a topology of mutually dependent habits or regional identities (Di Paolo 2009), interacting in hierarchical structures where habits enable and constrain each other in a myriad of ways (Egbert and Barandiaran 2014). The bundle of habits self-organizes in hierarchical structures according to behavior genres, in humans, activities like walking, cooking, smoking, shooting a rifle, and writing a novel. Habits are thus nested precarious networks of processes, including the CNS, the rest of the body, and relevant features of the environment. The networks become a source of normativity for an agent, i.e., the preservation of different habitual identities or ways of life (the runner, the shooter, the smoker) guides behavior.

The complexity of individual habits and the complexity of the hierarchical relations between them account for the curious complexity of habits: often unfolding in a non-deliberative manner but with enough dynamical criticality not to be mere automatisms in response to specific context cues. One potential criticism of the enactive approach to habits is the supposed difficulty to account for bad habits. If habits relate to organisms aiming at thriving in their environments, it becomes difficult to conceive of habits that put them in danger. Such consideration is not a problem for EA, because habits are not considered in isolation, as atomic responses to triggering stimuli. But rather, habits are complex networks of enabling and constraining patterns of repeated action, forming a coherent whole (the sensorimotor agent). Individual human agents are formed by coherent sets of habitual identities; you are a walker, a reader, or perhaps a dancer, in one specific idiosyncratic organization. A habit is bad considering the agent as a whole as the evaluative frame. Smoking,

for instance, is "a habit whose expression, while positive for its own continued self-maintenance, is negative for a person's well-being because it consistently overrules the expression of other situationally relevant actions and habits" (Ramírez-Vizcaya and Froese 2019, 8, italics removed). Smoking is bad for the reasons we typically say it is bad; it can alleviate stress and it gives momentary pleasure (what contributes to continual self-maintenance), but it decreases overall lung capacity, causes cancer, and ultimately undermines our biological viability (it causes death). Bad habits can also become the dominant guide of behavior in a person's life. Addictions, for example, can be conceptualized in this approach as "habitual identities that constitute an addict's form of life and that is so deeply ingrained into the agent's physiology that it alters her metabolic autonomy and escalates to dependence" (Schütz et al 2018, 4). Originally regional patterns of self-sustaining activity increasingly become the dominant guide of behavior, transforming the physiology of the agent in ways that increase the dependency on the bad behavior.

According to the EA account of habits, many of our daily activities are guided by them, and they are understood as nested precarious networks of organic and environmental processes organized around behavior genres and ways of life. Nothing in behavior is simple, Ryle was wrong in thinking of habits as single-track dispositions. Considered individually, actions have more degrees of freedom than would be expected in a more mechanistic stimuli-response model of explanation. Mathematically, one preferred model of explanation in Motor Control studies is the Uncontrolled Manifold analysis (Scholz and Schöner 1999; Bennett et al 2023). The model aims at differentiating good variation—the variation of equally effective ways of performing a task— from bad variation (the variation that leads to worsened performances). Going from single actions to the repeated behaviors that constitute our habits, complexity only increases. Repeated stabilized behaviors create a tendency for reenactment under the right conditions, but habits are also self-organized in hierarchies, so the same situation might call for different habits with different intensities and with different consequences for the overall organization of the sensorimotor agent. Enactment of habits contributes to the sedimentation of others closely related in the network (walking regularly contributes to the habit of running) while undermining the enactment of other actions, sedimented or not. In the most egregious cases, like addiction, a habit can become the dominant guide of behavior, leading to an intense decrease in overall quality of life. The approach tries to understand the habits of agents in the context of their interactions with the environment. The agent is viewed as a highly complex network of tendencies and proclivities to act resulting from her (neuro)physiological structures, the responsiveness to features of the environment, and her previous history. In this sense, it is a vindication of Ryle's adverbial account of the mind; the "habitual mind" is understood in terms of abilities, liabilities, and as inclinations to do and undergo certain sorts of things. Most of the explanation of

habitual activity will rely on predominantly public behavior, going beyond it without going behind in the cases in which prior history, features of the environment, and neurophysiological structures are also relevant for the explanation.

