Bridges to history: biomechanical constraints in language

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Learning to talk

What Wittgenstein calls (1958, S: 242) 'agreement in judgements' are necessary to learning to talk. By coming to act consistently with such agreements, babies develop biomechanical constraints necessary to encultured life. Although grooming (e.g. Hinde, 1983; Dunbar, 1993) shows many primates consistently assess status, kinship, what it is allowed and so on, they do so independently of *local* behavioural dispositions or 'habitus' (Bourdieu, 1971; 1991). Human perceptual ecology, by contrast, is irreducibly historical. As infants get caught up in a matrix of conduct, by the fourth month, they begin to participate in culturally appropriate activity. Using primate biology, they find themselves adapting to historically-derived practices. Below, I argue that these capacities for consistent behaviour enable babies to enter history. As Wittgenstein stressed (ibid.), there is something distinctly odd about capacities that enable us to reach agreement about *what it is* that is judged.

To show how we enter history, I focus on a 14 week old who does *what her mother wants.* In so doing, I take an inclusive view of culture that brings out how 'meaningful' behavioural patterns permeate the child. To act as the mother wants, I argue *is* a culturally-based judgement. Since it defies classic nativist or empiricist explanation, I advocate a 'distributed' view. This enables me to stress that phylogenetic and ontogenetic history allows the infant to exploit two brains. At three months, 'dual control' provides babies and caregivers with a new way of contextualizing. Thanks to something like the motivational/ affective systems posited by Trevarthen and colleagues (e.g. Trevarthen, 1979; 1998; Trevarthen et al., 1999), infants are prompted, at times, to act appropriately. Biomechanical constraints thus develop in their interests and allow them to meet and, later, anticipate social expectations. Finally, I suggest that required motivational/affective systems derive from selection pressures on an infant–in-a-niche (Laland et al., 2000). Their primate equivalents may have changed as, in pre-historical time, caregiver activity became a *cognitive* resource. Today, the systems ensure new-borns act as if knowing that social life was shaped around talk. By 14 weeks, social biases and associative learning allow behaviour consistent with historically-based judgements. As culture is implanted, infants learn to contextualize, and by the end of the first year act in ways that can be analysed in terms of sounds, acts and goals. For Western adults, they speak 'first words'.

The social life of babies

Behaviourism, genetic epistemology, information-processing and activity theory all examine how babies learn. The theories, however, downplay early social life. Rather than ask how culture permeates babies, they are presented as coming to know and/or learning about 'the world'.

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Appeal is made to Vygotsky's (1978) 'lower' cognitive functions or abstract concepts like object, stimulus, response, learning, accommodation, assimilation etc. It is hastily assumed that conditioning and/or inference-making limits development to processes *within* the organism. Unfortunately, this downplays social learning, active perception and specific biases (Karmiloff-Smith, 1993; Mehler and Dupoux, 1997; Rochat, 2001). Further, as Thelen and Smith (1993) observe, the view throws little light on what develops or how changes arise. Indeed, if cognition is exclusively within the skull it is hard to account for how babies adapt to individual persons. As Rochat (2000) stresses, we fail to ask *why* change occurs.

While developmental psychology and linguistics make little of social adjustments, work by Spitz (1965) and Bowlby (1969) generated a major research tradition. Today, all agree that, by the third month, social events dominate infant life (see, Schaffer, 1978; Bullowa, 1979; Kaye, 1982; Bråten, 1998; Nadel & Butterworth, 1999). Together with caregivers, baby bodies and voices enact and evoke practical understanding. Since events can be *explained* (by lay persons), they have affective and cultural content (e.g. Bateson, 1979; Trevarthen, 1988; Cowley, in press). Social development leads human babies into varied cultural worlds. Further, given neural selection (e.g. Johnson, 1997; Edelman, 2000), sound and movement sculpt infant brains (Deacon, 1997). Early development, then, exploits behavioural content that, in some way, arises as activity is orchestrated between baby and caregiver. Utterance-activity, or 'language in movement' (Piaget, 1962) plays a major role in infant life.

