Updating Dewey's Transactional Theory of Action in Connection with Evolutionary Theory

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1. INTRODUCTION

The past quarter-century has seen social theorists rediscovering the classical pragmatist concept of 'habit,' and using it to formulate theories of action such that could contribute to solving or overcoming the agency–structure and individual–society quandaries (Joas 1996; Kilpinen 2000; Hodgson 2004; Kivinen and Piiroinen 2004, 2007; Joas and Kilpinen 2006; Fleetwood 2008). John Dewey's concept of habit and transactional[1] theory of action (see Dewey 1983, 1988b; Dewey and Bentley 1991), replacing belief- and desire-based 'mind-first' explanations of action with 'action-first' explanations of the mind,[2] are designed to dispel the modern age 'brood and nest of dualisms' (Dewey 1988a, 271), starting with the Cartesian mind–world, or subject–object dichotomy (see, e.g., Dewey 1988b, 137; Dewey and Bentley 1991, 290). Such a theory of action avoids contrasting agency with its environment or individuals with their communities, thus dissolving these traditional sociological problems. This theory points to what we call methodological relationalism in social science, operationalizing theoretical concepts into actions in problem-solving research practices (Kivinen and Piiroinen 2006, 2013, 2018c; cf. also Bourdieu and Wacquant 1992).

Dewey's thinking was, in many ways, ahead of his time, foreshadowing later developments in philosophy and human sciences, although he was well aware that his philosophy, like all theories,

was a child of its time, too. One eminent, and in Dewey's time, quite novel, idea was the Darwinian theory of evolution by natural selection; Dewey was right to surmise that its impact would change the notions of life and human being, and thus, also many philosophical questions, if not the very aim of philosophy (Dewey 1977; see also, e.g., 1988a, 89–94, 1991, Ch. 2). The root of Dewey's philosophy lies in his Darwinian view of nature, which is the basis not only of his notion of habit and transactional theory of action but also of his problem-solving-centered, pragmatist theory of inquiry and knowledge (Dewey 1988c, 1991), not to mention of his ideas of learning by doing and education as growth (see Dewey 1985, 4 ff.).

Of course, no one could have foreseen all the evolution theoretical developments and findings since Dewey's time. Theoretical advances, technological innovations, and empirical findings have accumulated. For one thing, a good deal of archaeological and paleoanthropological discoveries have taken advantage of novel technologies, refining knowledge of human evolutionary history. Notably, the findings do not contradict the outlines or the main ideas of the Deweyan theory of action, and could be taken into account in providing an update of that theory. The task of the present chapter is to try and sketch a sort of 'centennial update' of Dewey's transactional theory of action, drawing from contemporary sources. We utilize certain theoretical advances and empirical findings concerning human coevolution in ecological niches, as discussed by theorists like Kevin Laland, John Odling-Smee, Robert Boyd, and Peter Richerson. A central theme is the articulation, worked out by Kim Sterelny in his *Evolved Apprentice* (2012), of the special importance of what he calls the 'apprentice learning' setup in human evolutionary history. Apprentice-like learning (by doing) has played a pivotal role in the training of the members of human communities, new generations in particular, to take advantage of the tools and opportunities in their environment. Along with cultural evolution, enhanced learning distinguished the human evolutionary lineage from those of all other

species, and justifies calling our species *Homo discens*, learning man. (See Sterelny 2011, 2012; Boyd, Richerson and Henrich 2011; Heyes 2016; Kivinen and Piiroinen 2018a.)

We also discuss the relatively fresh conceptualization of the brain's action-related function as that of predictive processing, taking into consideration, for instance, Andy Clark's recent book *Surfing Uncertainty* (2016). Clark's older theory of the 'extended mind' (see Clark and Chalmers 1998; Clark 2008) will not be forgotten, either; in fact, we advocate a comparable position, although we favor a more resolutely thoroughgoing notion of 'the four "E"s' (Gallagher 2008, 163) of the mind as enactive, embodied, embedded, and extensive—avoiding what we find is a dubious impression involved in the extended mind talk, that the mind could somehow get started entirely in the inside of the head, and only then become extended out of it (see also Hutto and Myin 2013, Ch. 6; Hutto, Kirchhoff and Myin 2014; Gallagher 2017).

Taken together, the theories mentioned above on human evolution and the role of culture and learning in it, complemented with a Clarkian type of view of the predictive function of the brain running a '4E' human mind, offer useful tools with which Dewey's transactional, habit-centered theory of action can be updated for the twenty-first century. All said ideas are thoroughly action-driven, 'action first,' sort of pragmatist notions. A few additional ideas will be made use of in this connection, too, found, for instance, in Daniel C. Dennett's (1991, 1995, 2017) philosophy, which includes elements of the niche construction theory of the human mind coevolving with its socio-cultural niche, and conceptualization of the brain as a kind of (predictive) biological hardware running (world-involving, extensive) cultural software. Dennett's thinking comes, in many ways, close to Deweyan pragmatism.

2. THE BRAIN AS A PREDICTIVE ENGINE AND THE '4E' TYPE OF MIND

Conceiving of the mind as a habitual affair interwoven with and explained by action, transactions with the environment, Dewey (see 1983, 1988b; Dewey and Bentley 1991) offers an alternative to the twentieth-century reductionist attempts to simply identify the mind with the brain. To Dewey, the mind and knowledge involve the world. Human minds are constituted in bodily, active organism–environment transactions, involving action and communication in the world; communities, and culture, in particular, are among the most important constituents of human minds. One could say that the concept of mind for Dewey exhibited each of the four E's. It was very much embodied, enactive, embedded, and extensive.