5. Rethinking the continuum of embodied intelligence

In the last two sections I have argued against the strong dichotomy between habits and intelligent behavior or knowing-how indirectly, by arguing that no action is a determined automatic response to context cues, and by offering an alternative to the mechanistic view of habits. The motion of animals always has considerable degrees of freedom, and the spontaneity of action carries through our habitual activities. In fact, the enactive view of habits proposes that habits are a type of intelligent behavior, adaptive sedimentation of patterns of conduct related to historically significant situations, organized in ways of being in the world that enable and constrain each other. Now is a good moment to reconsider underlying assumptions about intelligence and argue for the intelligence of habits more directly. For Ryle, intelligent behavior is heterogeneous and robust, it requires flexibility and reliability. Knowing how to do something demands success under different adverse conditions, be it actual or possible. My claim was that Ryle was wrong about the *scope* of intelligent behavior, animal action in general admits a variety of more or less dissimilar exercises, and within certain boundaries and constraints, behavior is always adaptive. Habits are deceptively simple, especially when considered as isolated units, as mechanistic accounts often do. Ryleans could object that the variety I indicated is not *wide* enough. According to the Rylean dispositional account, the difference between being brittle, being a smoker, and being a novelist is of degree and not kind. What was discussed in sections 3 and 4 would fail to meet a determined threshold, it would not constitute intelligence. The variability of action is the widespread variability of dispositions and not the specific variability of intelligence. However, it seems one is gerrymandering intelligence or knowing-how in making this move. Without a more substantial account of intelligence, the objection is *ad hoc*. Nevertheless, to give a more convincing case in favor of the view put forward in the last two sections, I sketch a path towards an embodied conception of intelligence, using conceptual tools from enactivism and Thelen and Smith's (1994) dynamical account of cognition and action.

First, the intelligence in question here amounts to knowing how to do certain things, so we can look closer at the notion of know-how. I'm going to look specifically at the closest to an account of know-how given by EA, their account of *mastery* (Di Paolo et al 2017, chapter 4; Di Paolo 2019). Mastery is "the know-how our bodies have that certain patterns of movement will induce certain sensory changes" (Di Paolo 2019, 212), and know-how consists of "powers and sensitivities required for

action" (ibid). Enactivists are explicitly anti-intellectualists (Varela 1999; Thompson 2007; Hutto 2005), but an analogy with propositional knowledge is useful. One general assumption of traditional epistemology about propositional knowledge is that it entails true belief, I cannot know what is false and if I know, I believe. But propositional knowledge cannot be true belief because arriving at a true belief by luck or happenstance is not knowledge (acquiring knowledge would be too easy). Following Rolla and Huffermann (2021), I propose to expand this general idea and think of similar criteria for know-how: *reliable effective action relative to metastable habits under consideration*. Effective action is not going to be enough for an action to be an instance of know-how, actions can be effective by happenstance (a favorable, but not anticipated or controllable change in the environment can be the cause). Know-how must rest on reliable or stable effectiveness:

> [know-how] implies *stability*, that is, regularly achieving successful results in varying situations and under similar constraints (for a similar idea, see Rolla, 2019). To know how to do a somersault, for instance, is to successfully perform a pattern of acts that result in the full rotation around one's horizontal axis. And this can be done across a wide range of conditions—but naturally not across all conditions. (Rolla and Huffermann 2021, 8).

