



BOOK SYMPOSIUM

What is a schema?

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I am glad to contribute to this symposium on Philippe Descola's *Beyond nature and culture* because I find the book so fascinating in its synthetic reach and I am all for the idea that we should be able to make structuralism take new analytical forms. Whether or not, however, the twenty-four configurations (i.e., integrating schemas) made possible by Descola's combination of four modes of identification and six relational modes exhaust human ontological-cum-epistemological possibilities is an empirical question—one that opens up probably inexhaustible new realms for investigation. It is not, however, the route I wish to follow in the present contribution; rather I want to consider how we conceive of schemas and their formation.

Descola devotes part two, "The structures of experiences," to exploring the idea of the schema because it is fundamental to his attempt to go beyond nature and culture—an endeavor with which I am entirely in sympathy, but for all its careful characterization, his schema cannot get free of this very distinction. My intention here is to focus on the schema and how we are to conceive of it because it seems to me that this fundamental issue has escaped not only cognitive anthropologists, but many cognitive psychologists, and that once the schema is understood as autopoietic—self-producing, self-regulating—the question becomes not "what kind of schemas are there?" but "what is the process in and through which schemas form?"

Considered as the process that characterizes living things, autopoiesis entails relative autonomy—that is to say, the system differentiates itself from within; this is the case for all living things, which cannot help but evince the history of their autopoiesis (Maturana and Varela [1972] 1980, 1988). In human beings, the zygote formed by the union of ovum and sperm differentiates itself to become the human



embryo, the fetus, the neonate, the infant, and thereafter this process continues throughout life, ceasing only with death. I argue that, in all its dimensions, human autopoiesis has to be characterized as microhistorical because always and everywhere the process engages particular intersubjective relations with particular others at particular times. There is no dimension of human autopoiesis that does not evince its particular history—from our genes to our regional location, physical appearance, and all our ideas and practices. It is a process of which it makes no sense to ask whether it is universal or peculiar to particular persons because, in every instance, the continuity over time of a human physical type, or of a schema that structures say, our perception of faces, resides in its continuing differentiation, which is inevitably informed by a particular lived history of intersubjective relations with others in the historically structured environing world in which any given person inheres. In this view mind is a function of the whole person that is constituted over time in intersubjective relations with others in the world as lived—that is to say, the world that we bring into being for ourselves. As I have shown elsewhere, the historical process of human autopoiesis is open to anthropological investigation and analysis and I return to it below. For the moment, however, I want to continue to look at how we might characterize a scheme.

A self-regulating transformational system

As used by Piaget the term “schema” refers to a dynamic, self-producing system that is differentiated in functioning; its constitution over time is an aspect of the functioning of the embodied nervous system (it is not confined to the brain). Considered as an autopoietic system, the schema is best thought of as a dynamic process whose product is emergent, never quite fixed—it is emphatically not a representation; moreover, all schemas come into being in the same way and have the same formal properties. Take, for example, the schema that we might suppose subtends the grasp of a newborn baby whose little fingers curl reflexively around anything that touches her palm; this grasping schema is differentiated in use as the child grasps different things—mother’s finger, her hair, the handle of a rattle, a cloth, and so on. Differentiation occurs as a function of the complementary relation between assimilation (the same schema assimilates the feel of finger, hair, rattle, cloth, and so on) and accommodation (each and every instance entails a transformation of the schema that subtends grasping). In other words, assimilation and accommodation are aspects of the self-same process that goes on and on differentiating itself in functioning: every assimilation of something to the grasping schema—irrespective of whether that something is novel or well-known—is at the same time an accommodation of the schema itself to the properties of what is grasped. Over time, accommodation and assimilation reach an equilibrium, and differentiation in use becomes ever finer and more subtle; a well-established schema is one that is highly differentiated.

Piaget argued that many of the schemas that constitute the understanding of young children evince a lack of equilibration as when, for example, a six-year-old overaccommodates to one aspect of an experience and says to his mother, “see, now I can run faster” because the new pair of shoes he is wearing shows a higher



number on the soles (i.e., a larger size) than those he had on when he entered the shop. In other words, a Piagetian schema is a self-producing transformational system whose continuity over time rests precisely in this dynamic of assimilation and accommodation through which it continues to differentiate itself—more or less radically, more or less subtly—as a function of living.