> Every 'mind' that we are empirically acquainted with is found in connection with some organized body. Every such body exists in a natural medium to which it sustains some adaptive connection …. At every point and stage, accordingly, a living organism and its life processes involve a world or nature temporally and spatially 'external' to itself but 'internal' to its functions. (Dewey 1988b, 212)

Alas, Dewey was so much ahead of his time that these ideas were not well appreciated in his lifetime; the idea of the environment-encompassing mind was not taken seriously in the early or mid-twentieth century.[3] The past decades, however, have witnessed interesting discussions about the '4E' mind. Ideas of the mind being embodied, enactive, embedded, and extensive were advanced in the 1990s by theorists like Francisco Varela, Evan Thompson and Eleanor Rosch (1991), Robert Wilson (1995), John Haugeland (1995), Susan Hurley (1998), Mark Rowlands (1999), and Andy Clark and David Chalmers (1998), and since then, have been significantly broadened and elaborated by such twenty-first-century philosophers and scientists as Alva Noë

(2004, 2009), Anthony Chemero (2009), Daniel Hutto and Erik Myin (2013, 2017), and Shaun Gallagher (2017), as well as by Clark (2008, 2016) in his later works.

Unlike nativist naturalists and reductionist physicalists, Dewey [1925] (1988b, 222) could already see that the mind is not the same as the brain: The mind is read out of actions in the world, and it differs from the brain like walking differs from legs, or like breathing differs from lungs. Much like walking and breathing, mental life consists of transactional flows of organism–environment activity, involving a body and its environment, in a dynamic interplay. Now, Clark, for instance, in his *Surfing Uncertainty* (2016), opens fresh paths to understanding the functioning of the brain in those dynamic organism–environment transactions, by offering a conceptualization of the brain's main function as predictive processing. Like Dewey's, Clark's theory is an action-first sort of conceptualization; the brain is taken to be like a surfer striving to stay in the 'pocket' of oncoming waves, 'surfing the waves of noisy and ambiguous sensory stimulation by … trying to stay just ahead of them' (p. xiv). Clark (pp. 182–183) even recognizes that his proposal is in line with Dewey's action-driven ideas about perception, for instance. With respect to perception, Clark, much like another contemporary theorist of the extensive mind, Alva Noë (2004), is actually rearticulating what Dewey (1896) stated more than a century ago: that our perceptions are not caused by a one-way process; they do not arise as a response to worldly stimuli bombarding our passively awaiting brains, and only then trigger activities toward the objects perceived. Perception, like thought, always takes place in a context of activity and readiness for—or habits of—certain kinds of actions, and that context gives direction to, and partly constitutes, what one perceives. As pragmatists are well aware, perception, like all activity, is channeled by habits and dispositions, which, of course, have been formed in, and affected by, previous actions.

Clark's (2016) formulation of these ideas depicts 'brains as restless, pro-active organs constantly driven to predict and help bring about the play of sensory stimulation,' as predictive engines 'seeking to generate the sensory data for themselves,' and using incoming signals mostly just to check the guesses they have made, especially sensitive to signs of prediction error (pp. 3, 10). Signals are never passively received, but are picked out in a context of relentless predicting and testing of predictions, the brains actively participating in the selection and unification of what is perceived as one part of active organism–environment transactions, helping accommodate environmental demands and opportunities for action. Predictions lean on previous experience, and are continuously modulated and enhanced by new stimuli. Thus, in a sense our predictive brains function like Bayesian probabilistic systems. (See Clark 2016, e.g., 1–2, 8, 40–41, 120.) Crucially, human brains are part of an 'embodied agent located in multiple empowering webs of material and social structure,' and thus, are not to be conceived of as some insulated inference machine, but as a thoroughly action-oriented organ for engaging the environment, one 'node in patterns of dense reciprocal exchange binding brain, body, and world' (Clark 2016, xvi).

Clearly, then, Clark's ideas go well together with Dewey's (see 1983, 1988b, 1988c, 1991; Dewey and Bentley 1991) transactional, action-first view of the mind and knowing. The same can be said of other '4E' mind theorists' critiques of mental internalism. Noë, for example, criticizes internalism much in a Deweyan vein, as a manifestation of Cartesian intellectualism that portrays the essential function of the mind as reasoning independent from habits; he argues instead for a notion of the extensive mind on the grounds that as living organisms, we are habitual creatures first, and habits involve and tie the organism to its environment (Noë 2009, esp. Ch. 5; see Dewey 1983).

According to Dewey [1916] (1985), as a thoroughly habitual affair, the mind depends on learning in action. Habits of thought, like all other habits, can be adopted only in action, by doing the deeds in

question—perhaps a bit clumsily at first, and then with increasing smoothness as one acquires the necessary knowing-how. This is the case with the habits and skills of intellectual life, even the twenty-first-century 'knowledge worker' skills celebrated today; they can be acquired only through learning by doing, using the appropriate tools and materials (Kivinen and Ristelä 2002; Kivinen, Piiroinen and Saikkonen 2016; Kivinen and Piiroinen 2018a). However, of course, the ability to learn by doing, from trial and error, is something that humans share with many other animals, so the appearance of distinctively human minds calls for an additional explanation, pointing to some unique factors in the human evolutionary history. The explanation should involve a reference to how humans alone became a species living in a socio-cultural niche, where the community supports its members' thinking and learning (see, e.g., Sterelny 2007, 2011, 2012).

