

Fictionalism of Anticipation

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Abstract

A promising recent approach for understanding complex phenomena is recognition of anticipatory behavior of living organisms and social organizations. The anticipatory, predictive action permits learning, novelty seeking, rich experiential existence. I argue that the established frameworks of anticipation, adaptation or learning imply overly passive roles of anticipatory agents, and that a *fictionalist* standpoint reflects the core of anticipatory behavior better than representational or future references. Cognizing beings enact not just their models of the world, but own make-believe *existential agendas* as well. Anticipators embody plausible scripts of living, and effectively assume neo-Kantian or pragmatist perspectives of cognition and action. It is instructive to see that anticipatory behavior is not without mundane or loathsome deficiencies. Compelling anthropomorphisms of anticipatory activity suggest a formulation of an anticipatory kind of panpsychism.

Key words: anticipation, prediction, fictionalism, semiosis, complexity, self-organization, embodiment, panpsychism, teleology, *a priori*.

1 Introduction

Human anticipation gives color to experiences and social life. Or does it even define what it means to be fully alive and engaged in the society? Trust is a form of anticipation that plays essential roles in economy, business

organization, governing, politics, technological progress (Botsman 2017). For a multi-faceted example, consider the FIFA World Cup of 2018 in Russia. Various forms of anticipation are present in organization and sponsorship of the event, in the ready broadcasting industry and reliable communication technology. Prior political doubts (BBC 2014) underscore the risk of anticipation. Football itself is largely an anticipation game, especially for goalkeepers, but also for the attentive defenders, middle-field playmakers, and opportunistic forwards seeking to beat offside traps. Coaches do much anticipation work as well. And then there are expectations of football fans around the globe. At the same moment as Hirving Lozano scored a goal against Germany on June 17, 2018, seismic stations in the Mexico city registered a small earthquake (Semple and Villegas 2018). Plausibly, it was caused by jubilating fans in the city. How else can a ball kicked in a Moscow stadium cause a geological event on other side of the globe, but by powers of captive anticipation?

The FIFA World Cup illustrates that anticipation is a key feature of masterly performance, better life experiences, grand scale coordination. It is indispensable for vigorous economy and functional society. An ambitious academic view is emerging that anticipation, broadly understood, is a fundamental attribute of biological life, cognition, artificial intelligence, and even of emerging, self-organizing phenomena beyond mechanical matter interactions. Certain universality of anticipation is noticed by Poli (2010):

“... the major surprise embedded in the theory of anticipation is that anticipation is a widespread phenomenon present in and characterizing all types of realities. Life in all its varieties is anticipatory, the brain works in an anticipatory way, the mind is obviously anticipatory, society and its structures are anticipatory, even non-living or non-biological systems can be anticipatory.”

The growing interest in broad studies of anticipation is evident (Nadin 2016; Poli 2017). Nasuto and Hayashi (2016) write:

“... anticipation is an emerging concept that can provide a bridge between both the deepest philosophical theories about the nature of life and cognition and the empirical biological and cognitive sciences steeped in reductionist and Newtonian conceptions of causality.”

According to Nadin (2016, pg. 283), anticipation is “a definitory characteristic of the living”. This echoes Rosen’s (1985) distinction between simple, mechanical systems and complex, living systems. Similarly, *predictive coding* (Clark 2013; Pezzulo et al. 2018) and *active inference* (Friston et al. 2016) are key features of cognitive and biological processes in their free energy formalization (Friston and Stephan 2007; Ramstead et al. 2018).

Working definitions of anticipation in academic literature (Poli 2017, Ch. 1) refer either to future prediction (Poli 2010), or to representation of self and the environment (Rosen 1985). These definitions do not mention *fictionalist* aspects as a conspicuous feature of anticipation. According to linguistic definitions (Matti 2019), *fictionalism* accepts statements of a discourse not as literal truth but as useful fiction of some sort. Similarly, I see anticipatory cognition as having a pragmatic heuristic rather than rigidly representational character, and as generally resilient to possible and inevitable errors. As an alternative condition to belief and disbelief, anticipation is compellingly understandable in fictionalist terms.

This article constitutes a primer introduction to the overlooked fictionalist facets of anticipation and their deep going implications. It is worth mentioning that *fictional expectations* in economics are accentuated by Beckert (2013). The fictional character of anticipation is demonstrated amply by the current COVID-19 pandemics that causes huge disruptions in the global economy, travel, sports events, and thereby reveals the regular expectations as fictitious plans at heart. Ingrained routines became unsettled or counterproductive. Bryant’s (2020) early essay on the pandemics is a good accompaniment to this article.

I highlight two fictionalist aspects of anticipation that appear to counter the leading contemporary paradigm of cognition based on *predictive coding* (Friston et al. 2016). Firstly, anticipatory action includes not only exciting possibilities of learning, novelty seeking, rich experiential existence, but also mundane or even repellent facets such as prejudiced behavior and stressful reactivity. If human judgement can be patently biased, fallible, and irrational (Kahneman 2011), more primitive forms of anticipation can be expected to be even more superficial, fallacious, crude. With a contrasting reference to *behavioral economics* (Minton and Kahle 2013), the ambitious thesis of predictive coding that cognitive and living systems are effective

probabilistic prediction machines is comparable to *rational choice theory* (Gilboa 2010).