Experience and experiencing social behaviour

In a human world, interaction exploits culture, bodies and persons. An infant soon begins to use affective and cultural content in her own interests. Using prepared learning (Wilson, 2000) she sets off predictable activity that relies on biases like those allowing newborns to mimic tongue protrusion and mouth opening (Melzoff & Moore, 1997 Kugiumatzakis, 1999). At first, social behaviour lacks cultural content. As Rochat (2000) notes, the newborn deals with events at its body's boundaries. Then, around the sixth week, there comes a change 'almost as great as birth itself' (Stern, 1977). In the West, infants become able to have fun. In the ensuing 'intersubjectivity' (Trevarthen, 1979), like boxers or dancers, babies and caregivers co-ordinate their doings with joy and finesse. As with other kinds of dialogical activity, they become able to initiate and respond (e.g. Linell, 1990) or to act both retrospectively and prospectively. Recently, it has been suggested that this body-world activity is primate imitation or mimesis (see, Donald, 1991) that goes a long way to making us human (e.g., Bråten, 1998; Nadel & Butterworth, 1999).

In this paper I show how interpersonal dynamics draw on phylogenesis and ontogenesis to produce cultural conduct. Co-evolutionary processes allow babies to use two brains in fitting activity to encultured patterns in the world. Joint behaviour exploits affect-seeking bodies to link neural processes between persons in ways 'explained' by what we say, feel and do. Not only does behaviour link babies to cultural content but this also occurs publicly. When a mother wants a baby to smile, we see what she wants. Similarly, if seeking a baby's attention, the activity persists until she gets it, gives up, or elicits it directly (e.g. by chucking the baby's chin). Simply, as the baby adapts to caregiver judgements, cultural content shapes her use of adult acts, goals and sounds. From birth, interaction exploits affective and cultural events as a baby is persuaded to smile or, as described below, to hold her tongue. While encultured, the behaviour arises from meshing an adult's display with a baby's motorcentric activity. Intrinsic as it is to what the dyad does together, it is irreducible to *kinds* of act[2]. Utterance-activity exploits affect to ensure that the baby's doings are channeled by cultural expectations. Early social life is multimodal activity that forges joint experience. Further, given contrasting interests, different motives and capacities ensure that the behaviour becomes more orchestrated over time. Joint action locks the infant's doings to caregiver beliefs and, as this happens, events adjust to local ways of explaining. What an infant does adapts to what precedes, accompanies and follows. As joint activity gains coherency (see, Cowley and Spurrett, 2003), the infant enters history.

Early motorcentric activity is mainly biological. Drawing on much shared across phyla the child makes cultural use of patterns heard by species as different as humans, chinchillas and cotton tailed tamarins (Kuhl & Miller, 1978; Ramus et al., 2000.). While using perceptual biases that prepare us for learning and/or action, the cultural setting shapes how these function. Sensitivity to rhythmic patterns thus reflects, not linguistic categories, but how primate hearing serves history-prone individuals. By analogy, we can ask how social life affects non-human vocalization. It seems, for example, that prepared learning underpins vervet ability to issue alarm calls (Cheyney and Seyfarth, 1990). Like humans, juvenile vervets use circumstances to adapt to norms: ABC learning[3] allows activity to be gradually shaped by social controls. The synergy of cowbird song-learning is even more human-like in drawing on instants of dual control (West & King, 1996). Specifically, silent females assess the song of juvenile males by providing reinforcing 'wing flaps'. These mark passages that males remember and use in mature courtship. Interestingly, such bursts of song are most likely to elicit copulation (ibid) only in an 'appropriate' geographical area. In vervets, cowbirds and humans, vocalization develops, in part, through dual control. Using ABC learning, it develops through the influence of circumstances and companions as well as within-organism mechanisms. Synergy enables vervets to learn alarm calls, cowbirds to make up sexy songs and, babies to discover appropriate conduct. Infants connect with history as social learning guides them into culture.

In primates, perceptual biases guide infants to act in line with norms and circumstances. Humans, however, use encultured behaviour which, drawing on history, is irreducible to species specific biases. Rather than appeal to innate representations, therefore, I use Hutchins (1995), Clark (1997), Hurley (1998) and Rowlands (1999) to treat cognition as distributed. Bringing out how infants use vocal and visible patterns, I ask how babies come to enact agreement about *what is judged*. Oddly, I find, infants use experience to act in ways that can be 'explained' by acts, goals and sounds. Although a newborn's first days are outside history, babies of 6+ weeks participate in intersubjective behaviour that shows precisely this kind of understanding. Clarifying, I show how biomechanical constraints develop through an epigenetic process that gradually tunes affective and intentional activity.[4] Thanks to biases for affective and cultural content, a baby adopts consistent behavior that manifests the appropriate forms of agreement.

