

implement cognitive capacities through the minimization of (free) energy as the objective function of the brain. Predictive coding has also provided a framework from which to understand allostasis (Barrett, Quigley & Hamilton 2016) – that the central function of the brain and the organism is to efficiently regulate energy expenditure through the prediction, and circumvention, of energy-costly environmental interactions.

« 7 » At some level, design is inevitable in neural network architectures including energy-based models (§24). These types of models focus on unifying principles of cognitive behaviour. They are taken from statistical physics, which dictates the form of learning rule chosen and thereby limits the scope for design. These modelling approaches appeal to the notion of self-stabilization (where model updates follow the attainment of energy equilibrium states, see Hinton 2002) and promote emancipation of the agent from its initial model-based design (and environmental determinism, §3). This is the case insofar as the agent self-stabilization dynamics operate within hierarchical systems that entrain lower-level variables into non-designed-for values that align with the current need of the artificial agent as a whole (Pezzulo, Rigoli & Friston 2015; Peters, McEwen & Friston 2017). Some robot implementations of energy-based hierarchical models have recently been undertaken (e.g., Hossain, Capi & Jindai 2017), and they demonstrate the possibilities of learning cognitive (perceptual and action, i.e., grasping) capacities achieved through self-stabilization (energy-equilibrium approximating) generative modelling.

« 8 » An issue to be addressed for further energy-based learning robotic systems is that of how “goal” states can emerge in robots when tied to, and elaborated from, basic homeostatic states concerning functional viability such as battery charge, and physical integrity. At any rate, according to Palfreyman & Miller-Young, the critical issue of imbuing (artificial and biological) systems with autonomy is not one of design so much as the ability of the system to be underdetermined by its design (accountability, §3), which may be a somewhat relative concept. On this basis, utilizing artificial agents – at least as a means for modelling in an embodied context that unifies principles for cog-

nitive behaviour (e.g., based on statistical physics) – should help clarify the extent to which autonomous agency may be imbued in robots.

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Enaction Demands an Ontological Light Touch with Respect to the “Subject”

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> Upshot • The goal of Palfreyman & Miller-Young is to characterize a particular kind of self-determining subject in a way that attempts to resolve divergence between realist, constructivist and enactive accounts. The divergences exist for a reason, and the subject in a realist framework cannot be equated with the subject as it features in an enactive account.

« 1 » In seeking a resolution of differences between realist, constructivist and enactive characterisations of the cognizing subject, Niall Palfreyman and Janice Miller-Young raise a fundamental question about the nature of the self, or person. The question can be seen as inherently theological, and the questions raised thereby are distinct from, and prior to, those of relevance to psychologists and pedagogues (§5). The starting point of the authors is clearly expressed in §96: “we understand purpose and free will as rooted in self-actualization.” On the

search for some helpful concepts that might shed light on “autonomous accountability” (§5), the authors favour bypassing their own anthropomorphic bias through the use of computational mini-worlds. They thus seek to naturalize both autonomy and agency in their search for an account of a self.

« 2 » How many selves might we seek for? In common with some, but not all, enactive theorizing, the self sought here is a biological entity, skin-clad and possessed of a “unitary identity” (§23). It is frequently referred to as an organism, rather than a person. Yet it must also satisfy the desiderata of a fully fledged person, if we are to take the aspirations of the authors at face value, as they seek to grant the person, so construed, “the free authorship, through their current choices, of the person they will become” (§96). Is such a being to be held accountable for both its excreta and its symphonies? Is its postural stability an achievement on par with its political electability? Is its systolic blood pressure to be considered just one more piece of evidence of its integral identity, along with its bank balance, its memory of last summer, and its fondness for sweet soul music?

« 3 » The point is that the search here seems to be for some kind of essentialized entity, both person and biological organism, who fits the desiderata of the Western modern Protestant: autonomous and in charge of things, accountable and fully naturalized.¹ This has long been the goal of scientific psychology, and the manner in which the present initiative seeks to bridge the gap between constructivist, enactive and realist accounts suggests that some important reasons for their well-established divergence are being glossed over here.