Secondly, I argue that the established frameworks of anticipation, prediction, autonomy still under-appreciate active, generative drives whereby anticipating beings seek to fulfill or impose their *existential agendas*. The frameworks of representation, predictive coding, and *autopoiesis* (Maturana and Varela 1980) portray a reactive, stasis-oriented manner of observation, learning and adaptation. Even the time-centered approach (Poli 2010) has a flavor of reactivity to future. But anticipation can be spatial as well, as in venturing to new locations or encountering new objects. New experiences and exploits are often attained by own new behaviors, improvised persistence. Complementarily to the approach of *enactive embodiment* (Varela et al. 1991) of the environment, cognizing anticipators effectively seek to enact their destined actions in the world.

The next section reappraises the scope of observed anticipatory behavior, including mundane or loathsome manifestations. Section 3 defines the emergent *fictionalist stance* of anticipators, and finds similitude in several philosophical currents, particularly in the Kantian synthetic *a priori* categorization and American pragmatism. Vaihinger’s “The Philosophy of As If” (1935) and Santayana’s “Scepticism and Animal Faith” (1955) match well with the anticipatory fictionalism in complementary ways. Section 4 gives key definitions of *anticipatory plots*, *existential agendas*, and discusses formalization of anticipation itself. Section 5 contrasts entrenched, dependable plots of functional anticipation with indefinite, uncertain scripts. This localizes applicability of the stronger mythological language. Section 6 explicates embodiment and semiotic unfolding of anticipations and existential agendas. Section 7 adopts compelling anthropomorphisms of anticipators and defines an anticipatory kind of *panpsychism* (Brüntrup and Jaskolla 2016). The examples of tornadoes, lightning and snowflakes are put forward. The last section underscores broad significance of fictionalism.

2 The Scope of Anticipation

Fragility and forcefulness of being alive constitute a subtle polarity. On the one hand, the environment is ever changing and rudimentarily unpredictable.

There is no certainty that an acorn will turn into an oak tree. At best, an acorn effectively *anticipates* favorable conditions for appropriate employment of its nutty nutrients and DNA guidance. Even animals have objectively limited control over own fates. Some of their maturation phases — such as winning a duel for status, finding a sexual partner — are only roughly determined by the fixed biochemical mechanisms or scenarios. The whole trajectory of the Aristotelian *telos* of a living being depends on many things going right, sometimes sporadically, extraordinarily right. In a sense, an organism lives in anticipation of favorable luck and certain outside help.

On the other hand, organisms act powerfully on the environment. Fulfillment of anticipation is followed by resolute activity that intervenes in the ambient dynamics of the environment and own organic development. In aggregate, the biosphere changes the geology and the atmosphere of the Earth.

Representational models of anticipation poorly capture this polar dynamics. Rosen (1985, §6.1) defined an *anticipatory system* as a natural system that contains an internal predictive model of itself and of its environment, which allows it to change state at an instant in accord with the model's predictions pertaining to a later instant. This presupposes significant cognitive capacities that normally require a brain. The advance from prediction to action *at an instant* is not clear; say, how does a predicted scenario lead to a decision when the scenario is unfavorable? Rosen's formal structure of anticipatory modeling is particularly inapplicable to the animal behavior in predator-prey races, where the action is very fast, hardly predictable, contingent on accidental features of the environment, and the outcome is uncertain. Organisms cannot have a comprehensive model of the environment and its possible changes. Instead, an organism works from its *Umwelt* (von Uexküll 1957; Kull 2010), i.e., its functionalist-semiotic view of the environment (and itself). A living being filters the perceived environment for existential necessities, threats, and *affordances* (Gibson 1966). Action is triggered by rather few cues out of a mass of environmental information. For an example, consider seasonal phenological cycles (Schwartz 2003; Forrest and Miller-Rushing 2010), particularly the spring revival. They constitute webs of anticipatory attentions, responses, and influences without any organism apprehending wholly its environs.

To appreciate the scope of anticipation, we should recognize it in mundane, commonly failing, or even loathsome forms as well. Examples in human social contexts are: stereotypes, prejudice, superstition, strong first impressions, adoration of leaders. These anticipations determine human behavior to a larger extent than rational thinking. Comparable anticipations in the biological world are checked perhaps only by natural selection. A different example is the physiological stress response (Sapolsky 1994). For most animals, it is an episodic anticipatory reaction to adverse environmental conditions. But it is chronically triggered in the modern human life, with harmful effects on health.

On the other hand, higher levels of existence beyond being mere matter require determined anticipation, in a sense. Just being alive is inherently an anticipation of further favorable conditions. Anticipation or being anticipated can define agency (Poli and Valerio 2019; Simondon 1964). Anticipators act elementally from anticipatory *fictions* rather than from *representations* of future or the world. Workable fictions are often *reflexive* (Wikipedia 2020b): they “represent” worlds that would not exist without following of those fictions, including reflexively anticipated worlds that do not exist yet and may never exist. Crucially, the anticipatory fictions direct action. I argue that a worldly cognitive being does more than playing “the game of predicting the sensorium” (Allen and Friston 2018, p. 2464). It has an *existential agenda* delineated by its *anticipatory plots*, as I define in Section 4. The fictions have variable significance and probability of actualizing. I start testing mythological language in its both delusional and generative or stimulating meanings to underscore these variabilities.