Piaget's driving interest was to understand how the *necessity* that seems to be given in our categories of time, number, space, and so on could be the outcome of a process of cognitive constitution over time, rather than a given function of mind as Kant had argued. He did a brilliant job of demonstrating that people have to *constitute* their ideas of the world. Piaget's universal model of developmental stages has long been discredited and we have superb studies that show abilities in newborn babies that would have astounded him—more of which below. This said, certain of Piaget's fundamental ideas remain extraordinarily useful: (1) the idea of the scheme as a self-regulating transformational system, (2) the constitution of the scheme over time as a matter of differentiation through functioning, (3) the inevitability of this process and the necessity that is its outcome.

That babies are born with abilities Piaget saw as emerging much later does not, in itself, discredit his approach; rather it makes development inside the womb and out a faster and more complex process than we had previously been able to recognize. Moreover, Maurice Merleau-Ponty's view that "the body is our general medium for having a world" ([1945] 1962: 146) accords both with Piaget's insistence on sensorimotor or practical intelligence as the foundation for the development of logical categories, and with the much later enactive approach of Evan Thompson (2007) and Michael Tomasello's (2003) work on language. And when intersubjectivity is incorporated into autopoiesis it is easy enough to show that literally all our ideas and practices are historically constituted—more of this below.

It makes sense to us to distinguish a grasping schema from, say, a schema that subtends differential recognition of voices or faces, but an understanding of human ontogeny also requires that we realize that the differentiation of any one schema entails complementary differentiation in others, for example in the schema that gives the sense of our whole person. At any point in the lived history that is evinced in any given human ontogeny in any of its multiple dimensions, the state of the whole informs (it does not determine) the state of the parts. To take a simple example, the neonate who grasps mother's finger is in the self-same process sensing herself as, for example, lying on her back waving her legs about even while looking at mother's face and hearing her laugh. One may suppose that the schema that gives us a sense of our whole person has already, over the course of the neonate's final few months in the womb, become differentiated in such a way as to constitute what are apparently separate schemas for proprioception, facial recognition, and the sound of laughter. I draw the reader's attention here to development in the womb because contemporary research is beginning to show us how very possible it is that the development of schemas that subtend, for example, the various modalities of perception is occurring in utero.

Sensory systems are strongly linked in the fetus and the neonate, such that alterations in sensory stimulation presented to one sense can result in changes in responsiveness not only in that modality but also in other

sensory systems as well. We also know that detection of amodal stimulus properties, such as synchrony, intensity, tempo, and rhythm, is promoted by redundancy across sensory modalities and is involved in the emergence of normal patterns of perceptual organization. (Lickliter 2011: 15)

Descola rightly observes that the capacities of neonates are considerable. We know that newborn babies prefer face-like stimuli to other attractive visual stimuli, that they can discriminate and imitate certain facial gestures of others, show categorical perception of speech sounds, discriminate between curved and straight geometrical shapes, discriminate linguistic input from other auditory inputs, and at four days have learned enough to differentiate their native language from others. At three months they show surprise if two solid objects seem to occupy the same space; at four months they show surprise if a solid object seems to have passed through a solid surface; at this age they also show complex cross-modal perception—matching speech sounds to lip movements on the faces that produce them. At six months infants show talker normalization—recognizing as equivalent different speech sounds from different talkers; they are also able to make intermodal matches in numerosity between sounds and sights (all these examples are drawn from Elman et al. 1996). “By six months, infants follow people’s gaze and attend to objects on which people have acted. By nine months, infants reproduce other people’s actions on objects, and they communicate about objects with gestures such as pointing” (Spelke 1999). In other words, sensory development in utero provides for the constitution of schemas that are already being differentiated through functioning before birth—for example, a scan may reveal the fetus at one time to have its thumb in its mouth and at another to have its hands holding the umbilical cord. It is worth noting here, in passing, that because they are self-regulating systems and thus relatively autonomous, and because they develop as a function of self-differentiation, the schemas available to the neonate are going to look like what many cognitivists characterize as “prewired modules.”

What we now know of sensory development and the capacities of neonates and young infants, suggests not only that before birth the child’s experience is structured by the rhythms and practices of the mother’s quotidian existence but also that what cognitive psychologists take to be universal schemas are bound to be differentiated in use over time as a function of the intersubjective relations in which they are engaged.