Cultural mediation

Before examining how shared behaviour arises, I distinguish exclusive and inclusive uses of 'culture'. On the one hand, many appeal to mechanisms that, by definition, allow culture to be

[2] While many take human life (and talk) to be grounded in *acts*, with Hendriks-Jansen (1996), it is possible that, far from being the basis of our life, 'act' is a concept based on *analysis* of body-world activity.

[3] The term 'ABC learning' is used by Karmiloff-Smith (1993) and Dennett (1995) to capture the within-organism-learning that uses neural networks sebsitive to classical or operant conditioning. Other kinds of learning also occur.

[4] In short, development incorporates both maturational and 'external' factors; it is not epigenetic in a strict biological sense (for discussion, see Hendriks-Jansen (1996).

replicated across generations. This exclusive approach is found in the work of, say Dawkins (1986), Dennett (1995) as well as in Tomasello's (1999) theory of how infants allegedly attend to the intentions of others. Placing culture outside the body, meme-influenced views effectively identify it with systems, practices, artefacts and symbols.

Culture can be also applied in an inclusive sense. Boyd and Richerson (1996), for example, define it as "information or behaviour acquired from conspecifics through some form of social learning". It thus concerns both external entities and, crucially, behavioural and informational conduct. Culture is a set of patterns and frequencies that spread in time and space. In humans, of course, these can also be *explained*. Thus appeal to mechanisms must account for the dispositions that Bourdieu (1971) calls habitus and which, as Lizardo (MS) shows, ensure that social activity is jointly constituted by culture and cognition. Such a view is developed in Hutchins' (1995) work on navigation in a US navy ship and Micronesian boats.[5] Defining where a vessel is relies on external design and instruments as well as, say, discipline, ways of speaking, and how individuals map talk to world. Related inclusive views are used to examine non-human culture. Rendell and Whitehead (2001), for example, document how whales and dolphins learn cultural behaviour patterns. For example, some Brazilian dolphins have worked symbiotically with humans for over 100 years. The forefathers of today's fishermen established a tradition of sharing the catch in return for the dolphins' ancestors help in trawling.

Stressing variability of joint experience, inclusive approaches highlight culturally-based understanding. Rather than a language instinct (Pinker, 1994), symbolic reference (Deacon, 1997) or socio-cognitive adaptations (Tomasello, 1999) weight falls on empirical study of how individuals act culturally. We ask how they come to exploit a matrix for consistent action that, once formed, allows activity to be perceived round goals, sounds, acts and structures. Since these are defined by social function, social judgements can begin with behavioural consistency. Where picking up wants or beliefs, to act consistently is thus to move to the edge of history. Since culture derives from (or is) behaviour, what matters is how infants become sensitive to what *counts as* significant. With Piaget (1952), Donald (1991) and others, entry to a historically-based world is based on motorcentric activity.

What Nokhukanya shows us

The inclusive view of culture allows us to examine how an infant's doings come to be mediated by historically based events. As often occurs in mammals, this depends on how an individual adjusts to social activity. However, given primate biases, such adjustment leads a child to experiencing others as encultured. Further, for historical reasons, each social group is likely to have slightly different entry points to cultural life. Below, this is illustrated by activity in a single child-caregiver dyad. Using an example from recordings of 14 week- South African infants (see, Cowley, in press)[6], emphasis is given to how caregivers, infants and culture conspire to put development on locally appropriate developmental pathways. In the sample of Indian, White and Zulu dyads, encultured activity occurs first in the isiZulu speaking group.

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[5] For Hutchins (1995) "Culture is not any collection of things, either tangible or abstract. Rather it is a process. It is a human cognitive process that takes place both inside and outside the minds of people. It is the process in which our everyday cultural practices are enacted. I am proposing an integrated view of human cognition in which a major component of culture is a cognitive process…and cognition is a cultural process." (p. 354).

[6] By using this example I aim to give readers access to close analysis. In the current context, I include a transcription/description of the events in appendix A.