3. EVOLUTIONARY THEORY AT THE TURN OF THE TWENTY-FIRST CENTURY

Dewey pioneered Darwinian naturalism in philosophy in the nineteenth century, and his transactional understanding of life and evolution has turned out to be compatible with many recent theoretical and empirical developments, too (Kivinen and Piiroinen 2018b). Some of the progressive developments that the past few decades have witnessed in evolutionary biology and in the understanding of human evolutionary history are useful in updating the Deweyan theory of action. Some of our own previous papers (Kivinen and Piiroinen 2012, 2013, 2018a, 2018b) may be seen as contributions toward that goal—under the auspices of a niche construction approach (see especially Odling-Smee, Laland and Feldman 2003), embracing the co-evolutionary (Durham 1991) view of human evolution in particular, which has during the past twenty to thirty years risen to challenge the twentieth-century mainstream nativist, gene-centered (e.g., Dawkins [1976] 2006) view of the human nature (mind, language, culture).

The rise of the co-evolutionary niche construction approach is a relatively recent development,[4] and the issue is not yet fully settled regarding to what extent it will replace the nativist standpoint as the mainstream stance to take on the evolution of human beings. Currently, nativist 'evolutionary psychology' (Barkow, Cosmides and Tooby eds. 1992; Buss 1995; Pinker 2002) stands strong, with its presumption that the human mind is pivotally a product of genetically hardwired brain modules that were designed by evolution hundreds of thousands of years ago, adapted to the challenges of the Pleistocene era. Much of the work in linguistics presumes a nativist, Chomskyan framework, which presents language as a matter of genetically hardwired universal grammar. A Chomskyan conception of the evolution of language accordingly portrays it as something whose key steps must have taken place inside the head, perhaps simply as a consequence of growing brain size, or due to a few specific chance mutations, allowing first a sort of (proto-)'language of thought' to emerge and, finally, culminating in a 'language faculty' as an internal, purely biological capacity of the human brain to grammatically parse and then to 'externalize' some of its pre-linguistic mental life (see Hauser, Chomsky and Fitch 2002; Chomsky 2008). Thus, Chomsky's position is the opposite of Dewey's (1988b, Ch. 5) and our (Kivinen and Piiroinen 2012) pragmatist transactional view of language as first and foremost a community's tool of communicating and coordinating actions that proved an indispensable tool of thought and constituent of human awareness, for its part tying minds to communities and to the world. Contrary to such pragmatist transactionalism, Chomsky is committed to the Cartesian dualisms of subject–object, mind–world, internal–external, conceiving mental states as a subject's attempts to represent objects of the world; so, in the Chomskyan framework, language is explained from the inside, mainly as a channel for formulating and voicing innate thoughts. In an attempt to deny the primary linguistic significance of things outside the head, Chomsky even claims that language is not primarily a tool for communication. (See Chomsky 2002, e.g., 76, 79, 86.)

Another illustrative example of the nativist vein of thought in conceptualizing the relations among the human mind, language, and social life is found in the American philosopher John Searle's (e.g., 2010) works. He conceives of language in particular as an 'extension of' pre-linguistic intentional capacities and consciousness which emerged from big enough brains, which the early hominids had to have before they acquired language. The human social world of institutions, in turn, is something that is created by language. In Searle's vision, human reality is 'a natural outgrowth' of physical, biological phenomena, and its evolutionary explanation proceeds straightforwardly 'from intentionality to language and then from language to social institutions' (Searle 2010, 61 ff.).

Since around the turn of the millennium, however, a growing number of co-evolutionary niche construction theorists have challenged nativist thinking, and with it, dualisms like nature–nurture and organism–environment, emphasizing the evolutionary role of the organisms' own activity, including learning and respective lifetime developments (Laland, Odling-Smee and Feldman 1999; Lewontin 2000; Sterelny 2001, 2003, 2005; Odling-Smee et al. 2003; Laland and Sterelny 2006; see also Dennett 1995; Oyama, Griffiths and Gray eds. 2001; Weber and Depew eds. 2003). In place of the twentieth-century standard picture in which the environment simply selects the features and thus, the genes of an evolving population of organisms, niche construction embraces the notion of organism–environment reciprocity, taking into account the evolutionary significance of the fact that organisms, for their part, shape the world in which they live (Sterelny 2005, 21).

The rise of co-evolutionary niche construction theories is part of a theoretical change in evolutionary biology. These theories share important affinities with 'evolutionary developmental' (EvoDevo) biology (Laland, Odling-Smee and Gilbert 2008), which is based on the idea that evolutionary and developmental processes are not as distinct from one another as mainstream

evolutionary theorists thought for much of the twentieth century (Hall 1992; Raff 2000; West-Eberhard 2003; Müller 2007; see also Oyama et al. eds. 2001). Maurizio Meloni (2016), for instance, speaks of a 'postgenomic age' of 'soft heredity' (Meloni 2016), and Evelyn Fox Keller calls the twenty-first century 'the century beyond the gene' (Keller 2005), in contrast to the twentieth century, which she has dubbed 'the century of the gene' (Keller 2000). The presently topical research field of epigenetics (see, e.g., Hollis 2006; Allis et al. eds. 2015) is part of the said change in evolutionary biology.

Niche construction, then, is one evolution theoretical standpoint that would stress, in a thoroughly Deweyan-transactional vein, let us add (see, e.g., Dewey 1988a, 128–129, 1991, 35),[5] the evolutionary significance of the fact that organisms are never just reactive, but are truly active in their transactions with the environment, and thus, tend to change the respective local environments (Laland et al. 2008, 555).[6] The central idea of niche construction is that by changing their environment, organisms also change the selective pressures where their own (and often, many other populations' of organisms) adaptations to the environment will be weighed in the future. This may be thought of as a special inheritance system, that of ecological inheritance. Organisms transmit to their offspring altered selective environments. (Sterelny 2005, 22; see Odling-Smee et al. 2003.)

