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Evolutionary Understanding of the Human Mind and Learning – in Accordance with Transactional Naturalism and Methodological Relationalism

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Abstract

The approach to the evolution of human culture and mind suggested in this article represents transactional naturalism combined with methodological relationalism. In transactions, the organism changes the environment and vice versa. Transactional naturalism conceptualizes the human mind and awareness in a relational vein, as coevolving with the human socio-cultural niche, much like enactive and extensive theories of mind. The approach is in stark contrast with gene-centered and psychologizing nativist naturalism which views consciousness and language faculty as innate. The origin of the concept of transaction is in classical American pragmatism, in particular in Dewey's theory of action according to which one can learn only in action and in action one cannot but learn. Apprentice learning setup, emphasized by Kim Sterelny in particular, has been pivotal for the development of human community since the Pleistocene era. Coevolving with social institutions, human learning has played an exceptional role in cultural innovations when useful knowing-how and skilled habits have been transferred from generation to generation. Therefore humans deserve the epithet *Homo discens*, learning man.

Keywords

Awareness; culture; evolution; extensive mind; *Homo discens*; transactional naturalism

1. Introduction

The approach to the evolution of human culture and mind suggested in this article represents transactional naturalism and methodological relationalism. The approach is compatible with such evolution theoretical ideas as coevolution and niche construction (Kivinen & Piiroinen 2012, 2013; see e.g., Odling-Smee, Laland & Feldman 2003). The origin of the concept of transaction is in classical American pragmatism, John Dewey (1859–1952) in particular. By contrast to the notion of interaction taking place between independent parties, transactional naturalism as an anti-dualistic approach overcomes the alleged separateness of such parties as subject and object, organism and environment, or mind and world (Dewey [1949–52] LW 16). In organism–environment transactions, the parties are changing one another. As objects of inquiry, human mind and learning are conceived as relational affairs, calling for methodological relationalism. (See Dewey [1929] LW 4, [1938] LW 12; Kivinen & Piiroinen 2006, 2007.)

Transactional naturalism is here contrasted with nativist naturalism. Permitting slightly stereotypical simplifications, the outlines of the two naturalisms are as follows: nativist naturalism understands the evolutionary arc of human community, language, and consciousness inside-out, beginning with gene mutations and the growth of the brain size; whereas transactional naturalism considers the relevant transactions contextualized, as organisms changing their environment and vice versa. According to transactional naturalism, the most crucial evolutionary environment for human development is the human community and its culture. Therefore, there is a place also for social scientific inquiry utilizing methodological relationalism in evolutionary research. (See also Kivinen & Piiroinen 2012, 2018a.)

Leaning on methodological relationalism, transactional naturalism proposes to read the mind out of human behavior. Similarities and differences between minds then come down to those between (descriptions of) habits of action, typically learned from other people in their community life. Human awareness, in turn, is conceived here in a Sellarsian vein, as a linguistic affair. (Kivinen & Piiroinen 2007, 2012; see Sellars [1956] 1997; also Dewey [1922] MW 14, [1925] LW 1.) Transactional naturalism is broadly compatible with embodied, enactive and embedded theories of mind (e.g., Varela, Thompson & Ross 1991; Hutto & Myin 2013, 2017; Gallagher 2017), not to forget the extended mind hypothesis (e.g., Clark 1997, 2008; Clark & Chalmers 1998; Noë 2004, 2009; Chemero 2009), although we prefer the idea of extensive mind (also Hutto & Myin 2013, Ch. 6; Hutto, Kirchhoff & Myin 2014) rather than extended mind because the latter may leave the impression that the mind is something that first develops inside the head and only then extends out of it. That notion runs contrary to the pragmatist understanding that knowing-how (competence) comes before knowing-that (comprehension) (see Dewey MW 14; also Dennett 2017a).

The development of human mind and awareness has taken place in socio-cultural niches where human competences and linguistic capacities have been evolving since the Pleistocene era. A few ecological and socio-cultural hypotheses about the evolution of language will be discussed herein, as will be the development of human learning capacities paving pave for cultural evolution and skilled habits being transmitted from generation to generation. Basically, the paper leans on a Deweyan theory of action, entailing that in action one cannot but learn and one can only learn in action. Dewey's concepts of knowing-how and learning by doing, as well as the evolution theorist Kim Sterelny's (2012a) conception of the apprentice learning setup, speak for a variety of learning belonging to the core of human evolution to the extent that our species deserves the epithet *Homo discens*, learning man (Kivinen & Piiroinen 2018a), even in the present-day conditions of ubiquitous ICT. Theories of extensive and enactive mind, Andy Clark's (2016) notion of the brain

as a predictive engine, as well as Robin Dunbar's ideas about social life coming in layers and the so-called Dunbar's number will also be discussed in this connection.