« 4 » Among the many examples from the psychological literature, let me pick the landmark longitudinal studies of Roger Barker. When he descended in 1948 on a small town in Kansas, bringing an army of research associates with clipboards, they be-

1 | An entirely autonomous person could be seen as a Western Christian construct. Enaction draws importantly from Buddhist metaphysics, in which *anatman* asserts the absence of any such persistent self, and *pratityasamutpāda* asserts that everything that arises and ceases does so subject to conditions, or context.

gan a multi-year observational study of the residents in their native habitat (Sabar 2014). A great deal of negotiation was required to gain the acceptance of the townsfolk, and Barker bent over backwards to assure them that nothing they found would represent the townspeople in a negative light. He sought to construct a wholesome vision, akin to a Norman Rockwell painting, in which essentially nice folk went about their lives dutifully and respectfully. His findings were both profound and entirely predictable. The more he looked at what people did, the more he became aware that an appeal to interior psychological mechanisms was unnecessary. To account for people's behaviour, he found, one gets 95% of the way there by looking at where they are. People shop in shops, they play baseball in the baseball diamond, they pray in churches. Upon inspection, the people of Barker's world turn out to be limited in their autonomy; their overt behaviour was, rather, largely determined by context. His understanding of context, or environment, was couched, of course, in the same language as that which brought forth the clichéd virtuous American citizen. They necessarily shared a single and singular world.

« 5 » If we turn now to a very different discourse, we find a strongly analogous relation of a hypothetically autonomous system to its context, though both are couched in very different terms. In the much-discussed context of a minimal cell ascending a chemotactic gradient, we are faced with a mechanical system (by construction), that is nevertheless characterised as an exemplary agent. This is not, it must be said, an agent exerting free choices and self-determination, but an agent whose embedding in its Umwelt allows discussion of autonomy, perspectivalism, precariousness, sense-making, and normativity (Cummins & De Jesus 2016). The reason this account is trotted out again and again is that it satisfies the biologically motivated natural philosopher's need to build an account of a spatially bounded unitary organism, an autonomous agent, because that is what, on one account, the natural philosopher herself is. In line with Jonas's claim that only life can know life (2011), we recognise its striving, its conatus, because we, ourselves, are striving beings. Absent this empathic resonance, the cell is a mere mechanism, whose behaviour is en-

tirely dictated by context, that is, if we were to transplant the discussion to a physicalist, realist framework, there would be no causal split between agent and world. Everything would unfold in context.

« 6 » When we insist that system/organism/thing X in the world is autonomous in its own right, again and again we find it is fully, or almost fully, determined by context. The search for the kind of self that has free will is in trouble here. The enactive account will not provide any such self. The enactive system is never removable from context. In contrast to any realist account, the "worlds" brought forth by sense-making systems are infinitely plural. They do not collapse to a single world.

« 7 » The enactive account is likewise not limited to providing an account of a single kind of subject, a single kind of self. One of the reasons that the vocabulary of enaction has been so successful at overcoming the Humean fact/value dichotomy is precisely because it allows recognition of many kinds of enacted subjects, bringing into being many kinds of meaning-saturated Umwelten. The very notion of "context" will change greatly from one example to the next.

« 8 » Humberto Maturana has remained strictly within the organismic domain, which has generated an internally consistent, but necessarily topically limited, record of publications (Maturana & Poerksen 2004). Francisco Varela's formalisation of the recursive nature of self-production (Varela 1979) opened up the door to the application of the core ideas of autonomy, sense-making, structural coupling, and more, to novel domains beyond the organismic. While Maturana resisted such florid extension, the baton was picked up enthusiastically by Niklas Luhmann's work in the domain of social organisation (Luhmann 1986). In my own work, I have found the core concepts of enaction to be essential to make intelligible the practices of communities in rituals, chanting, and those activities that ground collectives and bring into being subjectivities of many kinds. In applying the core ideas of enactive theory, an ontological light touch with respect to the subject is called for.

« 9 » Enactive theory has contributed something fundamentally novel to the scien-

tific discussion of our own constitution. But its contribution is not to pin down the person in one way rather than another. It is precisely the opposite: to allow us to recognise that we are multiply constituted, that our activities bring into being many domains of values, overlapping, interacting, and inexhaustible. Where positivist psychological accounts assume a single subject, contained in a body, and equivalent to a "person," enactive accounts encourage us to recognise our participation in many kinds of systems, each bringing forth its own kind of value-laden world. Here, the recourse to computational toy-worlds can be misleading, just because they encourage us to construct a mapping from the computational object to the person, without doing the hard work of specifying just which value-saturated domain we mean to refer to. Such simulations provide us with tools that might illuminate part of our being, just as the wonderfully enriched dynamical accounts we have available through Terrence Deacon (2011), Alicia Juarrero (1999), and many others provide us with rich ways of constructing intelligible narratives within specific domains. But we should not mistake the map for the territory. The models are models. The person is non-finalizable.

Fred Cummins conducts interdisciplinary research into the business of joint (unison) speaking, as found in practices of protest and prayer. This topic raises issues of collective intentionality that seem to be best addressed within an enactive framework. It also spotlights such rewarding topics as rhythm, speech-gesture and speech-music relations, synchronized action, and the aesthetics of ritual practices. He works at University College Dublin, where he co-directs a postgraduate cognitive science programme.

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