Niche construction is a particularly noteworthy phenomenon in the case of human beings. It seems plausible to suppose that our species' extraordinary history of (socio-cultural) niche construction and ecological inheritance must be an especially important part of any good evolutionary explanation of many of the most distinctively human characteristics and abilities, such as language, human awareness, innovative and knowledgeable problem-solving, or enhanced learning capacities (Kivinen and Piiroinen 2012, 2018a). Co-evolutionary niche construction has become a prominent part of evolutionary explanations of these features of human action. Several theorists emphasize the

crucial role that has been played by some socio-cultural ecological niches in the evolutionary history of human mind and language (Deacon 1997, 2003; Donald 2001; Laland, Odling-Smee and Feldman 2001; Buller 2005; Richerson and Boyd 2005; Sterelny 2007, 2011, 2012; Bickerton 2009; Laland, Odling-Smee and Myles 2010; Kendal, Tehrani and Odling-Smee 2011; Dennett 2017; Henrich 2017).

For instance, David Buller (2005) has in a niche construction vein challenged the standard evolutionary psychological notion of a relatively stable 'human nature' traceable back to the Pleistocene era; according to him, human minds-in-action and their (largely cultural) environments are changing each other. Kim Sterelny (2011) argues that we should drop all nativist 'genetic trigger' explanations of the human mental capacities as something that would have appeared like 'a new and especially bright light being turned on in human minds by a sudden … genetic shift in *sapiens* genomes.' According to Sterelny, it is time to give up on the whole inside–out proceeding 'simple-reflection model,' which presents culture as simply a reflection of some intrinsic capacities of the human mind, and those capacities, in turn, as a simple reflection of a genetic blueprint, an outcome of some past lucky genetic coincidences. (Sterelny 2011, 813–814, 818–819.) Sterelny (2007) argues that human intelligence should be thought of as a product of incremental socio-cultural ecological niche construction, which has provided the necessary support for our mental capacities. Thus, the explanation of distinctively human minds is not to be found inside the skull; in fact, as Merlin Donald (2001, 315) reminds us, '[t]he main difference between apes and us is culture, or more specifically symbolic culture, which is largely outside, not inside, the brain box' (see also Kivinen and Piiroinen 2012).

The niche construction explanation of language evolution differs from Chomskyan and other nativist explanations which start with what is inside the skull, with the brain and its supposed

modules, innate intentionality and pre-linguistic consciousness. As Terrence Deacon (2003, 83–84) argues, there would be no end to the nativist search for the 'missing link'—the crucial genetic-coincidence-produced-brain-structure that allowed some early primates to become language users. According to Deacon, such nativist theories in which some 'freak mutation just happens to produce a radically different and serendipitously better-equipped organism' are like an evolutionary theorist's version of divine intervention (Deacon 1997, 35). What we need is an explanation that embraces the importance of a niche of human community, culture and coordinated social actions (over a course of at least a few hundred thousand—perhaps even a couple of million—years) as a key factor in explaining language evolution (see, e.g., Dunbar 1996; Deacon 1997; Lieberman 1998; Bickerton 2009; Kivinen and Piiroinen 2012; Sterelny 2016). And the explanation for why other species have not evolved into language users is not that their brains were too small or insufficiently complex, or that they have not been lucky enough to go through the chance mutations that produced the necessary language module in the human brains: rather, the explanation is that 'bottom line, they didn't need language' in their niches (Bickerton 2009, 24).

Even if the nativists emphasizing the significance of bigger brains for language evolution are right to think that increasing brain size did play some part, from a niche construction point of view we would remind that the increasing brain size itself also calls for a niche explanation. Bigger brains burn more energy than smaller ones, and nature is conservative in not wasting energy; thus, brains grow only if the animal needs a bigger brain to more effectively do something that it has already began to do (Bickerton 2009, 34)—and that something would have to be pivotal enough for the animal's capacity to reproduce itself, something that plays a central role in the animal's population's ecological niche. In fact, much the same can be said of all the peculiarities of human physiology: The opposable thumb, shortening of colons, bipedalism and increasingly upright posture, the loss of body hair, the lengthening of legs—all these need to be explained with the

selection pressures of an ecological niche, which, in the human case, has involved such collectively carried cultural skills as proto-language, fire making and cooking, and the use of hunting weapons and other tools (Henrich 2017, 81).

In human co-evolutionary processes involving cultural elements, it has been pointed out that of pivotal importance are the capacities of communities to transfer skills and knowledge from one generation to the next. Of particular interest in this connection are explanations of social and cultural learning that go especially well together with a niche construction view of the evolution of the human mind, theories such as Kim Sterelny's and Cecilia Heyes' (Sterelny 2011, 2012; Heyes 2012, 2018; see also, e.g., Richerson and Boyd 2005; Boyd et al. 2011; Henrich 2017; Kivinen and Piiroinen 2018a).

4. HUMAN LEARNING AND THE MIND AS CULTURAL INNOVATIONS

For good reasons, Dewey is known as an eminent philosopher of education. One of his lasting ideas is that in action one cannot but learn, and one can learn only in action (Kivinen and Ristelä 2002; Kivinen et al. 2016; Kivinen and Piiroinen 2018a). Dewey tied learning and education (in the sense of the development of individuals and groups) to the theory of evolution: to him, successful learning and education meant 'growth,' which, in turn, was to be judged ultimately by the Darwinian criterion of whether the organism, group, or a population of species manages to cope with its changing environment, keep up with the ever-continuing evolutionary arms race, 'staying even or getting ahead in the struggle for existence' (Popp 2007, 81–83; see Dewey 1985, Ch. 1 and 4; Kivinen and Piiroinen 2018a). The measure of the growth of an organism, group, or community is whether it successfully copes with the environment, in the last instance reproducing itself, for

example, by passing on its traits, tools, and behavioral dispositions to subsequent generations. As for humans, the community may be seen as a life form reproducing itself to continue life by transferring its customs, as well as its members' habits, skills, and beliefs, from one generation to the next through education (Dewey 1985, Ch. 1).