The prenatal environment provides the fetus a variety of tactile, vestibular, chemical, and auditory sensory information. . . . Although little research has directly focused on this issue, the human fetus likely experiences a great deal of integrated multimodal stimulation across the auditory, vestibular, and tactile senses in utero. For example, when the mother walks, the sounds of her footsteps can be coordinated with tactile feedback as the fetus experiences changing pressure corresponding with the temporal patterning and shifting intensity of her movements, as well as accompanying and coordinated vestibular changes. In addition, the mother’s speech sounds, laughter, heart beat, or sounds of breathing may create tactile stimulation that shares the temporal patterning of the sounds as a result of changes in the musculature involved in producing the sounds. (Lickliter 2011: 7)



From an anthropological point of view, it is obvious that the pregnant woman's quotidian existence is itself structured as a function of the lived history of her own intersubjective relations with others in an historically structured environing world, such that even before the child's birth the mother's own history is contributing to constitute the conditions under which the child is coming into being as the autonomous product of its own autopoiesis. Once out of the womb, historically constituted forms of intersubjectivity structure the conditions in which the child continues to constitute all its ideas of self and world.

Mental representation?

The autopoietic schema is very different from the schema-as-mental-representation, which, incorporated into neural network "connectionist" models of psychological functioning, figures in the work of the various cognitive anthropologists to whom Descola refers. Connectionist models of mind attempt to make computational theory consistent with what we know of the workings of the human brain; they employ an idea of parallel distributed processing that allows for a cognitive scheme that is always emergent, never quite fixed, and thus provide for a model of how cognitive processes respond to their own environment and are modified by it. Nevertheless, as representation and as a component of the more complexly configured "cultural model," the schema that figures in works by Holland and Quinn, D'Andrade and Shore (to take several well-known examples) is peculiarly static. Shore's attempt to distinguish between "conventional models" and "personal models" manifests neatly the problem with the schema-as-representation idea of mental processes. Because the schemas that compose cultural models are conceived of as mirroring mental representations of the world inside the human head, Shore's "cultural model" cannot intrinsically allow for the fact that in so far as we understand and embrace what is conventional, we do so as particular persons with particular histories. From which it follows that for any one of us the conventional and the personal are bound to be aspects of one another (an artifact of the self-same process) and that continuity over time is likewise an aspect of transformation.

Descola's idea of the scheme inevitably carries with it the problems that render unworkable the scheme-as-mental-representation-embedded-in-a-connectionist model. Because all these models of the scheme rest on fundamental distinctions between nature and culture, individual and society, they produce further distinctions such as that between possible universal "attributive schemas" (universal because they evince themselves in the behavior of neonates and children up to the age of three or so) and "those that stem from a particular acquired cultural experience or the vagaries of an individual's history" (2013: 102) the former of which are otherwise called "collective schemas . . . the principal means of constructing shared cultural meanings" (103.) The burden of my discussion above, however, is that any given personal history is the artifact of the intersubjective relations in whose terms the person differentiates him or her self—what we have in common evinces itself uniquely in each one of us (as it were idiosyncratically) and because intersubjectivity is historically constituted, so are ideas of self and other, personhood and collectivity, interiority and exteriority, and so on. Ideas and practices are

not transmitted; rather they are constituted over time by particular persons in a process that at once maintains and transforms them. Likewise, so-called attributive schemas continue over time to self-differentiate such that, for example, the schema that subtends counting comes to be elaborated in terms entailed by distinctive cosmologies (cf. Mimica's [1988] analysis of Iqwaye counting and the survey by Read 2011.) In other words, "attributive schemas" too are historically constituted as a function of the social relations that engage them in a world that is likewise always an artifact of history in all its material and immaterial forms. As Descola's book shows so well, we can only know the world as a function of our own history.

In Descola's account of the schema, however, the attributive schemas that give rise to possibly universal expectations concerning human action, expectations concerning the mode of being of physical objects, and expectations concerning the intrinsic nature of nonhuman organisms, are from the outset distinguished from the acquired collective schemas. This is important because the distinction being made here between innate and acquired, carries in its train the cognitivist assumption that only a subset of cognitive structures are properly characterized as "social." Thus the acquired collective schemas are defined as "psychic, sensorimotor and emotional dispositions that are internalized thanks to experience acquired in a given social environment" (Descola 2013: 103). These collective schemas may manifest themselves either as explainable vernacular models or be nonreflective and thus "more or less resistant to objectivization" (104). The nonreflective schemas can be further subdivided into integrating schemas that are "highly thematic and can be adapted to a wide variety of situations," and specialized schemas that are activated only in very particular circumstances; different kinds of habitus are examples of specialized schemas. The integrating schemas are much more complex.