2. Evolutionary understanding of human awareness – nativist and transactional approaches

The American philosopher John Searle (2002) is a prominent representative of nativist naturalism. According to him, the key to the solution of "the problem of consciousness," "the most important scientific discovery of the present era," will be found when it is understood how exactly the neurobiological, ultimately physical and chemical, processes of the brain are producing consciousness (pp. 18 ff.). Searle's evolutionary explanation of the human mind, language, and society then proceeds in a straightforwardly nativist naturalist manner, inside-out: it begins with the emergence of intentionality and consciousness from complex enough biological brains; explains language as an outgrowth of intentionality which allowed early humans to speak their pre-linguistic minds; and concludes with social institutions being created by language-use. That is to say, the explanation proceeds "from intentionality to language and then from language to social institutions," each step being presented quite simply as "a natural outgrowth of more fundamental … phenomena." (Searle, 2010, 61–63, also 1995.)

Searle thinks that his explanation is compatible with Darwinian thinking. But, as has been pointed out before (e.g., Kivinen & Piiroinen 2012), his notion of Darwinism is quite restricted – it simply calls for non-teleological explanations in terms of the environment selecting, from amongst a random variation of organisms' genetic features, "by way of blind, brute, natural forces" (Searle, 1995, 16). The Searlian view seems based on a rather narrow reading of the typical twentieth century interpretation of the modern synthesis of evolutionary theory, holding fast to the notion of

unilateral causation in evolution, disregarding the idea of reciprocal causation, which is pivotal to the twenty-first century theory of niche construction as a genuine evolutionary force (see Laland, Sterelny, Odling-Smee, Hoppitt & Uller 2011; Constant, Ramstead, Veissière, Campbell & Friston 2018).

Unlike nativist naturalism, transactional naturalism is well in line with such twenty-first century developments in evolution theory as niche construction and gene–culture coevolution (see, e.g., Durham 1991; Dennett 1995, 2017a; Deacon 1997; Donald 2001; Odling-Smee et al. 2003; Weber & Depew ed. 2003; Buller 2005; Richerson & Boyd 2005; Bickerton 2009; Sterelny 2011, 2012a). Like co-evolutionary theories of niche construction, transactional naturalism emphasizes that there are no Darwinian adaptations to the world in general, only adaptations to local conditions which, after all, are what any living organism must cope with in its organism–environment transactions. Darwinian adaptations tend to change over time with changing environments; in organism–environment transactions both parties are changing, which will also change subsequent natural selection pressures that are faced in the environment. (Odling-Smee et al., 2003, 1 ff., 40 ff.; see, e.g., Laland & Sterelny 2006; also Dewey LW 12: 32–42.)

Niche constructionist and co-evolutionary theories are competing with more reductionist, gene-centered views in the heartland of evolutionary biology; if the twentieth century in biology is known as the century of the gene, the twenty-first century could be called "the century beyond the gene" (Keller 2005), or the "postgenomic age" (see Meloni 2016). Evolutionary biology is investigating, not just singular genes and presumed consequences of their mutations, but relational and dynamic (epi)genetic systems. This is in line with American pragmatist tradition, where Dewey and Bentley [1949] could already stress that genes do not hold "the secret of life," and should not even be conceived as independent elements in themselves; genes are thoroughly relational

conceptualizations and thus "configurational" within their settings, as parts of broader wholes (Dewey LW 16: 118–119). The very term transaction was introduced for relations where the parties are changing one another; there is a crucial difference to the idea of interactions between distinct parties. The concept of transaction crosses the boundaries between organism and environment or the mind and world, going well together with the family of extensive mind theories (e.g., Varela et al. 1991; Clark 1997, 2008; Clark & Chalmers 1998; Noë 2004, 2009; Chemero 2009; Hutto & Myin 2013, 2017; Hutto et al. 2014; Gallagher 2017).

As opposed to such nativist naturalists as Searle, Chomsky, and many who identify themselves as evolutionary psychologists (e.g., Barkow, Cosmides & Tooby ed. 1992; Buss 1995; Pinker 1997, 2002; Hauser, Chomsky & Fitch 2002; Chomsky 2008; Searle 2010), transactional naturalists do not explain the evolution of the human mind, language, and social institutions starting from inside the head, stressing unilaterally the brain and its genetic blueprint. Instead, they take into account the evolutionary relevance of the cultural niche, including technologies and the customs of social life, and use them in explanations of the development of language and the distinctively human awareness (e.g., Dennett 1995, 2017a; Deacon 1997; Donald 2001; Weber & Depew ed. 2003; Buller 2005; Richerson & Boyd 2005; Sterelny 2007, 2012a, 2016; Kivinen & Piiroinen 2007, 2012, 2018a).