Of course, by the standards of our time, Dewey had to work with an elementary conception of human evolution. A cumulating body of paleoanthropological research and archeological discoveries has been piling up over the past few decades, and as the anthropologist Chris Stringer (2012, Ch. 2) points out, it has become possible to subject these findings to vastly improved physical timing methods, for instance.

Present-day researchers have at their disposal advanced methods and knowledge, such as elaborate and well-substantiated theories that take into consideration the evolution of uniquely human forms of learning, and their interdependence with a specific kind of socio-cultural niche (see, e.g., Richerson and Boyd 2005; Sterelny 2011, 2012; Boyd et al. 2011; Heyes 2012, 2018; Henrich 2017; Kivinen and Piiroinen 2018a). Today, it is known that around two million years ago, the human niche gave rise to collectively enhanced forms of learning that diverged the early hominid evolutionary lineage from those of all other species, especially by allowing culture a growing role to play in the human evolution, as an autocatalytic process where the coevolution of genes and accumulating culture produce its own driving force (Henrich 2017, 57 ff.). The accumulation of culture took its time, but around seventy thousand to one hundred thousand years ago, it led to the emergence of what is called behavioral modernity (Sterelny 2011, 2012).

A significant piece of present-day knowledge that Dewey could not have at his disposal is the archaeological record showing that it took the anatomically modern *Homo sapiens* more than one

hundred thousand years to achieve behavioral modernity, through an incremental, sometimes locally stagnating or even regressing process. According to Sterelny (2011), available evidence shows that the evolution of the human mind cannot have been caused mainly by the growth of the brain, or by any particular genetic mutations, but was produced by a co-evolutionary process of constructing for the subsequent generations such socio-cultural ecological niches that could support the evolution of increasingly clever behavior and minds.

As said, pivotal for that human development has been the community's capacity to transfer skills and knowledge from one generation to the next, to reliably transmit received wisdom and useful knowing-how, habits and customs—sort of ecological inheritance which is a prerequisite of cultural evolution.[7] Sterelny (2012) emphasizes that a key factor in this was a particular kind of apprentice learning setup by which more experienced members of the group encouraged and guided the learning by doing of less experienced members, somewhat like a master of a craft would encourage and guide an apprentice. With this arrangement, communities came to engineer educative environments that allowed reliable and effective, broad bandwidth flows of ecological inheritance, skilled habits and information, from generation to generation. Relatively rapid cultural evolution got started, and made the difference between humans and all other species, most notably by making humans much more malleably adaptable and cleverer (Sterelny 2011, 2012; see Richerson and Boyd 2005; Boyd et al. 2011; Heyes 2016, 2018; Henrich 2017; Kivinen and Piiroinen 2018a; cf. Gergely and Csibra 2005).

The ideas presented above are quite compatible with Deweyan pragmatism. The reductionist view that genes hold 'the secret of life' was a nonstarter for Dewey and Bentley [1949] (1991, 118–119) in the first half of the last century, and Dewey's ([1920] 1988a, 128–129, [1938] 1991, 32–42) transactional view of evolution may be said to have foreshadowed the present-day ideas of niche

construction, gene–culture coevolution, and epigenetics, which all encourage conceiving life and its evolution as taking place in a reciprocal interplay of organisms and their environments. Sterelny's apprentice learning setup, for one, is particularly well in line with Deweyan ideas about learning by doing, too, as opposed to conceptions of learning as passive reception of information detached from actions. At its core, we find action, trial and error, the trying out of alternative procedures, as well as reflection of mistakes made and problems encountered in action (Sterelny 2012, 35; Kivinen and Piiroinen 2018a). Researchers today can elaborate theory along those Deweyan lines, drawing also on the latest evidence, which suggests that our human enhanced learning capacities depend on the support of a niche of community, and are, in effect, a cultural innovation (Heyes 2016; see Sterelny 2011, 2012; Kivinen and Piiroinen 2018a).

5. ADDITIONAL UPDATES OF DEWEY'S EVOLUTIONARY THEORY OF ACTION

Theories like Clark's, conceptualizing the brain's main function as predictive processing quintessential for the workings of the 4E type of minds, and Sterelny's detailed presentation of how a socio-cultural learning setup has played a pivotal role in the evolution of human beings and the mind, offer useful tools for an update of Dewey's transactional, habit-centered theory of action.

Sterelny himself, however, remains cautious about the notion of the extensive mind whose constituents would literally include some external resources; we could say that he subscribes to only the milder view that some of the resources found in the environment may offer enabling 'scaffolding' for the mind (Sterelny 2010, 2012, 206n3). For Sterelny, forming representations of the world is a key function of the human mind (Sterelny 1990), which, in fact, evolved in the first

place to enable our forebears to better keep track of the (often hostile and dangerous) external world by forming belief-like representations of it (see Sterelny 2003, 30 ff.).