The penetrative contrast between observing and active anticipation is well captured by the famous quip of Marx (1845, Thesis 11): “The philosophers have only interpreted the world in various ways; the point, however, is to change it.” Ironically, the prototypical examples of consequential impetuous change happen to be capitalists like John D. Rockefeller. The *modus operandi* of entrepreneurs is brazenly mythological rather than analytical. Their innovative action is formed by incomplete visions, ambitious anticipations, and quickly devised plans. For example, Rockefeller’s success was furthered by his determined, optimistic appraisal of the risks in the early oil industry (Chernow 1998, Ch. 6, 16). He daringly expanded his oil business in an

unstable market, despite uncertainty of how much oil would ever be yielded from the Pennsylvania fields or anywhere else. He entreated partners to hold onto Standard Oil shares, or willingly bought them from disgruntled stockholders (Chernow 1998, pg. 168, 181, 380).

Entrepreneurs rely on their experience largely in a mythological mode as well; high rates of venture failure attest to that. Crises are commonly resolved by essentially betting on a fortunate strategy. For example, the diverging fortunes of Kodak and Fujifilm — the two largest manufacturers of photo films until the 2000s — are attributed to different decisions in coping with the swift competition of digital photography (Kmia 2018). Fujifilm wagered on massive production of LCD screens, even if the competition from the plasma technology was intimidating.

I argue that the anticipatory aspect of aspirational mythology deeply unifies human sciences with biology, ecology, and eventually with self-organizing phenomena in general. Living or complex forms of existence require specific dispositions, habits (Fernández 2012), learning, and effectual adherence to survival interests, systemic-communal “practices”, established interaction patterns or signs. These associations offer and justify concrete anthropomorphic generalizations toward pansemiotics (Salthe 2012) and panpsychism (Goff 2017). While making a similar argument, Ulanowicz (2010) quotes Bertrand Russell (1960, Ch. II):

“Every living thing is a sort of imperialist, seeking to transform as much as possible of its environment into itself and its seed. [...] We may regard the whole of evolution as flowing from this ‘chemical imperialism’ of living matter.”

More benign but similarly active aspects of human experience and learning are underscored by Dewey (1916, Ch. II, XI). The *direction-to-fit* distinction (Searle 2001, p. 37–38) between beliefs (as having to fit the world) and desires (as seeking to alter the world) is a kindred philosophical discussion. Let us take a look at other philosophical confirmations.

3 Philosophical Parallels

Western philosophy has been in opposition to mythological interpretation of the world since the Greeks (Robinson 2004, Lect. 2). Modernist philosophy, especially positivism (Ayer 1936), has yet greater distaste for speculative, metaphysical narratives. But reversal of Comte's (1975) theological-metaphysical-positive historical progression of knowledge is worthwhile to consider when formulating a primitive epistemology for simpler living or cognizing beings. A good reference point is MacIntyre's (1981, Ch. 10) view of the ancient societies, where everyone had to know own place in the community as well as correspondent privileges, duties, performance norms; where courage, loyalty determined reliance for friendship, et cetera.

My proposal boils down to assigning a pragmatic *fictionalist* (Matti 2019) and *fallibilist* stance to cognizing, anticipating beings towards future, own capacities and fate, and the indirectly apprehended environment. They are corporeally ready to employ their developmental stories as useful, even vital fictions rather than comprehensive, unambiguous verities. As I discuss here, indirect support for viability of the fictionalist stance can be found in philosophy of science and post-modernist ideas. The stance embraces the Kantian *a priori* categorization and American pragmatism liberally. The fictionalist stance is anti-realist epistemically, but onticity of reality is acknowledged implicitly: there would be no set out fiction without reality.

Fulfillment of aspirational expectations is never guaranteed. But rational, empirical or post-modern skepticism (Popkin 2003) leads to the conclusion that any anticipation, intuition, knowledge, conviction are open to failure. According to anti-realist currents (McCain 2016; Massimi and McCoy 2019), scientific knowledge differs only in commitment to reliability and technical standards as a set of predictions and extrapolation of perceptions. Popper (1962, p. 66) writes: "Science must begin with myths, and with the criticism of myths." Living out anticipatory myths is similarly inescapable as falsification of scientific theories. Biological cognition and anticipation are probably closer to superstition, faith than to the best scientific practices such as *Bayesian inference* (Knill and Pouget 2004). Rather than focusing on a few well-defined, immediate problems of life, the organisms may inherently follow reflexive behavioral myths that encompass necessary wisdom for their whole term of existence. Downsides of *a priori* beliefs and anticipatory organization

can be mild, while probable rewards could be existentially enormous, like in Pascal's Wager (Hájek 2018). From the skeptical perspective, life is an art of being right for wrong reasons. Or in other words, the organisms rely substantially on *epistemic luck* (Pritchard 2005), particularly when making fight-or-flight, migration, or mating decisions.

The relation between aspirational fiction and life is reminiscent of *psycho-physical parallelism* (Wikipedia 2020a), particularly of the Spinozian notion that mental and physical events do not interact causally, but are coordinated as two attributes of God. In our context, the fictions and the physical reality are coordinated by a generalized natural selection. Thereby emergent mythological meaning defines the teleology of the being and intentionality of its behaviors. The extent of the parallelism can be extraordinary: the DNA guides the development and the living of organisms within viable contexts; values of individuals or societies direct their fate and history. Conversely, operative myths constitute the semiotic DNA of the being, a critical causal factor of its ways.