They may be defined as cognitive structures that generate inferences that are endowed with a high degree of abstraction, that are distributed in regular fashion within collectivities of variable dimensions, and that ensure compatibility between different specialized schemas, at the same time making it possible to generate new ones by induction. . . . Over and above these many particular capabilities that are immanent in practices [i.e., the specialized schemas], human beings also resort to a much more limited number of more general integrating schemas in order to structure their relations with the world. (Descola 2013: 104–5, 110)

The continuity over time of any of these schemas—whether specialized or integrating—depends on their being transmitted from one generation to the next by socialization and acculturation, ideas that, like Descola's characterization of the scheme, depend on distinctions between individual and society, nature and culture, speech and language. It should be noted here that Descola takes his scheme to be transformational, much in the same sense that Bourdieu characterized the habitus, (it is a structured structure predisposed to act as a structuring structure) but because it is not autopoietic it is not inherently transformational and its continuity through time depends on its being "transmitted" more or less unchanged from one generation to the next in a process of social-cum-cultural construction.



[Integrating schemas] are constructed little by little, all with identical characteristics, given that the individuals of a group all pass through comparable experiences. This is a process facilitated by a common language and the relative uniformity of the ways in which children are socialized within any given group. (Descola 2013: 105)

Descola does not use the terms social or cultural construction as he is well-aware that they resuscitate the nature/culture distinction. Transmission, socialization and acculturation, however, appear throughout the text—inevitably so, given his characterization of the scheme.

Intersubjectivity is intrinsic to human autopoiesis

So what to do? From my point of view, this issue is simple once we understand that literally everything about humans is a product of history as lived. Every aspect of my being as a particular person, from my genes to my physiological characteristics, to everything I do and say, to every thought I have had and will have, is the artifact of the transforming history that goes on and on making me who I am. I am a product of a long, long history of social relations that continues to transform me over time from birth to death. I manifest that history in all my physiological characteristics and in everything I do and say and think. My continuity through time is that of a *self-regulating transformational system*—everything about me transforms over time but it does so as a function of an autonomous self-regulating system that has sociality at its core. Autopoiesis as self-creation or self-regulation is not to be confused with choice, freewill, and agency. We do not make ourselves at will. We humans cannot be human outside relations with others who inform who we are and we inhere along with those others in a historically constituted enviroing world. Intersubjectivity is an historical process that provides at once for continuity and change, such that we humans transform the conditions of our existence even as we live them. Once we understand history as lived, it becomes clear not only that we have no need of nature or culture as analytical categories but also that they get in the way of our understanding of people who do not make use of them.

I have long argued that the challenge for the human scientist—for the anthropologist in particular—is to demonstrate the historical processes that continue, over time, to give rise to the ontologies and entailed epistemologies that at once unite and differentiate us humans through time and across regions of the world (see Toren 1999). Wherever anthropological work is undertaken—whether “at home” or in some distant country—the ethnographer’s task is to render analytical the categories of the people with whom he or she works; this is not a matter of interpretation but rather of showing how they come to be taken for granted and thus to have a purchase on the world as lived, such that the world confirms them as real, given in the nature of things. One of the most obvious ways of doing this is to do ethnographic studies of ontogeny. Systematic research with children enables the anthropologist to uncover the knowledge processes that are giving rise to the concepts adults use to describe themselves and the world. But this kind of research is revealing only to the extent that it bears on adults of all ages as well as children of

all ages. What you find out from observing babies and talking to five-year-olds (for example) is not going to be what you find out from observing and talking to older children, teenagers, adults, the middle-aged, and old people. This said, the inclusion of children in a study can give the ethnographer privileged access to material he or she could not obtain by any other means (see Toren 1990 for an extended example, also Toren 2009). Children have to make sense of conditions in the world created by adults and if, as an anthropologist, you can find out what sort of sense they're making and how they are doing so, then you can actually demonstrate not only the process that constitutes people's lived realities, but their historical necessity.

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