Habits are what guarantee the stability condition proposed in the quotation above. Regularly achieving successful results in varying situations and under similar constraints seems to be exactly what Ryle meant by intelligent behavior and it is very much in line with an adverbial account of the mind. Practical knowledge is still being understood as an achievement of the agent. The effort being made is to connect know-how to the relative control one has over their situation (self-maintenance and self-regulation). Practical knowledge is enabling and constraining the control typical of cognitive performance. Enactive know-how maintains the gradation associated with skill, as one can be more or less reliable in doing something. It also maintains the precariousness highlighted in the characterization of habits, to be able to actually perform the act in similar circumstances and under similar constraints is part of the stability condition. This conception of know-how also elucidates the embodied and situated normativity of action. Acts are correct and incorrect depending on the agent's goals, bodily morphology, acquired habits, and environmental circumstances. Normativity, thus conceived, is *immanent normativity*. The habits the agent has partially constrain the normativity of their actions. But more importantly, habits make agents responsive to the correct ways of acting in a situation, it is their responsiveness that enables them to improve and adapt in changing environments. Our habitual activity is not a blind automatism, it rests on know-how (powers to act and sensitivities to situations) acquired in previous interactions, the know-how is also slightly changing (positively or negatively) as the behavior repeats.

The account of know-how provided relates skillful engagement with the world to the ways here-and-now interaction progressively shapes the agent and her habits. Practical knowledge "is a trajectory of activity that depends on both the past and the current." (Thelen and Smith, 1994, 222). Based on those considerations, my proposal is to reconsider the pinnacles of intelligent behavior. Intelligence is not predicated on symbolic structures, highly abstracted and general thought, reasoning, and context-free knowledge. Rather, it is based on richly detailed, context-specific know-how. The mark of intelligence is not less dependency on the situation, on the contrary, intelligence requires attunement to it:

> Intelligence means the ability to adapt, to fit behavior and cognition to the changing context. A smart system seems unlikely to ever do exactly the same thing twice. Rather, a smart system would shift its behavior slightly to fit the nuances of the particular context or would shift radically—jump to an all-new state—if the situation demanded it [. . .] its activity is *always* dependent on the here and now, the just-previous activity, and the history of the system as a whole, it will always incorporate—always bend—to the demands of both history and immediate experience. (Thelen and Smith 1994, 244)

To act knowingly or skillfully is to be acutely attuned to the particularities of a situation since it is in the situation that one finds the conditions for effective action (i.e., its normativity). However, we are unfolding trajectories of activity (Thelen and Smith (1994) formalized it in terms of dynamical systems theory). Going beyond the normativity related specifically to the novel present situation, the intelligent system responds to norms pertaining to the history of interaction, historical norms whose incorporation characterizes the agent.

Following Thelen and Smith (1994), intelligence is the ability to adapt behavior to the changing context. Following enactive considerations, know-how is the powers and sensitivities one mobilizes in adapting. In this framework, the intelligence of habits can be accessed in terms of the contribution of repeated behavior to maintaining the tendency for reenactment, i.e., adaptability to different contexts. But also, the habits under consideration in an assessment of intelligence can be the whole network that forms the agent. For instance, smoking can be said to be unintelligent only in the sense that it is a bad habit, it is bad for the agent's well-being and, therefore, it limits the overall capacity to adapt to changing contexts (you are not going to be able to run as long as you could if you did not smoke). In the more severe cases of addiction, the viability of the agent is threatened. Regardless, bad habits are still context-sensitive and not mere automatism in response to specific context cues. In line with pre-theoretical understanding, bad habits are less intelligent than good habits, nonetheless, they are instances of embodied intelligence.

Both the notion of instinct-as-innate-behaviors and the mechanistic accounts of habit (Ryle included) appear to be grounded in "the mistake that the behavior of