Not only do infants everywhere get upset but, as the behaviour derives from biology, it can be identified even by outsiders. There are, moreover, many differences in how adults deal with distress. In the sample, Indian and White South Africans tend either to fuss over the child or soothe it (e.g. by rocking the baby) while their Zulu counterparts are more likely to control 'from a distance'. Avoiding touch, jiggling and blowing on the body, infants are more often (and earlier) encouraged to *thula*, or fall silent, by means of purely vocal and visible movements. If successful, the events become joint activity (henceforth, TH-activity) during which a caregiver silences the baby. The frames below show Florence getting the 14 week old Nokhukanya to be quiet. They illustrate the baby's ability to enact *her mother's want*.[7]

Images Nokhu_1, Nokhu_2, Nokhu_3 about here

In the first frame, Florence's singing evokes or parallels the infant's incipient crying. Immediately, she responds and makes Nokhukanya party to dramatic Zulu hand waving together with vocalization of, among other things, 'njega, njega, njega'. In the second frame, the silent baby is rewarded with a beam of approval. Immediately, there follows ritual ticking off (using an index finger to prod in the direction of the child) and a warning about the father's arrival. In the third frame, nine seconds after the first, as Nokhukanya re-orients to intersubjective contact this is acknowledged by her mother's full-bodied expression.

Nokhukanya falls silent. Rather than react to movements *qua* movements (TH-movements) the baby's behaviour (henceforth S-behaviour) enacts understanding. Since a sceptic may deem the account 'subjective', I stress that while the events can be formulated many ways, the baby indisputably has a practical grasp of what her mother wants. Four sets of reasons back this ascription. First, it is consistent with what is usually required of a distressed baby. Second, among other things, Florence says no, no, no (njega, njega, njega). Third, those familiar with Zulu life see the want in hand-movements and facial expressions. Fourth, the ascription is supported by subsequent events: when Nokhukanya does fall silent, Florence rewards her with a smile and reinforces her actions with (what adults hear and see as) ritualised threats. Thus, all who view the video agree that, as Florence wants silence, Nokhukanya's behaviour is *appropriate*. What must be clarified, then, is how baby behaviour achieves this coherency, or comes to adopt an encultured ways of going on. Somehow, locking on to caregiver expectations, she fits behaviour to a historically derived pattern. Her body enacts a judgement about what, in the circumstances, her mother wants.

Neither language nor universal signalling explain what happens. First, no-one thinks a 14 week old baby understands words. Second, if babies heard 'what was said' in [njega] the pattern would be in general use. In fact, outside the Zulu sample, touch is (almost) always used to silence 14 week olds. Verbal interpretation, then, does not explain Nokhukanya's behaviour. Nor, it seems, does the baby use universal non-verbal signals. Even if some of the activity might fit such an analysis (perhaps, aspects of voice quality and/or some pitch contours), the events are unmistakably Zulu. As clarified below, Nokhukanya's silence results from hand-waving *and* vocalization. Further, if TH-movements were conventionalised, their nature would be explicitly

[7] Hauser, Chomsky and Fitch (2002) suggest that other primates are unable to produce behaviour that is "intentional in the sense of taking into account what others believe or want". It is striking that, because of the cultural environment, 14 week old Nokhukanya does this without any 'inner' understanding.

known. Yet, when asked, members of the group give no such explanation.[8] Further, in the recording, the mother obtains silence in similar- not identical- ways 3 times in five minutes. Nokhukanya's S-behaviour is not set off by a determinate stimulus. Rather, the child participates in joint activity by meeting full-bodied Zulu TH-movements with silence. Finally, this view fits what happens in groups where silence is invoked by other modes of contact (i.e. touching and shaking). Although Nokhukanya uses encultured patterns, her brain-body system certainly uses resources that have been used in dealing with earlier (non-cultural) incidents.

Nokhukanya's 'act' is motivated. She uses social learning about encultured activity that is *meant* to invoke silence.[9] She exploits maturation, her current affective state, her mother's movements and the Zulu setting. Nokhukanya's entry into history arises as S-behaviour meshes with TH-movements. Using dual control and another body, she acts in line with how her mother's behaviour is meant to be judged.

Cognitive internalism versus distributed cognition

Nokhukanya's intersubjective behaviour shows 'aboutness' as it fits what her mother's body represents. Since this is inexplicable from both classic nativist and empiricist viewpoints, I stress that, in a lay sense, Nokhukanya 'understands' when to *thula*. Using principles like those allowing male cowbirds to learn song that enhances reproductive success, I suggest that both parties exploit previous encounters in learning to orchestrate what they do. The baby uses synergy for which its brain-body systems are prepared. Biology and culture conspire to ensure that utterance-activity falls under dual control.