Investigations into human evolution along the lines of transactional naturalism can be found in the works of Terrence W. Deacon (1997), Daniel C. Dennett (2017a), and Merlin Donald (2001), for example. Their theories take carefully into account the changing human niche in explaining the evolutionary arc of human body and behavior, mind and language. The key questions to be answered then differ markedly from what the nativists looking for some particular gene or mutation are asking. Like Sterelny (2011, 813–814, 818–819), transactional naturalists do not search for a

"genetic trigger" that would have turned on the higher capacities of human minds like "a new and especially bright light being turned on" in individual heads. The nativist naturalist search for a particular genetic "missing link" that turned hominids into humans is seen as waste of time (Deacon 2003, 83–84; cf., e.g., Chomsky 2008, 18–19; Hauser et al. 2002). The same goes for attempts to try and pinpoint some specific threshold of brain complexity that, as Searle (2002) supposes, would have made brains capable of producing the "electrochemical sequences ... causally necessary and sufficient for consciousness" (pp. 72–73). Instead, we find it more promising to concentrate on the peculiarities of the socio-cultural niche that would have given rise to proto-language and then language, which is a crucial constituent of human awareness.

3. A socio-cultural niche for language to evolve

Transactional naturalism conceives language first and foremost as a tool of communication and coordination of actions (Kivinen & Piiroinen 2007, 2012). This is in glaring contrast to Chomsky's (2002, 76, 79, 86) view, for example, stating that language should be thought of primarily as a channel for voicing one's thoughts. That idea was criticized by pragmatists already in the 1920s for making language as superficial to one's thoughts as a pipe is to the water running through it (Dewey LW 1: 134). According to Dewey (MW 14: 57), language evolved "out of unintelligent babblings, instinctive motions called gestures, and the pressure of circumstance." It did not evolve for people to be able to speak their mind because, for starters, there were no contents of thought before language (Kivinen & Piiroinen 2007, 105–209, 2012, 92 ff.; see Davidson 1985; Hutto & Myin 2017). That is to say, language as a tool of communication and coordination of actions in communities has evolved primarily to satisfy shared action-related needs, and later on turned out to give rise to human awareness as early language users became aware of their experiences and of

themselves as experiencers. That could happen when they had a rich enough language to communicate thoughts to themselves as well as to others. (See Dewey LW 1: 134–135, 198; Mead 1934; Dennett 1991, 195–197; also, e.g., Bickerton, 2009, 169 ff.)

As Dewey anticipated and later research has confirmed, language cannot have appeared abruptly; it had to evolve incrementally over quite a long period of time: there were likely many significant chains of events going on in an environmental niche favorable to (at first, perhaps strongly mimicking-based) proto-language, and later to an increasingly full-fledged language to emerge, over a period of at least a few hundred thousand, if not one or two million, years (see, e.g., Deacon 1997; Donald 2001; Bickerton 2009; also Kivinen & Piiroinen 2012; Sterelny 2016).

There had to be some highly unique circumstances for language to evolve – judging by the fact that language is such a dramatic anomaly that no other species has evolved anything even remotely similar to it (Deacon 1997, 28–34). More specifically, the early-human niche that enticed proto-language and then language to evolve must have featured some pressing and highly unusual needs to communicate, such that gave a significant edge to those groups and individuals who found a way to accomplish such acts of communication. So the explanation for why other animals have not evolved into language users is: "bottom line, they didn't need language" in their niches (Bickerton, 2009, 24).

Of course, human language evolution required big and complex enough brains and some genetic mutations, but those are by no means such ultimate explanations as nativist naturalists think, for all such physical developments needed to prove themselves useful in the organisms' evolving environment, ecological niche. Bigger brains burn more energy and therefore call for a niche explanation; brains will grow only if the population of animals is already engaging in some

important enough actions for it to be sufficiently rewarding to have bigger brains than one's competitors (Bickerton 2009, 34). Placing brain evolution before language evolution, like Chomskian nativists are doing, is just putting the cart before the horse (Deacon, 1997, 44, 102 ff.).

3.1. Dunbar's number

The survival of humans has throughout their evolutionary history depended on groups; hence, also niche construction explanations for the evolution of language emphasize the importance of group life, cooperation, and community as a pivotal part of the niche where proto-language and then language would have evolved. One evolution theorist to emphasize the importance of community in language evolution is Robin Dunbar (e.g., 1993, 1996, 2016a).

According to Dunbar, social life comes in layers, where the next layer's ratio to the one before it is approximately 3:1. In the human case, these layers consist of 5, 15, 50, 150, 500, and 1,500 people (chimpanzees and baboons have only the first three layers and monkeys have even less). The way Dunbar (2016a, Ch. 3) puts it, 5 is the "innermost" layer, 15 the "best friends," 50 "good friends," 150 "friends," 500 "acquaintances," and 1,500 is the number of "people whose faces we can give names to."[1] People invest most of their time and energy in their innermost five, whom they tend to trust most unconditionally and have densest relations with; the function of this layer, according to Dunbar, is to offer the most intense emotional support. A vast majority of the rest of the time goes with the next few layers, keeping it within about 150 acquaintances. (Dunbar 2016a, 292–301.)

[1] The same 3:1 ratio can be found in modern military organizations, for example: it is typical for three smaller groups to be taken as constituting a platoon of 40–50 soldiers; three platoons as making up a company of ca. 150; three companies a battalion of about 500; three battalions a regiment of 1,500; three regiments a brigade of 5000; and three brigades a division of 15,000 soldiers (Gamble, Gowlett & Dunbar 2014, 43).