animals is definite and stereotyped" (Kuo 1922, 347). In this paper, I have argued that, within certain boundaries, variability and modifiability are the rules rather than the exception in behavior. But not all forms of life and not all behavior within a form of life are equally intelligent. The variability of behavior was associated here with the phenomena of motor redundancy, so the scope of the argument consists of organisms with CNS and musculoskeletal complexity. They are smart because they don't do exactly the same thing twice. The scope could be easily extended to invertebrates (see Honegger and de Bivort 2018 on "stochastic individuality"). Organisms without nervous systems are a gray area. One finds authors making the case for adaptive behavior in single-cell organisms (Lyon et al. 2021; Egbert et al 2010; 2011), and there has been recent attention on the topic of plant intelligence (Calvo and Trewavas 2021). I did not put forward a strong case in favor of intelligence in those cases, but even if not intelligent, those organisms are closer to us than previously thought. Going up the gradient of dispositional complexity we find human intelligence, but not all human action is equally intelligent. Actions can lack intelligence insofar as they are ineffective or they achieve the relevant goals unreliably, without mobilizing know-how. Stabilized repeated patterns of conduct (habits) are intelligent because they incorporate the demands of both the agent's history and the immediate situation. But they can be more or less intelligent, insofar as they contribute to the overall adaptivity of the person. There is a continuum of dispositional complexity going from salt's solubility to being able to write impactful literary fiction, Ryle was right in that regard. His major mistake was neglecting the complexity of our habits and behavior in general. The repetition of behavior does not lead to automatization of it, in a sense, agents are always learning and cannot dispense intelligence.

References

Alksnis, Nikolai; Reynolds, Jack. 2021. Revaluing the Behaviorist Ghost in Enactivism and Embodied Cognition. *Synthese* **198**(6): 5785–5807. https://doi.org/10.1007/s11229-019-02432-1.

Barandiaran, Xabier E. 2017. Autonomy and Enactivism: Towards a Theory of Sensorimotor Autonomous Agency. *Topoi* **36**(3): 409–30. https://doi.org/10.1007/s11245-016-9365-4.

Barandiaran, Xabier E.; Di Paolo, Ezequiel. 2014. A Genealogical Map of the Concept of Habit. *Frontiers in Human Neuroscience* **8**: 522. https://doi.org/10.3389/fnhum.2014.00522.

Barrett, Louise. 2019. Enactivism, Pragmatism. . . behaviorism?. *Philosophical Studies* **176**(3): 807–18. https://doi.org/10.1007/s11098-018-01231-7.

Bateson, Patrick; Mameli, Matteo. 2007. The Innate and the Acquired: Useful Clusters or a Residual Distinction from Folk Biology?. *Developmental Psychobiology* **49**(8): 818–31. https://doi.org/10.1002/dev.20277.

Bennett, Timothy; Thomas, Liam; Wilson, Andrew D. 2023. Affordances for Throwing: An Uncontrolled Manifold Analysis. PsyArXiv. https://doi.org/10.31234/osf.io/u4j2g.

Bernstein, Nikolai Aleksandrovich. 1930. A New Method of Mirror Cyclographie and Its Application towards the Study of Labor Movements during Work on a Workbench. *Hygiene, Safety and Pathology of Labor* **56**: 3–9.

Bernstein, Nikolai Aleksandrovich. 1967. *The Co-Ordination and Regulation of Movements*. Oxford: Pergamon Press.

Calvo, Paco; Trewavas, Anthony. 2021. Cognition and Intelligence of Green Plants. Information for Animal Scientists. *Biochemical and Biophysical Research Communications*, Rethinking Cognition: From Animal to Minimal, **564**(July): 78–85. https://doi.org/10.1016/j.bbrc.2020.07.139.

Darwin, Charles. 1859. *On the Origin of Species or the Preservation of Favoured Races in the Struggle for Life*. New York: D. Appleton and Co.

Dewey, John. 1930. *Human Nature and Conduct: An Introduction to Social Psychology*. New York: Random House.

Di Paolo, Ezequiel. 2005. Autopoiesis, Adaptivity, Teleology, Agency. *Phenomenology and the Cognitive Sciences* **4**(4): 429–52. https://doi.org/10.1007/s11097-005-9002-y.

Di Paolo, Ezequiel. 2009. Extended Life. *Topoi* **28**(1): 9. https://doi.org/10.1007/s11245-008-9042-3.

Di Paolo, Ezequiel. 2019. Process and Individuation: The Development of Sensorimotor Agency. *Human Development* **63**(3–4): 202–26. https://doi.org/10.1159/000503827.