Extending Kant's (1998) transcendental turn, the myths can be seen as the synthetic *a priori* knowledge of the cognizing being. They dynamically organize, mold its perception (and action!), impose "intuitive" frames of apprehension, stabilize experience and performance. Anticipation itself is a kind of categorization of future scenarios. Fictional expectations as assorted Kantian-like categories determine the *Umwelt* (von Uexküll 1957) and routine perceptions of the cognizing being. Vaihinger's (1935, III.A) interpretation of Kant's *ideas of pure reason* as self-conscious fictions with practical benefits grounds his philosophy of As If. Vaihinger (1935, III.D) credited Nietzsche with alike association of neo-Kantian ideas of instrumental cognition with Darwin's natural selection. In the same vein, evolutionary epistemology (Lorenz 1977) affirms that the synthetic *a priori* knowledge is shaped by natural selection. This implies that workable semantics and competences appeared first in partly *ad hoc* ways. The world is thereby a natural selection of myths.

The fictionalist perspective matches well with subtleties of post-modernism. One point of agreement is that all cognition is inferential and mediated by signs (Cahoone 2010, Lect. 31). Variable slicing by different perceptions and categorizations naturally leads to perspectivism. Derrida's (1974) critique

of Western logocentrism is conforming, but his radical *deconstruction* is antithetical to appreciation of myths. Eventually though, a workable myth is to be understood roughly uniquely. Brashly rephrasing Foucault (1980), *mythology is power* — no less potent as organizing or generative power than possibly oppressive. Contrarian and pluralistic confirmations can be found in Lyotard's (1983) critique of metanarratives, and his account of the post-modern abundance of *little narratives, language games*.

Not least, the outlined fictionalist stance matches well with American pragmatism (Legg and Hookway 2019), particularly with:

- Peirce's (1935, 1:141) *fallibilism*; i.e., the epistemological view that no belief or theory can ever be certain;
- anti-skepticism (Putnam and Conant 1994, Ch. 8);
- Peirce's inquiring logic of *abduction* and speculative grammar (Fann 1970; Ejsing 2007; Bellucci 2018);
- James' (1896) *will to believe* as the necessary practical will for required, purposeful action and fulfilling experience;
- James' *functionalist*, purpose-driven psychology (Robinson 2004, Lect. 47).

Peirce (1935, 1:545) replaced Kant's preformed categories of understanding and forms of intuition by a dynamical stock of signs (Cahoone 2010, Lect. 17). Just as Peirce's (1935, 5:283) implicit theory of mind postulates that all thoughts are signs, biosemiotics (Emmeche and Kull 2011) proposes that animal perception, communication, behavior, and metabolism are ubiquitously mediated by signs. Anticipation within systems is recognized as a semiotic process by Kull (1998) and Nadin (2012). Individual anticipation can be bluntly seen as a Peircian triadic sign (Savan 1988): a cause to anticipate can be viewed as a *signifier* (i.e., representamen), fulfillment of the anticipation as the correspondent *signified* (i.e., object), and the consequential process or its supposed scenario as the *interpretant*. Own action of an anticipator is typically a crucial part of the interpretant process of converting a signifying affordance to a welcome consequence. Accordingly, anticipators or their *habits* (West and Anderson 2016) could be considered as general manifestations of Peirce's thirdness.

The difference between pragmatism and Vaihinger's (1935, viii) fictionalism is that the latter admits theoretical falsity of usable ideas, while pragmatism ties fruitful ideas to the definitions of truth and knowledge. I lean to the pragmatist side in seeing reflections of reality in workable notions and dispositions. Santayana's (1955) naturalism is even more to the point. It postulates *animal faith* of vital, ingrained beliefs that are essential for action and cognition. Continuing the pragmatist gist, Rorty (1979) denied foundational justification of knowledge and definability of truth. He affirmed Davidson's (2001) veridicality of existing beliefs. The truth of (mythological) knowledge could be established by the depth and the temporal extent of the parallelism with the surrounding reality and, pragmatically, with own existential purposes.

4 Existential Agendas

Broad universality of anticipation invites recognition of anticipatory capacities, teleological agendas in simplest cognizing, self-organizing beings. Contrary to (Rosen 1985; Nadin 2012), I consider perception-reaction cycles as prototypical anticipating entities already. *Primed dynamical systems* of (Vidunas 2019) can be recognized as *radically open* (Chu 2011), critically sensitive, causation delegating, provoking anticipators. Attribution of a fictionalist stance to anticipators provides with many engaging anthropomorphisms. Section 7 embraces them to define *anticipatory panpsychism*. Here I give resonating definitions of *anticipatory plots*, *existential agendas*, and discuss briefly formalization of anticipation itself. Next, Sections 5 and 6 discuss material and semiotic modalities that embody or actualize anticipated items or events.