Let us mention that representationalist ideas are ill-suited to our anti-representationalist and anti-essentialist views that go along with methodological relationalism (Kivinen and Piiroinen 2006, 2013, see 2018c), drawing from Dewey's (1896, 1988c, 1991) pragmatism the idea that one can engage in any inquiry, or even perceive anything, only from an actor's point of view, related to some purposes and problems of action. That view makes inquiry and knowledge tools of action, and knowing cannot then be a case of representing—as if 'looking at' an independent object's nature (Dewey 1988c). We are in agreement here with ('radical') enactivist, embodied and embedded versions of extensive, ecologically explained cognition that advocate non-representationalism (e.g., Chemero 2009; Hutto and Myin 2013, 2017; Gallagher 2017). Clark (2005), too, has noticed that in giving a pivotal role to a supposedly native capacity to form belief-like representations, Sterelny actually fails to take full advantage of his own niche construction framework. According to Clark (2005, 780–781), the idea of human niche construction allows us to get rid of the notion that minds have an innate capacity to form decoupled, belief-like representations of the world, and to emphasize, instead, the necessity of a socio-cultural niche (which, after all, is what provides us with such enormously pivotal thinking tools as language) for all human mental capacities. More recently, Clark (2015, 1) also pointed out that his predictive processing view of the brain's function is far removed from the age-old debates about internal representations.

As Clark's conception of predictive processing implies active selection of perceptional contents, and that depends on the organism's goals and bodily features which have, in turn, been shaped by its personal and evolutionary history in some niche, he certainly does not depict perception as simple representations of the external world (Clark 2015, 2). To be sure, Clark does not completely

refuse to use the term representation as such; in fact, he sees himself more as a peacemaker between representationalists and radical-enactivist non-representationalists than as a non-representationalist.[8] However, his interpretation of representation is nothing like the traditional view of picture-like mental copying of objects—what Rorty (1979) called the 'mirror of nature': for Clark's (2015) perception is not about revealing the nature of the external world but about engaging the world, which says as much about the organism as it does about the world. 'Representation,' as Clark uses the term, should not be seen as something internal designed to capture the way that the external world is, but as a description that an interpreter of a predictive system might use to praise it for its being geared to successfully engage some of the aspects of the world that matter to it (pp. 2, 5). Such representations are 'action-oriented through and through,' Clark (p. 4) stresses, and 'firmly rooted in the history of organism–environment interactions' (or, transactions). For any Clarkian representation, the apt test has to be just how well it enables the organism to act in the world; and to us, that sounds the same as our Deweyan and Rortian view of minds as tools for coping, not for copying. Accordingly, Clark's predictive processing seems largely compatible with our pragmatist non-representationalism.

Leaving aside certain discrepancies, Sterelny and Clark seem to be in agreement on things that matter to us here; for instance, Clark embraces Sterelny's ideas about socio-cultural niche construction as an important additional inheritance mechanism that works alongside, and interacts with, genetic inheritance. Clark also agrees with the related point that, most pertinent to the human mind has been its superb plasticity (implying, obviously, enormous learning capacities), allowing adaptability to a great variety of environments—a view that directly contradicts the nativist evolutionary psychologists' claims discussed above that the human mind is effectively a Pleistocene mind situated in the modern world, consisting of modules wired into the brain at birth (Clark 2005, 778–780). Sterelny (2012, xii, 26–27), in turn, has acknowledged 'important affinities' between his

niche construction view of the evolution of human cognitive competences and theories of extensive mind, agreeing that Clark—and Dennett, for example—was right to point out that, in many ways, our minds crucially depend on a suitably adjusted environment, on the tools for thinking that support our mental capacities.

Dennett may not be known as a card-carrying member of the extensive mind group, but the basic idea that the contents of our minds, and thus, much of our awareness, thoughts, and decisions, depend crucially on what has been going on around us in the (person's socio-cultural and the species' evolution historical) environment has long been part and parcel of his philosophy (see, e.g., Dennett 1991, 2003, also 1987, 65). No wonder Clark (2016, 4) calls Dennett 'one of my true philosophical and scientific heroes.' Moreover, in Dennett's philosophy, the ideas paving the way for the theory of extensive mind come together with an explicitly Darwinian view of life and mind (see Dennett 1995, 2017), which is something that further unites him and Dewey, and makes it appealing to try and apply some of Dennett's concepts in an update of the Deweyan theory of action.

As a Darwinian philosopher, Dewey would have agreed with Dennett that evolution is a kind of biological engineering. Dennett has recommended that the human mind and culture—along with all life—should be understood through evolutionary 'reverse engineering,' viewing living organisms as composed of parts with functions whose evolutionary history can be backtracked by asking and answering the question, what purposes they may have served so well in the (ancestral) population's environment that they offered the organisms that exhibited them a sufficient advantage in the struggle for survival (Dennett 1995, 2017). The question is: 'What is – or was – this feature *good for*?' (Dennett 2017, 28–29, 80). Dennett also agrees with Dewey, Clark, and Sterelny that, in our human case, many traits have been good for something in the socio-cultural environment in

particular; he is a ‘Baldwinian’ thinker appreciative of the evolutionary significance of (changes in) social environment (Dennett 1991, 182 ff.), which is pretty much the same as acknowledging the crucial role of niche construction in human evolution. Dennett (see 2003, 69) has not always been as enthusiastic as Sterelny, for instance, about the term niche construction as such,[9] but at least in his most recent book, he offers an apt and favorable treatment of this notion, especially in connection to the evolution of language (Dennett 2017, 260 ff.). Moreover, Dennett (1995) has long since grasped the Sterelnian point that human cultural and mental evolution has crucially depended on our enhanced capacities to adopt habits and ideas, and thus, on the human tendency to learn from others, and to pass information and skills from generation to generation.