Di Paolo, Ezequiel; Buhrmann, Thomas; Barandiaran, Xabier E. 2017. *Sensorimotor Life: An Enactive Proposal*. First edition. Oxford, United Kingdom: Oxford University Press.

Egbert, Matthew D.; Barandiaran, Xabier E. 2014. Modeling Habits as Self-Sustaining Patterns of Sensorimotor Behavior. *Frontiers in Human Neuroscience* **8**: 590. https://doi.org/10.3389/fnhum.2014.00590.

Egbert, Matthew D.; Barandiaran, Xabier E.; Di Paolo, Ezequiel. 2010. A Minimal Model of Metabolism-Based Chemotaxis. *PLOS Computational Biology* **6**(12). https://doi.org/doi.org/10.1371/journal.pcbi.10011004.

Egbert, Matthew D.; Barandiaran, Xabier E.; Di Paolo, Ezequiel. 2011. Behavioral Metabolution: The Adaptive and Evolutionary Potential of Metabolism-Based Chemotaxis. *Artificial Life* **18**(1): 1–25. https://doi.org/10.1162/artl_a_00047.

Egbert, Matthew; Hanczyc, Martin M.; Harvey, Inman; Virgo, Nathaniel; Parke, Emily C.; Froese, Tom; Sayama, Hiroki; Penn, Alexandra S.; Bartlett, Stuart. 2023. Behaviour and the Origin of Organisms. *Origins of Life and Evolution of Biospheres*, May. https://doi.org/10.1007/s11084-023-09635-0.

Fodor, Jeremy. 1975. *The Language of Thought*. Harvard University Press.

Froese, Tom; Di Paolo, Ezequiel. 2011. The Enactive Approach: Theoretical Sketches from Cell to Society. *Pragmatics & Cognition* **19**(1): 1–36. https://doi.org/10.1075/pc.19.1.01fro.

Gallagher, Shaun. 2017. *Enactivist Interventions: Rethinking the Mind*. First edition. Oxford, United Kingdom: Oxford University Press.

Griffiths, Paul; Linquist, Stefan. 2022. The Distinction Between Innate and Acquired Characteristics. In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Spring 2022. Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/spr2022/entries/innate-acquired/.

Honegger, Kyle; de Bivort, Benjamin. 2018. Stochasticity, Individuality and Behavior. *Current Biology* **28**(1): R8–12. https://doi.org/10.1016/j.cub.2017.11.058.

Hutto, Daniel D. 2005. Knowing What? Radical versus Conservative Enactivism. *Phenomenology and the Cognitive Sciences* 4: 389–405.

Hutto, Daniel D. 2023. A Positively Relaxed Take on Naturalism: Reasons to Be Relaxed but Not Too Liberal. *Topoi*, March. https://doi.org/10.1007/s11245-023-09892-8.

Hutto, Daniel D.; Robertson, Ian. 2020. Clarifying the Character of Habits: Understanding What and How They Explain. In *Habits: Pragmatist Approaches from Cognitive Science, Neuroscience, and Social Theory*, edited by Fausto Caruana and Italo Testa, 204–22. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108682312.010.

James, William. 1890. *The Principles of Psychology*. New York: Holt and Company.

Jaric, Slobodan; Latash, Mark L. 1999. Learning a Pointing Task with a Kinematically Redundant Limb: Emerging Synergies and Patterns of Final Position Variability. *Human Movement Science* **18**(6): 819–38. https://doi.org/10.1016/S0167-9457(99)00042-1.

Kuo, Zing Yang. 1922. How Are Our Instincts Acquired?. *Psychological Review* 29: 344–65. https://doi.org/10.1037/h0073689.

Kuo, Zing Yang. 1921. Giving up Instincts in Psychology. *The Journal of Philosophy* **18**(24): 645–64. https://doi.org/10.2307/2939656.

Latash, Mark L. 2010. Motor Synergies and the Equilibrium-Point Hypothesis. *Motor Control* **14**(3): 294–322. https://doi.org/10.1123/mcj.14.3.294.