Synergy allows external features of the world to shape cognitive processes. Events mesh with sub-personal systems that, in real-time, sustain behaviour. For Nokhukanya's activity to loop with her mother's, she must use cognitive powers from outside her body. What I have elsewhere called 'cognitive internalism' (Cowley & Spurrett, 2002; Cowley, in press)[10] is thus an inappropriate for understanding the events. They can be explained by neither representational nativism nor general learning.

The case against general learning is simple. Where learning is justified by stimulus-response or accommodation-assimilation, complex behaviour is not posited in the 14th week. Especially in relation to a cultural event, the general learning theorist struggles with the following.

- What happens uses, not a movement, but a want manifest as encultured activity.
- Since infants from other groups do not learn to *thula*, the behaviour is culturally specific.
- Since the 'meanings' are complementary, the event cannot be explained by imitation.
- What Nokhukanya does is neither automatic nor mediated by a specifiable emotion.
- Nokhukanya's activity is 'strategic' and 'motivated'.

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[8] An elaborate explanation is that hands are used to silence the child because their movements are a stand-in for physical punishment. However, not only does this seem post-hoc but, in this instance, it plainly does not apply.

[9] Elsewhere, this is called an 'indexical' function (Cowley et al. in press; Spurrett and Cowley, in press). This is justified because triggering behaviour correlates with a *culturally* defined similarity class. Here, I avoid the term, first, because it invites exclusion of the iconic and the symbolic and, second, because the events of, say, early tongue protrusion are already indexical (they use (noncultural) similarity classes).

[10] It is beyond dispute that much behaviour has a biological basis. In referring to 'classic' nativism, I refer to the representational views of, above all, Fodor (1983). Arguments along similar lines are found in, say, Karmillof-Smith (1993), Thelen and Smith (1993) and Elman et al. (1996).

As Nokhukanya reacts to a *want*, what is perceived is holistic and irreducible to a single signal. Even though the baby falls silent without training, no bottom up account can explain what she has learned. This is a starker version of Quine's puzzle (1960) of how 'gavagai' can be heard to identify rabbit. It appears intractable because, far from performing similar perceptual actions an animated Florence induces Nokhukanya to freeze. How, then, can a 14 week old act as if it knows what to do? Indeed, given the behavioural contrast, her knowledge can be based in neither imitation, mimesis, or, as Sroufe (1996) shows, 'fear'. Further, to the embarrassment of the general learning theorist, TH-activity makes strategic sense. While natural selection is likely to favour juveniles who can be 'motivated' to fall silent, no such explanation is sufficient to explain what Nokhukanya does. While using sub-personal systems, her S-behaviour is plainly also set off by historically shaped events. Even if what she does is based in biology, general learning cannot explain what happens.

Classic nativist views are immune to empirically-based refutation. As Matthews (1993) argues, such theories appeal to faith by presenting behaviour around epistemic problems that can only be solved by hypothetical-deductive methods. To challenge classic nativism, then, I deny that, to *thula* appropriately, the baby needs representations. Indeed, any such view is bound to adopt proposals along the following lines:

- She knows what makes a TH-movement a TH-movement
- She knows (at least one) 'function' of TH-movement is encoding an I-WANT-SILENCE representation.
- She knows principles or rules for applying I-WANT-SILENCE representations to a SELF-representation
- She knows how to use SELF-representation to generate an S-representation (i.e. one that triggers S-behaviour).
- She knows how to use an S-representation so that, within 9 seconds, she can produce the relevant S-behaviour.

None of this is plausible. First, it is unlikely that a 14 week-old *represents* TH-movement, I-WANT-SILENCE, SELF and S-behaviour. Second, there is no reason to believe that the child must know abstract principles or rules. Third, even if I-WANT-SILENCE, SELF and S-behaviour representations were 'innate', this cannot apply to the (typically Zulu) TH-movement. Either this is selected from innate alternatives or, perhaps, learned. Further, unless we say what *exactly* might be innate, we are floored, once again, by the general learning problem. The TH-movement is more likely to be a TH-movement, then, because of social function: it functions (with variations) because someone '*wants* silence'. Are we then to posit a universal baby who is born with a complete set of representations for invoking silence? That is unlikely. Further, even if a formula for identifying TH-movements is found, an explanation will be needed for how this evokes I-WANT-SILENCE while feeding output to SELF. Finally, the problem also applies to whatever causes S-representations to produce output that produces S-behaviour.