Referring to the size of many traditional and modern groups (see Dunbar 2016a, Table 3.1, pp. 70–71), Dunbar argues that 150 is actually the natural upper limit, relative to the size of the human (social) brain, of the human group size; it is known as the Dunbar's number. The size of the human brain has not changed much for over 200,000 years now, so neither has the natural basic group size; and yet somehow humans have been able to form much bigger and highly elaborate organizations, as our species has gone "from 7 million to 7 billion in a few 'minutes' of our evolutionary history, … from the Stone Age to the Digital Age" (Gamble, Gowlett & Dunbar 2014, 188).[2] According to Dunbar (1996, 2016a), up until about 150 heads early human groups could manage their social relations by non-verbal means, and only the growing of the size of groups past that ceiling necessitated language to evolve, to serve the needs of communication and coordination of actions in such bigger communities.

3.2. Some hypotheses on language evolution

As to what kind of actions might have been the most crucial to communicate and coordinate for (proto-)language to evolve, there have been various suggestions. Dunbar's (1996) hypothesis is that the most crucial social function that language first evolved to serve had to do with social relations. Humans are insatiably interested in group relations like what some other group member is doing and with whom, and what is one's own social standing. For these reasons, and language could have

[2] In a recent article discussing social media, Dunbar (2016b) remarked that, even though people today may have thousands of "friends" in Facebook and in other digital services, they still have the same layers of about 5, 15, 50, and 150 real friends that they invest a vast majority of their time and energy in.

evolved for gossiping, as sort of verbal "grooming" for the growing community. That is one hypothesis, but there are also plenty of others, more or less plausible ones.

Derek Bickerton (2009), for one, champions the idea that proto-language originally evolved for the purpose of early hominids to make a reference to dead or dying megafauna nearby, so that enough numbers could be collected to take joint action required to go retrieve that precious meat source and to collectively protect it against predators and other scavengers.[3] That would certainly have required making a reference to something that was not present, to a distant object, naming it as a goal that could be achieved in the near future if individuals worked together; and this is one important feature that differentiates language from other communication systems.

An interesting hypothesis is advanced by Terrence Deacon's (1997), saying that the first proto-symbols evolved to solve the problem of how the men of the group could leave the group's lair for lengthy periods of time and still feel confident enough that the children they were carrying food home to were their own. Deacon argues that the first few proto-words would have been sufficiently useful to be selected only if they evolved to solve this problem: in effect, they were invented for declaring that a certain couple was committed to one another, a sort of "marriage declaration."[4]

[3] This may be seen as an improvement on the idea that language evolved to help coordinate hunting parties. It is an improvement because, collective hunting parties for small game do not require language (chimpanzees can manage these too), and organizing large hunting expeditions for big game seems such an advanced capability that proto-language would likely have been needed much earlier. Bickerton's proposal would also push the origins of proto-language way back in time, because early hominids likely were scavengers long before they started hunting.

[4] Basically, Deacon is saying that an early form of marriage was the first institution to be created by means of what Searle (2010, esp. 11–12, 84–85, see also 1995) calls "Status Function Declarations" – language users creating institutional facts by declaring that those facts exist.

Another sensible suggestion is that the people who shepherded and spent a lot of time with children would likely have played a crucial role in the children's learning of the early (proto-)language and hence in the evolution of language. These people included the mothers of small children (Falk 2009), no doubt, but there is also a reasonable argument for the significance of "allomothering" – of other group members, perhaps especially grandmothers, participating in the shepherding of children (e.g., Hrdy 2009), in the social niche where language likely evolved. Grandmothers would have been a precious source of wisdom and potential help in child-rearing (and, thus, we might suspect, in the early language or proto-language learning of children) in a group that could support elderly members even after they were no longer in reproductive age. However, as Sterelny (2012a, 83–87), for example, points out, grandmothers likely could not have been the single most important factor explaining the evolution of human culture, because for grandmothers to survive long enough to reach the ripe age of their post-reproductive years, human groups would first have to have developed a prosperous enough ecological niche to consistently nourish and protect even the weakest members of the group.

Sterelny, for his part, stresses the role of learning situations, in tool making in particular, as having paved the way for proto-language (beginning, in the crude form, probably already in the species antedating *Homo sapiens*). The more experienced members of the group would have been subtly steering the learning of less experienced ones, in a sense training them, offering guidance or advice; and this sort of situations, so the argument goes, would have sparked early proto-language evolution too, because of how useful communication capacities would have been in them. (Sterelny 2012b, 2016; see also Gergely & Csibra 2005; Laland 2016.) That hypothesis is rooted in Sterelny's (2011, 2012a) more fundamental notion of peculiarly human apprentice learning setup, established in some early hominid groups in the Pleistocene period. In what follows, we will take a closer look at that notion and human learning more broadly.