Latash, Mark L. 2012. The Bliss (Not the Problem) of Motor Abundance (Not Redundancy). *Experimental Brain Research* **217**(1): 1–5. https://doi.org/10.1007/s00221-012-3000-4.

Latash, Mark L.; Kang, Ning; Patterson, David. 2002. Finger Coordination in Persons with Down Syndrome: Atypical Patterns of Coordination and the Effects of Practice. *Experimental Brain Research* **146**(3): 345–55. https://doi.org/10.1007/s00221-002-1189-3.

Levin, Janet. 2023. Functionalism. In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta and Uri Nodelman, Summer 2023. Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/sum2023/entries/functionalism/.

Lyon, Pamela; Keijzer, Fred; Arendt, Detlev; Levin; Michael. 2021. Reframing Cognition: Getting down to Biological Basics. *Philosophical Transactions of the Royal Society B: Biological Sciences* **376**(1820): 20190750. https://doi.org/10.1098/rstb.2019.0750

Maturana, Humberto; Varela, Francisco J. 1980. *Autopoiesis and Cognition: The Realization of the Living*. Kluwer Academic: Dordrecht.

Miyahara, Katsunori; Ransom, Tailer G.; Gallagher, Shaun. 2020. What the Situation Affords: Habit and Heedful Interrelations in Skilled Performance. In *Habits*, edited by Fausto Caruana and Italo Testa, 1st ed., 120–36. Cambridge University Press. https://doi.org/10.1017/9781108682312.006.

Miyahara, Katsunori; Robertson, Ian. 2021. The Pragmatic Intelligence of Habits. *Topoi* **40**(3): 597–608. https://doi.org/10.1007/s11245-020-09735-w.

Myin, Erik; van den Herik, Jasper C. 2020. A Twofold Tale of One Mind: Revisiting REC's Multi-Storey Story. *Synthese*, September. https://doi.org/10.1007/s11229-020-02857-z.

Neander, Karen. 2020. Teleological Theories of Mental Content. https://plato.stanford.edu/archives/win2020/entries/content-teleological/.

Noë, Alva. 2004. *Action in Perception*. London: MIT Press.

O'Regan, J. K.; Noë, Alva. 2001. A Sensorimotor Account of Vision and Visual Consciousness. *The Behavioral and Brain Sciences* **24**(5): 939–73; discussion 973-1031. https://doi.org/10.1017/s0140525x01000115.

Ramírez-Vizcaya, Susana; Froese, Tom. 2019. The Enactive Approach to Habits: New Concepts for the Cognitive Science of Bad Habits and Addiction. *Frontiers in Psychology* **10** (February): 301. https://doi.org/10.3389/fpsyg.2019.00301.

Ritchie, J. Brendan. 2021. What's Wrong with the Minimal Conception of Innateness in Cognitive Science?. *Synthese* **199**(1): 159–76. https://doi.org/10.1007/s11229-020-02543-0.

Rolla, Giovanni. 2021. *A Mente Enativa*. https://doi.org/10.22350/9786559173341.

Rolla, Giovanni; Huffermann, Jeferson. 2021. Converging Enactivisms: Radical Enactivism Meets Linguistic Bodies. *Adaptive Behavior*, June, 105971232110207. https://doi.org/10.1177/10597123211020782.

Ryle, Gilbert. 1953. Ordinary Language. *The Philosophical Review* **62**(2): 167–86.

Ryle, Gilbert. 2009. *The Concept of Mind*. London; New York: Routledge.

Scholz, J. P.; Schöner, G.. 1999. The Uncontrolled Manifold Concept: Identifying Control Variables for a Functional Task. *Experimental Brain Research* **126**(3): 289–306. https://doi.org/10.1007/s002210050738.

Schütz, Christian G.; Ramírez-Vizcaya, Susana; Froese, Tom. 2018. The Clinical Concept of Opioid Addiction Since 1877: Still Wanting After All These Years. *Frontiers in Psychiatry* **9**: 508. https://doi.org/10.3389/fpsyt.2018.00508.