An *anticipatory plot* is a sequence of anticipations, responding actions, set outcomes, and further anticipations, actions of a cognizing being. It is an implicit script of what *could* happen given the right context. The script does not have to be rigid or definite, but may be approximate or flexible, and may have relative gaps to be filled in opportunistically. Anticipatory plots should match cognitive capabilities of the anticipator; excitatory (though not necessarily productive) reaction to anticipation fulfillments has to be possible or probable. The prescribed reaction may be objectively possible only under

extraordinary circumstances, or with some “magic” assistance not specified by the anticipation. For example, an elephant *might* fly steadily under exceptional stormy conditions, possibly filling in a plot gap thereby. In the next section, I differentiate anticipatory plots by their plausibility or routine reliability, and suggest mythological terminology for the less dependable yet vital anticipated scenarios. Interesting plots are those enhancing quality or probability of prolonged existence of the anticipator. Primarily, anticipatory plots address autonomy, subsistence, and relational organization of the anticipator.

An *existential agenda* is a set of anticipatory plots of a cognizing being, together with their semantic meaning to its existence. It is a set of implicit anticipations, adumbration of what *should* happen. For example, a stray cat seeking an owner has an existential agenda, with several behavioral scripts to attract her or him. Biological *life* can be defined as an existential agenda that includes metabolism, self-repair, and reproduction. Emergence and evolution of life could be described within a spectrum of existential agendas. This spectrum can be imagined starting with Maslow’s (1943) hierarchy of human needs by extrapolating it to existential agendas of mammals, vertebrates, multicellular and unicellular organisms, and eventually to virtually biotic hypercycles of chemical reactions. Existential needs will vary across the food chain, within territorial or hierarchical species, down to parasitic organisms, and so on. The variable complexity of agendas allows variable complexity of requisite biochemistry, information processing. Graves’ (1970) *levels of existence* follow Maslow’s hierarchy to a great extent, and fit into the delineated spectrum of existential agendas even better.

A technical definition of anticipation itself may be premature while usage of this notion shifts with newly appreciated limitations of representational models and future prediction. Radical openness of anticipation is well characterized by Deacon’s (2011, p. 27) *ententionality*; he uses the term *ententional* as “a generic adjective to describe all phenomena that are intrinsically incomplete in the sense of being in relationship to, constituted by, or organized to achieve something non-intrinsic”. Cryptically, ententionality encompasses self-preservation, adaptation, functionality, satisfaction conditions, purposes, subjective experiences (Logan 2012) — in a word, anticipation. The primary aspect in my focus is structural readiness for

favorable conditions and predisposed self-enhancing reactions, behaviors or dynamics. That readiness constitutes a whole anticipatory story. *Delegated causality* in (Vidunas 2019) stipulates structural readiness for external perturbation, but the positive value of the ensuing interaction may be missing. We would not say that humanity *anticipated* the COVID-19 pandemics with its unpreparedness and institutional vulnerability.

Let us consider a tornado as an intricate example. It may seem tricky to set apart a tornado from its environment, as the whole phenomenon is constituted not just by the intense vortex but also by an expansive convection cell and nascent conditions (Bluestein 2013). On the other hand, a tornado is a rare, short-lived disruption of ordinarily fair atmospheric dynamics. A tornado becomes soon nearly independent of the boundary conditions except for energy input. Salthe (2012) refers to *dissipative structures* (Prigogine 1980) exemplified by tornadoes as “entities with needs”. But the environment is needy as well, in a passive way. Its need is to resolve convective and thermodynamic instabilities, and the usual deterministic dynamics is not up to the task, so to speak. To model the sheer disruption, unstable weather conditions can be considered as a primed dynamical system that delegates resolution of the instabilities to singular phenomena such as thunderstorms with tornadoes as some *deus ex machina*. From the inside perspective, isn’t a forming storm tantamount to competition of gusts, swirls and eddies, each with a potential to become a twister story? The tornado structure may amount to a categorization process that orders weaker flows. Its formation could have elements of seeking and learning (Wolchover 2014). A voracious tornado measures the environmental limits for own existence, at least.

Recent research in abiogenesis (Russell and Kanik 2010) suggests that biological life was spawned by the global eletrochemical instability of *hydrogenating carbon dioxide*. In comparison to weather storms, the biosphere enjoys a vast span in time and diverse contingencies. Section 7 here tries to define a panvitalistic or panpsychic continuity between dissipative structures, life and cognition, based on delegating or anticipatory interactions.

5 Logistics and Mythology

Working representation of anticipatory plots or enaction of existential agendas require material embodiment and a whole logistical system of furnishing essentials. Anticipatory plots are fulfilled by *following* them by means of dispositions, habits, learned behaviors, recognition of the expected context, referral to information carriers, reference to systemic (or ecological, social) constraints and familiar patterns as signs. A prime example is the chromosome DNA that constitutes basically an embodied mythological story of the development and the living of an organism. The DNA molecules and the supporting machinery of ribosomes, RNA polymerase, transfer RNA (Berg et al. 2006) exemplify existential, material modalities of the biochemical mythology.

Incidentally, is the language of mythology justified right here? On the one hand, biochemical functionality and organic development are amazing, still mysterious in their arrangements. They are mythical in the nihilistic sense as well, since so many physical interventions may wreck the fine biological organization. On the other hand, routine biological meanings have to be taken at face value in organic employment or investigation. Numerous instances of optimized biochemical or physiological functionality (Bialek 2012) constitute a firm basis for organic behaviors and their biosemiotic interpretation. Mythological vocabulary should rather not be used beyond initial rhetorics to characterize entrenched, dependable functionality.