4. Learning by doing, cultural evolution and the human mind

According to Sterelny (2011, 2012a), the group life that enabled apprentice learning played a crucial part in the evolution of human "behavioral modernity" – the cluster of behaviors shared by modern humans and distinguishing them from all other known species and even from early *Homo sapiens* that was physically indistinguishable from modern humans. The single most important work by Sterelny with respect to this topic and the present article's purposes is *The Evolved Apprentice: How Evolution Made Humans Unique* (2012a). Its basic idea can be summarized as follows.

Human learning has been of crucial importance for the evolution of our species, because it enabled human groups to transfer unprecedentedly vast quantities of skilled habits and knowledge from one generation to the next and consequently allowed cultural evolution to take the steering wheel from genetic evolution in the evolutionary trajectory of the species. This was due to the fact that at some point in the Pleistocene era human learning capacity stepped up to a much higher level of efficiency than what is found amongst any other species – justifying the epithet *Homo discens*, learning man. And these greatly enhanced learning capacities were not produced "mind first"; rather, they were a mostly unintentional product of, and then sustained only by, ecological and cultural niche construction. (See, e.g., Richerson & Boyd 2005; Boyd, Richerson & Henrich 2011; Sterelny 2011, 2012a; Henrich 2016; Heyes 2016, 2018; Kivinen & Piiroinen 2018a; cf. also Gergely & Csibra 2005.)

As such, human learning capacities, like much of the rest of the human mind, are indeed a "cultural innovation," as Cecilia Heyes (2016, 2018) says. Human learning was a key innovation which, as it turned out, allowed culture to become an increasingly important driver of human evolution (see, e.g., Henrich 2016). Both human behavioral modernity and the human mind consist of clusters of habitual actions, are incremental products of social mechanisms where apprentice learning setup played a pivotal role, in conditions created by long-term ecological, socio-cultural niche construction by earlier generations. Behavioral modernity and the apprentice learning setup that enabled it cannot but be collective achievements; in Sterelny's (2012a, xi–xii) words, "we stand on the shoulders not of a few giants but of myriad of ordinary agents who have made and passed on intact the informational resources on which human lives depend." Human mind or learning is nothing without the community, the locus of collective wisdom (Kivinen & Piiroinen 2018a, 123).

The cultural innovation of apprentice learning setup indeed gave rise to behavioral modernity and distinguished human evolutionary lineage from those of all other species; it is the difference making the difference between humans and other animals. No other species is as malleably adaptable, precisely because no other species has anything like the largely cultural arrangement of human learning capacity. Humans alone engineer educative environments to support effective and reliable flows of skilled habits from the previous to the next generation, encouraging and guiding learning by doing, much like a master would encourage and guide an apprentice. (Sterelny 2011, 2012a; Kivinen & Piiroinen 2018a; see also, e.g., Boyd et al. 2011; Heyes 2016, 2018; Henrich 2016).

Underlying the apprentice learning setup, we can see a pragmatist, Deweyan notion of learning by doing (although Sterelny does not mention Dewey at all) (Kivinen & Piiroinen 2018a; see Dewey [1916] MW 9). Actually, learning by doing is the way to learn for any organism, because all organisms are doers first. For Dewey (see, e.g., MW 9, MW 14, LW 1, LW 12), the starting point is

action, which is continuous in life and does not need any mental "spark" from a mind to get started. In action, organisms form habits and improve them if they do not work well; one cannot act without learning or learn without action. Apprentice learning, in turn, means learning by doing in an environment seeded with some relevant resources (Sterelny 2012a, 35), supported by a distinctively human socio-cultural niche.

Sort of apprentice learning may have evolved before proto-language, and certainly long before full language.[5] Later, when humans already had also language at their disposal, the same learning setup would still have been efficient in speeding up socialization into local norms and customs, too, for example, as well as in the passing of useful knowledge about the environment. (See Sterelny 2012a, 17–18, 48–50, 151–171, 2016.) Apprentice learning thus paved way for the distinctively human mind (Kivinen & Piiroinen 2018a).

As Merlin Donald, among others, has pointed out, the hominid specialty of being able to share knowledge with others in cultural networks greatly accelerated the pace of biological evolution in hominid species, making the brains and the rest of the body go through an amazingly fast series modifications. In a sense, cultural evolution, which can be orders of magnitude faster than biological evolution, "hijacked the normally slow-moving process of natural selection and caused it to speed up." (Donald, 2001, 259–260.) Some niche construction theories make the further point that, the speed of local cultural evolution is in connection with the density of social relations. In some circumstances cultural evolution is very slow or stagnated, or may even regress. (See, e.g., Sterelny 2011, 818–819, 2012a, 45–47; Henrich 2016, Ch. 12.) In fact, in its early phases cultural

[5] Apprentice learning may have started already with the introduction of the Acheulian stone tool culture, ca. 1.7 million years ago, at the latest, because the skills needed to manufacture those tools appear complicated enough to be too expensive (in terms of time and energy spent) for the members of the group to obtain by means of totally undirected, solitary trial-and-error learning (Sterelny 2011, 2016).

evolution was remarkably slow for a very long time; the crude Oldowan stone tools, created by *Homo habilis* ca. 2.6 million years ago, were in use for one million years. Even for the anatomically modern *Homo sapiens,* it took well over 100,000 years to start behaving like modern humans.