Similar to Clark and Sterelny, Dennett offers tools for re-conceptualizing and elaborating on Dewey’s pragmatist theory of action. Dennett speaks of natural evolution producing ‘design without a designer,’ which we human inquirers can explain with ‘reasons without a reasoner,’ or ‘free-floating rationales’—explanations for traits, features, and behaviors that do not involve a reference to any organism’s motivating reasons, but are such that we can find reasonable for our explanatory purposes (Dennett 2017, 50).[10] He also offers a fresh formulation of the classical pragmatist understanding that skillful knowing-how is a crucial prerequisite of and underlies all reasoning and knowledge-that. Dennett (2017, e.g., 3, 54–55, 94–101, 299–300, 388–389) puts this old idea in his own terminology, saying ‘competence precedes comprehension.’ Comprehension could evolve only quite recently in our evolutionary history, after culture, especially language—‘the *launching pad* of human cognition and thinking’ (Dennett 2017, 260), had risen from the skilled practices of human communities, engendering an increasingly rich variety of novel tools of thinking. Dewey would certainly agree, and would likewise stress the importance of the evolution of linguistic communication (to the purposes of communication and coordination of actions), because that gave

rise to true communities of people and thus, to shared meanings, those crucial components of human mental life and propositional knowledge (Dewey 1988b, Ch. 5).

Another key concept that Dennett (2017, see Ch. 5) and theorists of extensive and (more or less radically) enactive mind (Chemero 2009, Ch. 7; Gallagher 2017; Hutto and Myin 2017, 78, 82 ff.) make use of is 'affordance.' Although J. J. Gibson (1987) originally introduced affordance as a psychological term, here we understand it in a thoroughly transactional sense, as referring both to the environment and the organism and implying their mutual complementarity, a notion that can be used to define also ecological niches—'a niche is a set of affordances' (pp. 127–128)—as a transactional affair. Dennett (2017, 76 ff.) and others are now utilizing the notion to clarify how natural selection designs species to deal with affordances. Affordances, therefore, are a useful conceptual tool for analyzing evolution, for instance, because changes in local affordances tend to change the selection pressures that a population of animals faces, and accordingly, what kind of individuals tend to get rewarded or punished for their traits and behaviors.

Dennett (2017, 167 ff., 354 ff.) embraces the notion of brains as predictive engines, and like Clark (2016, 177–188), ties it to the concept of affordances, along with the view that comprehension is based on competence. Seen as a Bayesian predictive engine, the brain is making probabilistic anticipations, all the time, about some relevant affordances, using incoming signals chiefly just to weed out previous prediction errors; and according to Dennett (2017, 168–169), in a familiar environment (for which one has apt habits) the need for corrections decreases, and the brain's guesswork gives the organism a particularly substantial head start on what to do, allowing activity to run like on autopilot, without conscious attention, 'creating new affordances on the fly.'

Because affordances, like transactions in general, involve an organism and its environment, an extensive mind and its perceived, meaningful environment, the concept leaves no room for subject–object dualistic internal representations of external objects (Chemero 2009, Ch. 7; Solymosi 2013; Hutto and Myin 2017, 82 ff.; Gallagher 2017, e.g. 96 ff.). Similar to Dewey's transactional pragmatism, the concept of human affordances overcomes dichotomies like subject–object and nature–culture (Heras-Escribano and De Pinedo-Garcia 2018). As Dennett (2017, 78–79) points out, affordances could be said to constitute what von Uexküll called 'the organism's *Umwelt*, the behavioral environment that consists of all the things that matter to its well-being.' This—obviously thoroughly transactional, too—notion of *Umwelt* is likewise compatible with the idea of predictive processing. Clearly, many of the most pivotal elements that our predictive brains (thoroughly action-driven as they are) will try and anticipate, and deal with, are the various affordances that also constitute our *Umwelt*. Our environing world is an *Umwelt*, 'a world tailored to human needs, tasks, and actions,' precisely because it is 'built of affordances' (Clark 2016, xv).

6. FINAL WORDS

Drawing outlines for a twenty-first-century update of Dewey's transactional, habit-centered theory of action, as we have done here, a good place to start is that from the very beginning, the backdrop of Dewey's philosophy and theory of action was a Darwinian theory of evolution. It has turned out a remarkably effective guarantee of his pragmatism's lasting relevance in the social and human sciences, even when the world has changed much. Evolution takes time, there is a dizzyingly long evolutionary history behind the human being we know today, and the main outlines and principles of the continuing human evolution are not about to change into something unrecognizable any time soon. Thus, it is probably safe to assume that Dewey's insightful understanding of the basic

transactional principles of human life, action, and evolution will remain relevant in the foreseeable future, too. Yet the rapidly accumulating evolution historical data, together with improving theories on the coevolution of the human mind and its socio-cultural niche, of course, provide useful materials for updating Dewey's view of the evolution of human beings, and thus, of his theory of action. Among recent niche construction theories on the evolution of human being, one particularly compatible with Deweyan thinking is Kim Sterelny's—amply empirically supported—theory of how socio-culturally enhanced learning (by doing) must have played a key role in the evolutionary history of our species.