Still, the current point is that biochemical fictions of normative organic functionality require a lot of logistical support. Besides genetic guidance, resourceful systems rely on nutrient supply, waste removal, homeostasis, neural and hormonal coordination on various scales. The right contexts and logistical support are parts of anticipatory plots. Many vital physiological mechanisms are structurally deeply protected from surprises. Reflexively, organic health and well-being depend on orderly actualization of developmental plots and regular anticipations.

Importance of the functional logistics is acknowledged by *constructor theory* (Deutsch 2013; Marletto 2015). For any physically possible circumstance or transformation, constructor theory postulates existence of a *constructor*, that is, an object or a process that can repeatedly and reliably bring that circumstance about. Like relational biology (Rosen 1985) or the

notion of *autopoiesis* (Maturana and Varela 1980), constructor theory focuses on abstract organizational requirements and processes. The organizational relations have an anticipatory character, really: each involved substance fills in an expected requisite role, and more importantly, the material substances are radically open to particular demanded interventions or informational guidance.

Reliability of designated functionality mechanisms can be variable. *Allostatic* (Sterling 2012) regulation through anticipatory change of somatic parameters is less firmly reliable than homeostasis. The neural-cognitive control of behavior is prone to errors. Here probabilistic models of *predictive coding* (Friston et al. 2016) should apply most fittingly. Further, the genetic script for the whole lifespan may contain gaps, that is, relatively much less specified scripts for developmental or living events. In particular, sexual mating may “purposely” have indefinite, open-ended facets that would, for example, channel environmental conditions and stabilize natural selection. Lifetime learning may evolve not only through cognitive capacities, but also through anticipation patterns of growth, trials and lifetime semiosis. The comprehensive lifespan script may include a *habit change*, entailing a messy cognitive overhaul. Campbell’s (1968) monomyth of Hero’s Journey could be a good guidance to archetypical metamorphoses that are subtly anticipated in many biological-cognitive lives. It is for these underspecified, barely probable scenarios that mythological language would be appropriate.

Anticipatory plots do not have to be restricted to learning from past experiences or resemblances. It may encompass merely feasible but bold existential agendas, and some implicit wisdom regarding *unknown unknowns* (Logan 2009). Less definite but gradually effective semiotics is particularly characteristic of ecological interactions (Ulanowicz 2010). Synergetic mutualisms arise from congruous anticipations whose actualization is somehow protected. Interactive categorizations can have a flavor of socio-cultural framing (Cassirer 1953).

Both evolution and a single life induce action in learning environments of *low validity* (Kahneman 2011, Part III). The list of human cognitive biases, fallacies and heuristics (Kahneman 2011) should be a good guide of how spontaneous or anticipated semiosis happens routinely — even if common failures to employ more objective means of cognition would remain to be

explained. Particularly interesting are the cognitive biases based on story formation: valuing associative or causal coherence; the narrative fallacy; the halo effect. The propensity to story development reflects key importance of anticipatory plots in any evolving cognitive-semiotic system, I reckon. The operative stories could be analyzed using the multivalued semiotics of Greimas' (1987, Ch. 6–8) *narrative grammar*.

6 Embodiment and Semiosis

How does semiosis develop, either spontaneously or by inherited anticipation? The focus should be on employment of already available material and cognitive resources, or *semiotic scaffolding* (Hoffmeyer 2015). Anticipatory relations can buildup innately bottom-up as the primed structured materials define abstract demand for particular interventions, and that demand is normally satisfied eventually by distinct substances. The whole vehicle of living relations is reconstructed in a born organism as a “free market” of primed genes and proteins (mainly). Available and emergent signs are linked on various scales into hypothetical patterns whose experiential affirmation is anticipated. Less reliable signs and awaited coincidences may fit productively into anticipatory plots and existential agendas.

Emerging demands of the functional organization can be satisfied only by present substances which are likely to have unrelated other roles or original conditions of existence. The substances become new *affordances* (Gibson 1966) for the most open-endedly anticipating components. This dynamics constitutes a form of *embodiment* (Glenberg 2010) and *semiotic scaffolding* (Hoffmeyer 2015). For example, biological information carriers probably evolved as successful targets of guidance “requests” from the anticipators, starting from arbitrary, “superstitious” sensitivities of the anticipators. This fits the paradigm of *extended cognition* (Clark and Chalmers 1999), epitomized by the behavior of consulting a map or a notebook.

Other example of the embodied fulfillment of this anticipatory inquiry could be quick organic development of rich motor repertoire and mannerisms by referring to loosely related experiential memory, perhaps most completely encoded in one perceptual-motor modality in a manner insinuated by the theory of visual, auditory or kinesthetic *learning styles* (Pashler et al. 2008).

In a similar vein, behavioral economics (Kahneman and Tversky 1984) describes how human choices are primarily determined by largely emotional *framing* rather than objective merits of the choices. Likewise, momentary animal interpretations and decisions are spontaneously generated based on contingent clues, impulses or impressions, without anything like objective deliberation generally. These *virtual* embodiments are based on cognitive rather than physical resources. Embodiments arise as *spandrels* (Gould and Lewontin 1978) rather than adaptations: they are incidental scaffolds for emerging new capacities and substantive purposes.