Early cultural evolution was slow because it took time for the socio-cultural networks to grow dense enough, and even then the networks could always break down, which explains why cultural evolution has been an incremental, sporadic, and periodic affair (Sterelny 2011, 2012a), although relatively recently in history the speed of cultural evolution has been accelerating exponentially with the globalization of the socio-cultural network and increasingly rapid accumulation of innovations. The multitude of tools and technologies accumulating over centuries have made humans so powerful "habitat engineers" that they have extended their niche to cover the entire planet and pushed it into a whole new geologic epoch, that of the "anthropocene" (Ellis 2015; Fox, Pope & Ellis 2017). This niche and, accordingly, cultural evolution and the human mind, are apt topics for the social sciences.

5. Methodological relationalism in investigation of extensive mind

Transactional naturalists are relationalists; they view human beings as coevolving and changing with their communities, institutions, customs and technologies, and do not subscribe to the notion of innate human nature hardwired into the brain (e.g., Buller 2005; Kivinen & Piiroinen 2013; cf. Pinker 2002). Human minds, like human nature and the socio-cultural niches that they coevolve with are thoroughly relational affairs and apt topics for social scientific inquiry in line with methodological relationalism (see Kivinen & Piiroinen 2006, 2007; also Bourdieu & Wacquant 1992). This means the methodological commitment premised on the view that the only way to

know anything is through linguistic and other symbolic descriptions, the meanings of which depend crucially on their interrelations and whose worth is to be measured in how useful operationalizations they allow for empirical research as tools for handling the relations involved in the research questions one wants to answer (Kivinen & Piiroinen 2018c).

Methodological relationalism in evolutionary sociology (Kivinen & Piiroinen 2013, 2018a) contrasts with evolutionary psychology (e.g., Barkow, Cosmides & Tooby ed. 1992; Buss 1995; Pinker 1997). Respectively, our conception of human awareness contrasts with notions like Searle's "intrinsic" consciousness as something that modern humans supposedly share with their pre-linguistic ancestors (and with many other animals with big enough brains). Searle's notion of intrinsic consciousness goes together with the old dualistic idea that the skull marks a crucial division between the external affair of behavior and the internal affair of conscious thought; for him, it is all about the brain – human behavior and language-use lag behind consciousness (Searle 1992, 65–69). Searle (2010, 61) conceives Dennett's, Davidson's, and many other theorists' claim that language plays a crucial role in the human mind, as both "a philosophical error … [and] bad biology." According to Searle, any animal with a biological make-up similar enough to ours must have conscious experiences structured by pre-linguistic categories (Searle, 2010, 68). But we who prefer to study the mind in action, to read it out of behavior, find it better to join Dennett and Davidson, alongside Dewey who already stressed that the "world of inner experience is dependent upon … language" and therefore a social product (Dewey LW 1: 139).

We agree with Dewey (LW 12: 63 note) that there is no "'mental' activity or result that cannot be described in the objective terms of an organic activity modified and directed by symbols-meaning, or language, in its broad sense." Of course, a complex enough animal can have feeling of pain and comfort, for example, without being consciously aware of having them (Dewey LW 1: 198; see

also, e.g., Davidson 1985; Dennett 2017b). As Robert Brandom (2000, 2) puts it, non-language-using animals only have "sentience," not "sapiens," which like human awareness is a linguistic affair. Awareness as a linguistic affair can arise only in transactions with the socio-cultural environment, and is thus never simply "made in the brain or by the brain" (Noë, 2009, 164; also Dewey LW 1: 140 ff.). Hilary Putnam (1975, 144) had it right: "'Meanings' just ain't in the *head*!"

Drawing from Deweyan pragmatism (see Dewey MW 14, LW 1, LW 12, LW 16), transactional naturalism and methodological relationalism, as anti-dualistic approaches, are studying the human mind and awareness in action in its community and cultural niche (Kivinen & Piiroinen 2007, 2012, 2013; see Bourdieu & Wacquant 1992; cf. also Dépelteau 2018). In this, our approach is in a way similar to the theories of extended or extensive (embodied, enactive and embedded) mind, wherein the mind and awareness are likewise intertwined with the world outside the head (e.g., Clark & Chalmers 1998; Noë 2004, 2009; Clark 2008; Chemero 2009; Hutto & Myin 2013, 2017; Gallagher 2017). The notion of extensive mind is here preferred over that of extended mind, to avoid the more or less unintentional impression that the mind could first develop inside the head and only then extend out of it (see Hutto & Myin 2013, Ch. 6; Hutto, Kirchhoff & Myin 2014).