Sterelny, Kim. 1990. *The Representational Theory of Mind*. Cambridge: Blackwell.

Tanney, Julia. 2009. Rethinking Ryle: A Critical Discussion of *The Concept of Mind*. In *The Concept of Mind*, by Gilbert Ryle. London ; New York: Routledge.

Tanney, Julia. 2022. Gilbert Ryle. In *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Summer 2022. Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/sum2022/entries/ryle/.

Testa, Italo; Caruana, Fausto. 2020. The Pragmatist Reappraisal of Habit in Contemporary Cognitive Science, Neuroscience, and Social Theory: Introductory Essay. In *Habits: Pragmatist Approaches from Cognitive Science, Neuroscience, and Social Theory*, edited by Fausto Caruana and Italo Testa, 1–38. Cambridge: Cambridge University Press. https://doi.org/10.1017/9781108682312.001.

Thelen, Esther; Smith, L. B. 1994. *A Dynamic Systems Approach to the Development of Cognition and Action*. Cambridge, Mass: MIT Press.

Thompson, Evan. 2007. *Mind in Life: Biology, Phenomenology, and the Sciences of Mind*. Cambridge, Mass: Belknap Press of Harvard University Press.

Varela, Francisco J. 1999. *Ethical Know-How: Action, Wisdom, and Cognition*. Stanford, California: Stanford University Press.

Varela, Francisco J.; Thompson, Evan; Rosch, Eleanor. 2017. *The Embodied Mind: Cognitive Science and Human Experience*. Revised Edition. Cambridge, MA, USA: MIT Press.

Wallace, Alfred Russel. 1891. *Natural Selection and Tropical Nature*. London: Macmillan.

Ward, Dave; Silverman, David; Villalobos, Mario. 2017. Introduction: The Varieties of Enactivism. *Topoi* **36**(3): 365–75. https://doi.org/10.1007/s11245-017-9484-6.

Wood, Wendy; Rünger, Dennis. 2016. Psychology of Habit. *Annual Review of Psychology* **67**: 289–314. https://doi.org/10.1146/annurev-psych-122414-033417.

Yang, J.-F.; Scholz, J. P. 2005. Learning a Throwing Task Is Associated with Differential Changes in the Use of Motor Abundance. *Experimental Brain Research* **163**(2): 137–58. https://doi.org/10.1007/s00221-004-2149-x.

Notes

[1]Behaviorism or not, Ryle's project is not a form of eliminativism about mental terms and is not committed to a stimulus-response model of explanation, two features typically associated with behaviorism.

[2]However, it has already been argued in the literature that enactivism is sufficiently distinct from behaviorism (Gallagher 2017, 69–70; 148–49; Thompson 2007, 50; Noë 2004, 32–34; Rolla 2021, 85–86).

[3]As Tanney (2009; 2022) has pointed out, Ryle was not interested in reducing mental predicates to a list of actual and possible happenings. One of the main reasons is that such a list would be an infinite series, even in simpler cases.

[4]In this paper I'm referring to instinct as inheritable automatic responses, independent of experiences, somehow intrinsic to the nature of the organism (instinct-as-innate-behavior). I'm going to remain neutral in regard to other notions of instinct and the use of so-called minimal notions of innateness in current cognitive science (Ritchie 2021).

[5]But not without objections. One line of criticism is that concepts like innateness and instinct are epistemic roadblocks in attempts to account for behavior. The point was made more than 100 years ago by Kuo's now famous critiques (1921; 1922): "To call an acquired trend of action an instinct is simply to confess our ignorance of the history of its development" (Kuo 1921, 650). and "instinct is a 'finished' psychology. It is a stumbling block in the way of experimental genetic psychology" (Kuo 1922, 345).

[6]A conduct becomes habitual if it is "good" under some evaluative frame. I go into more detail on this aspect of the account when discussing bad habits.

[7]Egbert and Barandiaran (2014) provide a proof of concept and a formal-computational model of the process of formation, individuation, and hierarchical organization of habits.