As mentioned in Section 3, anticipation is a semiotic process on systemic (Kull 1998; Nadin 2012) and participating individual levels. Affordances, recurrent sequences of events become Peircian signs whereby initial perceptions or triggers signify eventual benefits or outcomes under “interpretant” action or dynamics. Semiosis translates resources, dynamic processes into potential utility. The meaning of the signs is pragmatically fictionalist rather than precise, logocentric. Bounds of the *recursive semiosis* (Peirce et al. 1935, 1:339) — presumably, toward fundamental physical interactions in one direction, and some cosmic selection in the other — are disregarded by the fictionalist stance of anticipators, as their operative level of interpretation ignores dynamical details, thermodynamic limitations, higher meanings. The most reliable signs establish persistent patterns of behavior and experience. They provide the embodiment frame for semiotic scaffolding towards rich functionality and interaction. Less reliable signs are the focus of emergent creative manipulation by a kind of free association; they become leverage points for flexible adjustment, learning, communication. Systemic or communal tendencies may evolve for fixing precedents and “customs”.

Semiotic scaffolding may recursively continue beyond material embodiment. This virtual embodiment across cognitive levels can be recognized in the techniques of competitive memorization through rich association or navigation scenarios (Foer 2011; O’Connor 2019), and in abstract cognition through metaphorical bodily sensations (Carpenter 2011; Sapolsky 2017, Ch. 15). An example of the latter is moral disgust registered as physical disgust. The James-Lange theory (James 1884) that emotions are initiated physiologically rather than mentally is another exemplar of embodiment dynamics. With genuine emotions, the *somatic markers* (Damasio 1994,

Ch. 8) “fire together” with the processing brain circuits, to borrow a phrase (fully quoted in the next section) from Hebb (1949). These scaffolded signals have great weight in decision making, evidently.

Focusing on the “free market” aspect of the semiotic interaction between anticipators, I recapitulate as follows. The demands of existential agendas are satisfied by haphazard, opportunistic embodiments of affording services in various forms of material modalities and cognitive constructs. This interaction of bio-economic *demand and supply* should extrapolate to anticipatory capacities and teleological agendas of simplest cognizing, self-organizing beings. The simplest *Umwelt*, existential agenda, or Peircian habit of a primed dynamical system can be recognized in mere organization of the particular reaction. Anticipators constitute (generally non-neural) *dispositional representations* (Damasio 1994, p. 102) of demands and opportunities in the environment. The existential agendas of many entities may include becoming effectively well-designed, *strangely familiar* (Botsman 2017, Ch. 3) affordances to others, or fitting competitively into a *centripetal* (Ulanowicz 2009, Fig. 4.3) autocatalytic flow. These emergent drives are analogous to the objectives of the design industry (Hinton 2014, Ch. 4).

7 Anticipatory Panpsychism

Compelling anthropomorphisms arise easily under the introduced view of fictionalist anticipation. Here are several anthropomorphic characterizations of anticipators: they are *persistent, observant*, and have *tendencies, habits, behavioral character*; they are strongly *biased* toward *satisfying* triggers; they *need or demand* them as *living necessity* or *economic utility*.

Panpsychism (Brüntrup and Jaskolla 2016) is the philosophical view that all or most things in the world are mental. The strong anthropomorphisms suggest a concrete form of panpsychism which can be called *anticipatory panpsychism*. Rather than postulating elemental consciousness or cosmopsychism (Goff 2017), a vital force or, say, Spinoza’s self-preserving, striving *conatus* (Schmitter 2010; LeBuffe 2015), I propose that cognitive activity emerges from specific physical, chemical, topological interactions of primed, anticipatory dynamical elements. Mentality is thereby not fundamental ontologically, but it is a ubiquitous feature in the natural world with plenty of

various anticipators and good chances for their expectancies getting gratified. With anticipation identified as the core common element, Thompson's (2007) *deep continuity of life and mind* becomes explicable.

At the end of Section 4 we considered tornadoes as an example of anticipatory dynamics between unstable weather conditions and equilibrating swirls. Electricity discharge through lightning is a very similar example of apparently vitalistic energy. Again, the charged milieu seems unable to release its electrostatic potential itself, but effectively waits for a manifestation of discharge. The lightning appears to choose a path of least resistance in one moment, but high speed slow motion videos (Wikipedia 2012) show that leader channels branch and jerk, generating partial small discharges into the air. The optimal destiny (or the Aristotelian *telos*, why not) for a leader channel or its branch is to become a full discharge path, by as much creating as finding that path. Or consider the much slower process of snowflake forming. Similarly again, the disequilibrium of a phase transition is thereby resolved. A snowflake is a competitive collector of water molecules, thus a chemical categorizer. There is liveliness and sense in dissipative existence, in a Daoist way (Garfield 2011, Lect. 13).

Emergence of biological life would likewise address passively anticipated resolutions and eager bursts of fulfillment. *Supramolecular chemistry* (Lehn 2013) of non-covalent bonds can be viewed in anticipatory or panpsychic terms given a balanced chemical environment. Molecular recognition and selective interaction would restrict deteriorating reactions, organize the structural meaning of emergent hypercycles. Catalysts would activate already present prospects. Life would emerge in a niche that embodies a right selection of anticipations and actualizations.