Extensive mind theories share the Deweyan idea that minds are embodied and action-related, continually depending on adaptive connections to their environment since any organism's "life processes involve a world … temporally and spatially 'external' to itself but 'internal' to its functions" (Dewey LW 1: 212; see, e.g., Varela et al. 1991; Clark 2008). Extensive mind theorists also concur with Dewey's appreciation of the significance of language as a kind of "cognitive super-niche" (e.g., Clark 2006), or the "tool of tools" (Dewey LW 1: Ch. 5) that has allowed humans to construct a multitude of cognitive niches or useful tools of thinking (see also Dennett 2017a).

6. Competence comes before comprehension

In Merlin Donald's (2001, 315) words: "The main difference between apes and us is culture, or more specifically symbolic culture, which is largely outside, not inside, the brain box." Culture and language indeed make a remarkable difference between humans and other animals; for example, whenever people face a problem that stops their smooth flow of actions, for them it is possible to formulate the problem utilizing symbol systems, which may allow them to search for the causes and effects relevant to the case at hand.

A beaver can build a dam, too: it has the instincts and the habitual knowing-how for that. But since beavers have no symbol systems and accordingly no linguistic awareness, they do not develop their dams systematically and the dams have stayed basically the same for millions of years. Humans, by contrast, have besides their embodied, habitual knowing-how to do things, also the ability to sometimes plan and deliberate and work things out with their symbol systems. This has greatly promoted their adaptability and allowed staggering cultural evolution on this planet. But symbol systems are a relatively late invention. It is important to keep in mind the strongly pragmatist point that organisms are doers first; symbol systems utilizing thought is a recent servant of action, not its originator. (See, e.g., Dewey LW 12; Kivinen & Piiroinen 2007, 2012; Dennett 2017a.)

As Dennett puts it, in evolution, competence comes first. Comprehension (or knowing-that) is a recent human cultural achievement, and as such cannot have been the source of competence (knowing-how). Competence is primary and comprehension is composed of competences. All organisms need to have competence that allows them to cope with their environment, and whatever

comprehension there is, can only come from and consist of competence. (Dennett 2017a, 94–101, 299–300, 388–389.) Those who speak of enactive extensive mind have made much the same point (see Hutto & Myin 2013, 2017; Gallagher 2017). Dewey (see, e.g., MW 14: 49–50, 123) already said it using his own terminology. In his case, it was firmly grounded in his pragmatist theory of action and his conception of inquiry and knowledge: the mind, like inquiry and knowledge and science, is a tool of action (see Dewey MW 9, LW 4, LW 12).

As embodied capacities, knowing-how, thinking skills included, can only be learned in action, which always involves the environment (for example other people, from whom humans learn most of their knowing-how). The role of the brain might best be characterized as that of a "predictive engine" – a proactive (Bayesian-probabilistic) organ intertwined with the organism's actions in the world. In his book *Surfing Uncertainty* Clark (2016) elucidates the functioning of this predictive engine with the metaphor of a surfer trying to stay in "the pocket" of oncoming waves. Thus conceived, the brain is not an insulated inference engine, but a thoroughly action-oriented engagement machine, a node in a pattern of active exchange binding the body and the world (p. xvi).

The notion of brain as predictive engine fits well to our non-representationalist interpretation of the mind and knowledge (Kivinen & Piiroinen 2006, 2007; see also, e.g., Dewey LW 4; Hutto & Myin 2013), denying in a pragmatist vein the dualism of mind and world which would depict the mind's main purpose as that of forming (somewhat picture-like) representations of the environment to initiate and guide actions. The brain as predictive engine cannot by any means have time for forming such representations, to picture how everything is in the world, since it is engaged in action, all the time striving to anticipate what will happen next, registering and turning attention to the things that diverge from the outline of anticipated experience – "prediction errors" – which the

brain factors in to improve future predictions and hence the organism's habits of action to cope with its environment (see Clark 2016). These ideas fit well to pragmatist notions of competence before comprehension and learning by doing, and hence also to Sterelny's apprentice learning setup.

7. Ubiquitous ICT and the human mind and learning

As the human mind is extensive and involves parts of its environment, there is no question that it is still coevolving with its socio-cultural niche. Cultural innovations can clearly have an impact on the mind, for example the rapidly developing ICT certainly has its impact (e.g., Greenfield 2014). Today's human minds can be more extensive than ever as the present-day technology enables human thinking to involve the unprecedented benefits of data banks, cloud services, etc., and to get in touch with a multitude of ideas and events in collaboration with people all around the world. Meanwhile, questions are being asked whether digitalization in the form of robotization and other automatization is creating enough new jobs in place of the disappearing routine labor occupations, and what kinds of skills will people need in them (see, e.g., Brynjolfsson & McAfee 2011).