Of course, since Dewey's time, there have been many scientific advances (theoretical innovations and empirical discoveries), providing new ideas, conceptual tools, technology, and data that can, and should be, utilized in articulating conceptions of human beings, action, and the mind. The contemporary 4E notion of the mind as embodied, enactive, embedded, and extensive is one such novel research topic that goes well together with Dewey's philosophy—as well as with Sterelny's niche construction view of human evolution. We have argued here that Dewey's thinking appreciated each of the four 'E's' that philosophers around the turn of the millennium have become so excited about, but some of the ideas and research results that recent 4E theorists have advanced in this connection are certainly noteworthy additions to a Deweyan theory of action. One of the leading spokespersons of the 4E mind, Andy Clark, has been advocating a conceptualization of the brain's main function in terms of predictive processing, for example, and we find that another very promising tool to utilize in our update. Clark and Daniel Dennett, for instance, would also tie the idea of predictive processing to the notion of affordances—opportunities of action that involve the organism and its environment, and imply their mutual complementarity. These are action-driven, transactional ideas, and thus, smoothly compatible with Dewey's pragmatist theory of action, which

further contributes to reaffirming Dewey's relevance in the twenty-first-century sciences of the mind and in social science.

Our own methodological relationalism, as an anti-representationalist and anti-essentialist standpoint for social scientific research work that relies on Deweyan transactionalism in disposing the old dichotomies between subject and object, organism and environment, mind and world (as well as that between individual and society), is very compatible with the ideas mentioned above. That is, methodological relationalism goes well together with not just Dewey's good old pragmatist, habit-centered theory of action but also with Clark's and others' ideas about the 4E mind and about the brain's main function being that of predictive processing, as well as with Sterelny's and others' niche construction views of human evolution, and of the crucial role played in that by our human enhanced capacities to learn by doing in an appropriately supportive socio-cultural environment. The 4E mind, predictive processing, niche construction, and guided learning by doing are, all of them, very much action-driven, indeed pragmatist, notions, and many present-day theories on these topics are connected by their use of such thoroughly anti-dualistic, indeed transactional concepts as affordance, which also sits well with methodological relationalism.

Dewey would have agreed that proper understanding of distinctively human features and properties, including many that are often aptly conceptualized in terms of 4E minds and predictive brains, should be compatible with knowledge that can be gathered through what Dennett calls evolutionary reverse engineering—tracing the timeline of human species back far enough to account for the chains of events that were the most relevant causes and effects for the development of the properties at issue. The human niche to consider in such reverse engineering explanations has for hundreds of thousands, if not for millions, of years been a socio-cultural affair. Therefore, instead of evolutionary psychology or evolutionary brain science, we prefer evolutionary sociology leaning on

methodological relationalism, ready to take into account the most relevant issues involved in the transactional human evolutionary history in the niche of community and culture.

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NOTES

[1] In this chapter, consistently with a long line of our previous works going back for decades, we write the term 'transaction' and its derivatives without the hyphen.

[2] The switch from the 'mind-first' to the 'action-first' explanation, to put it briefly, is the idea that we should not seek to explain action with anything in the mind—beliefs and desires, or volition—but instead, conceive action, channeled by habits, as the baseline of all life that also explains whatever content we might want to say there is to someone's mind (see, e.g., Joas and Kilpinen 2006).

[3] In fact, pragmatism was unpopular in those days, in Europe in particular. An important change started in America in the 1970s, with Putnam's (1975) and Rorty's (1979) neo-pragmatism overcoming the subject–object dualism by emphasizing the importance of language for the human mind and the Wittgensteinian and Deweyan insight that there is no private language, that linguistic '"meanings" just ain't in the *head*' (Putnam 1975, 144).

[4] It is akin to certain much older ideas, though, for instance, those that go under the name of 'Baldwin effect' (after James Mark Baldwin), which somewhat similarly emphasized the role of behavioral plasticity and learning in evolution, and took into account 'the social aspect of evolution'—'social relations and traditions' in the evolving population—as an important part of the environment of selection (Richards 1987, 484; see Weber and Depew eds. 2003).

[5] 'The organism acts in accordance with its own structure, simple or complex, upon its surroundings,' Dewey [1922] (1988a) said, and stressed that '[a]s a consequence the changes produced in the environment react upon the organism and its activities. The living creature undergoes, suffers, the consequences of its own behavior' (129). 'The higher' (that is to say, the more neurologically complex and phenotypically flexible) 'the form of life,' he also knew, 'the more important is the active reconstruction of the medium' (128). 'Of human organisms it is especially true that activities carried on for satisfying needs so change the environment that new needs arise which demand still further change in the activities of the organism by which they are satisfied; and so on in potentially endless chain' (Dewey 1991, 35).

[6] This may be said of any life form. The most well-worn example of animal niche construction is probably beaver dams, but even relatively simple animals (spiders are a good example) utilize tools, such as traps to catch prey, and many more build nests, or store food; even plants and bacteria may be said to be engaged in some niche construction, because

in their transactions with the environment, they tend to change the composition of their surroundings in many ways (see Odling-Smee, Laland and Feldman 2003; Sterelny 2005).

[7] Ecological inheritance intertwined with (the evolution of) genetic and cultural inheritance is also referred to as 'triple-inheritance' (Laland and O'Brien 2010, 312; Odling-Smee and Laland 2011, 223).

[8] As Hutto (2018; Hutto and Myin 2017, 82–85, see 2013, Ch. 7) argues, Clark still clings to an unfortunate cognitivist framework where (the majority of) cognitive processing is thought to take place inside the body (only sometimes 'extending' partially out of it). Most cognitive scientists have been talking in terms of representations, and thus, arguably unnecessarily keeping the door open for 'creeping Cartesianism' which pragmatists like Dewey expelled (Solymosi 2013, 594).

[9] Dennett is indifferent to the terminological novelty of niche construction because he is well aware of Baldwinian and related ideas having been around for more than a century under different names, and thinks that they were incorporated even in mainstream evolutionary synthesis in the 1980s (see Dennett 2004, 725–726).

[10] Of course, this is well in keeping with the Dewey's action-first vein of explanation.