Extrapolation of anticipation down to basic chemistry and physics can be guided by Peirce's semiotic triad of semiotic roles. The structural readiness of an anticipator points to a future scenario, thereby performing a semiotic indication. Most often, this readiness is grounded historically: by learning or a kind of genetic inheritance. But structural novelties by mutation or some active association may lead to unprecedented semiosis, to a more tacitly anticipated breakthrough. Participatory individual semiosis is subjective and fallible. It seeks not just to follow historical meanings, but also to speculate on them by associative mechanisms, or even to "make history".

An anticipator is generally a signifier of being alive and of the signified performance or opportunity, while dynamical processes, energetic particles, own action, or the environment are the interpretants. Anticipatory panpsychism is relational, reflecting the intrinsic incompleteness of anticipation. Contingency of fulfilling interventions defines historicity of affordance recognition and signification.

Furthermore, an anticipator (of any scale) behaves like a *neuron*: it reacts to specific circumstances by changing own state and potentially triggering transformative changes on a larger scale. Reactively self-organizing anticipators (i.e., physical, physiological and signaling processes, chemical or hormonal modulations) may tend to imitate Hebb's (1949) dictum: "Neurons that fire together wire together". A pandemonium (Selfridge 1957) of anticipators may eventually organize themselves to a *global brain* (Heylighen 2011). Fundamental similarities between neural and somatic processes are noted in (Pezzulo and Levin 2018).

Conceptually, anticipation pertaining to own action is tantamount to *intention* or *teleology*. The fictionalist perspective gives a clear apprehension of holism and teleology in complex, self-organizing systems. The systems follow make-believe scripts so to realize (with good probability or to a workable extent) their subsistence functionality and broader existential agendas.

Anticipatory panpsychism is no more eccentric than *speculative realism* (Harman 2002; Meillassoux 2008). My view agrees with speculative realism on feasibility of avoiding *anthropocentrism* (i.e., giving humans a privileged distinction), but diverges in support of *correlationist* epistemology, psychophysical parallelism. Speculative realists articulate wilderness of *feral things* (James 2019), the reality that their capacities are inexhaustible by cognitive schemes of observers and consumers. In contrast, I suggest that complexity arises prototypically from interactions of *feral anticipators*, that is, from feral categorization, association, or semiotics. Against rational odds, the anticipators succeed often enough to find their place in needy environments. Our feral affordances with their own entropic agendas are passable anticipators themselves, frequently finding new own domestications even in their decay. Rather than postulating a flat, democratic ontology of things (Bryant 2011), I endorse a hierarchy of their existence in a manner

echoing the descriptions of Simon (1962), Maslow (1943), Graves (1970). The hierarchy is built locally by the relations of anticipatory *need* and affording *service*, where the “privileged” have higher and less conspicuous needs. There is no equality even among objects of the same kind, for example, among sports cars or painted art. On the other hand, recognition of causal influence of anticipations, propensities, tendencies (Salthe 2008; Fernández and Campbell 2019) democratizes them relative to physical, thermodynamic laws and principles. This democracy is reflected in Monod’s (1972) notion of *gratuity*, that is, the general independence between chemical qualities and function of biochemical processes. The democracy of propensities and other causal factors is particularly pertinent on the ecological (Ulanowicz 2009) and social levels.

8 More Fictionalism

Recognition of anticipatory behavior in complex self-organizing phenomena has enormous interpretive power. In turn, the fictionalist facets of anticipation clarify normativity, holism, teleology, striving of living or cognizing beings, and untangle complications of excess, malfunction, disequilibrium. Kindred anticipatory notions of *Umwelt* (von Uexküll 1957), affordances (Gibson 1966), functionality (Ariew et al. 2002), abilities (Maier 2018), dispositions (Choi and Fara 2018) can be similarly smoothly analyzed from the fictionalist perspective. Norms, meanings, intentions, goals, beliefs, signals are fictions whose proper unfolding can be usefully anticipated. As the poet Muriel Rukeyse (1968, IX) writes: “The Universe is made of stories, not of atoms.”

Semiotics and even philosophy of language could embrace the fictionalist approach rather than the customary logocentric setting. Embracing the spirit of Vaihinger’s (1935) expedient illusion, the meaning of a sign or an utterance becomes a fiction that has to be construed well by the listeners or the interpretants. Processes of communication and learning encompass homologous fictions of proper comprehension. Even conventions are likewise anticipatory, thus fictional, tools for minimizing misunderstanding. Alternatively, confidence in the meaning of words and signs can be compared to Santayana’s (1955) compulsive *animal faith*. My proposal here constitutes

a strong kind of *hermeneutic fictionalism* (Woodbridge and Armour-Garb 2010) towards the context of communication and the meaning of used language. Even *speech acts* (Green 2017) become inconsequential, thus arguably fictional, utterances if there is no subsequent compliance or regard. Similarly here, a fault (as a behavioral act) in sports has to be registered by the referees.

Fictionalism can be applied to theory of mind (Demeter 2013) to the extent that other mind is as unknown as future or a novel environment. Knowing the unknown in the messy, competitive world can be accomplished opportunistically by daring, tricky epistemology while anticipating the best development.

I highlight two fictionalist aspects of anticipation that counter the leading contemporary paradigm of cognition based on predictive coding (Friston et al. 2016): primitive forms of anticipation look more like prejudice, superficial bias rather than objective inference; and the basic existential epistemology has a boldly vigorous rather than a soundly careful character. These wilder aspects are moderated by generalized natural selection.

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