The fact that ICT is indeed an elementary part of our present-day global niche, a part of the world economy and of much of the rapidly changing working life, for example, means that people need to learn how to utilize these tools and their possibilities, as well as how to find support and collaboration possibilities in the related socio-cultural environment. Improving the citizens' prospects in the twenty-first century "knowledge society," as well as the needs of economy, likely requires educational changes that would enhance people's knowledge-worker skills, such as digital literacy and skills of communication, collaboration, creative innovation, argumentation, and inquiry

in the internet environment (e.g., Scardamalia & Bereiter 2005; Brynjolfsson & McAfee 2011, 60–63; Kivinen, Piiroinen & Saikkonen 2016).

Now, since competence comes before comprehension, and one cannot learn without action, even knowledge-worker and other intellectual skills consist of knowing-how, embodied habits, and can therefore only be learned by doing (Kivinen & Ristelä 2002; Kivinen et al. 2016). Twenty-first century human learning is in this sense still much the same as any organism's learning. Also the millions of years long evolutionary history of hominids, the one that finally made our species *Homo discens*, is as relevant today as it ever was: the peculiarly human, apprentice learning setup, supported by a socio-cultural environment where there are opportunities to train with the appropriate tools and useful guidance available from more experienced masters of the skills, is still the most pivotal arrangement for the less experienced members of human communities to learn the skills needed in their niche. (Kivinen & Piiroinen 2018a.) This has remained the case even as cultural evolution has replaced stone axes, bows and arrows, blacksmith's tools, and weaving mill equipment with post-industrial age computers, smartphones, digital data, and social media environment. Each generation still needs to learn in particular the skillful knowing-how to utilize the most important cultural tools on offer in their niche, and such knowing-how, skills and habits can only be learned by doing. In the present-day socio-cultural niche it is necessary to learn the skills to cope with the ICT so ubiquitous in our world. (Kivinen et al. 2016; Kivinen & Piiroinen 2018a.)[6]

[6] One striking peculiarity of ICT tools, especially computers and the internet, might be worth pointing out, however: in comparison to all other tools in history, the present-day digital tools offer also certain exciting novel possibilities for remarkably enhancing learning by doing, in that they can be used to create digital learning environments where just about any imaginable actions can be safely tried out (Kivinen et al. 2016).

We should point out that proper education, serving what Dewey (MW 9: 4 ff., 46–57) called "growth" – the organism's and community's capacity to keep on adapting to its ever changing environment and novel problems faced therein – could not ever be well implemented by means of the medieval and industrial age schooling methods of lecturing and rote learning. Namely, as Dewey (MW 9: 354) emphasized, information counts as knowledge only when it is suitably organized into an agent's dispositions so as to allow it a better adaptation to its environment. Deweyan growth-inducing learning has thus always depended on the learner's ability to tie the pertinent information and other tools and opportunities to his or her habitual actions, an outcome which can only be achieved through active training in the skills needed. (Kivinen & Piiroinen 2018a.) The present-day ICT niche will likely make the wisdom of these Deweyan ideas more evident than ever before, because in today's world there is simply way too much potentially useful information for anyone to memorize, much of which can instead be quickly accessed when needed if one has the technical, intellectual, and social skills to do so – including collaboration skills adapted to the present-day environment.

8. Discussion

The transactional naturalist standpoint advanced herein, by contrast to nativist naturalism, explains the evolution of human awareness, language, and culture starting with organism–environment transactions, with the properties and developments of the niche as well as those of the organisms.

Considering the way human evolution ended up on its own unique track as compared to all other species, we have to ask how early humans, at some point in their Pleistocene era ecological, social and cultural niche, learned to communicate and coordinate their actions much more efficiently than

before, using proto-language and then full language. The evolution of language proved to be of utmost significance with respect to the future of human (cultural) evolution, because it enabled people to think with symbol systems, to have knowledge of things, and to organize communities and societies. Language is what makes the most distinctive difference between the human mind and all other animals: human awareness alone is conceived here as a linguistic affair. Language has also made the human mind much more extensive than it would otherwise have been, because it came to involve symbol systems and lots of other cultural support available in its niche outside the head.

Besides language evolution, we have discussed another crucial cultural innovation: the peculiarly human form of learning by doing that Sterelny calls apprentice learning. It has been vital for the community's capacity to effectively transmit useful knowing-how, skills and habits, from one generation to the next, thereby allowing accumulation of culture and accelerated cultural evolution, making culture the primary driver of human evolution. Apprentice learning is indeed learning by doing, as Deweyan pragmatists put it. All knowledge, intelligence, and comprehension are forms of knowing-how utilizing skilled habits and apt tools of action, to be learned in action, by doing things, practicing. In evolution, competence always comes before comprehension, the latter being a cultural product, and while the cultural innovations of apprentice learning setup and symbol systems have led to increasingly clever engineering of the (global) human niche with which the distinctively human mind coevolves, the future of human learning and mind still rest on the nuts and bolts of learning by doing, captured already by Dewey in his pragmatist theory of action and philosophy of mind and education.

The key topics dealt with herein, such as community and culture, social life and language, the extensive human mind and awareness as a linguistic affair, are all of them very much social and relational issues. There is no doubt that proper understanding of those topics, as well as of the

evolution of human being, will benefit from social scientific research employing methodological relationalism.

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