The classic nativist assumes that babies process representations and thus rely on ways of relabelling events. In presenting a deflationary alternative, however, we must not undermine the insight that babies come to act autonomously. What must be clarified is how a child can act consistently with calls for silence (howsoever made).[11] We must explain how what sets off S-

[11] From a robotics point of view the problem can be solved by crude sensors and simple programming. It is analogous, for example, to systems that get Robovie (Ishiguro et al. 2001) to pick up and respond to a human's pointing. The machine needs neither a central processor (a SELF representation) nor any knowledge of its own S-behaviour routine.

behaviour can be *activity* that demands silence. Somehow, without knowing, Nokhukanya comes to act with coherency in response to certain social moves. To proceed, rather than ask what is in-the-system, we can look at how learning and experience exploit bodies in the world (see also Clark, 1997; 2001; Rowlands, 1999; Spurrett, in press; Cowley, in press). We can challenge what Hurley (1999) calls the Input-Output view of mind.

The distributed perspective

Instead of identifying the mental with brain processing, cognition may spread across brain, body and world. Reliance on 'internal' representations may be complemented (or replaced) by brain-body systems that learn, in part, from physical events. Even ABC learning can be directly shaped by what Dewey (1896) called 'circular' co-ordination**.** In more recent terms, brains can use dynamic patterns whose properties impact on neural and bodily activity. On this view, the child couples with the caregiver's doings as, in real-time, each pursues sub-personally driven interests. The baby learns that, all things being equal, it is positive to connect S-behaviour with (so-called) TH-movement. In place of internal processing and learned habits, coherency arises because TH-activity is of strategic value for both parties. Far from lying at the end of a causal chain, the baby's action contributes to a circuit of 'scattered causes' (Clark, 2001). Nokhukanya recognizes prospective behaviour on the basis of previous experience and, in the circumstances, this sets off retrospective action. Using perceptual biases and ABC learning, affectively-driven activity thus takes on coherency. To come further in understanding the events, therefore, we must posit that the baby uses underlying motivating/ affective sub-systems.

The nativist is correct that the infant draws on natural selection. However, rather than appeal to invariant representations, she may rely on affect seeking activity. Provided that we avoid the assumption that psychological terms name mental objects,[12] we can see affective systems as the basis for Nokhukanya's growing behavioural consistency. Thanks to learning, she allows another's 'want' to evoke a form of dual control favoured in the environment. Using prepared learning and biases shaped by experience, this enables the want to be felt by both parties. Looping with her motivational systems, the baby is prompted to 'go on' as she does. Her falling silent couples with the mother's wanting activity. In integrational terms, using past experience, she contextualizes the want to affect future experience.

Joint activity gains coherency through action that relies on ABC learning as well as in-built biases and social retrospection. In the short-term, the coherency of the activity elicits reinforcement. The child's doings evoke, first, her mother's broad smile and, then, ticking off. Given its appropriacy, dual control gives the caregiver a new capacity to influence her babys' affective/ motivational systems. Understanding the want makes Florence *feel* that the baby grasps what she means. In the mid term, then, she may well change how she reacts to the infant's *not* falling silent. Thanks to the temporal embedding of human action, the infant's contextualizing will shape her judgements. Just as TH-activity affects responding, in other words, Florence gradually becomes inclined to invoke silence by waving and vocalizing. Conversely, using ABC learning, Nokhukanya may learn to react to stereotyped expressions of the want. Consistently with Harris's (1996) principle of co-temporality (what has happened impinges on this, now) utterance-activity comes to be shaped by biomechanical constraints. This happens, moreover,

[12] This position is taken both by eliminativists (see, Churchland, 1996), Dennett (1987; 1991) and Harris (1981; 1995). Fodor, (1983) assumes that 'real' intentional states and linguistic forms embody, say, wants and verbs.

both in microtime and the slow domain of verbal thinking. Dual control loops utterance-activity with sub-personal systems that control social behaviour.

The dynamics of utterance-activity are themselves motivating content. Nokhukanya's affect influences her mother's neural systems which, in turn, exert joint control over what happens. The baby's directs attention at –and picks up on—what *counts as* TH-behaviour. By participating in the event, she enacts what it is that is judged. At 14 weeks, Nokhukanya is learning, literally, to assess and manage her mother. Without inner understanding, she is establishing new ways of contextualizing. Before asking how, biologically, this is possible, I must clarify how each influences the other's contextualizing.

Distributed contextualizing

Contextualizing occurs where, in the circumstances, an individual uses experience to act in ways that affect its future. While even insects contextualize, social vertebrates use synergy to ensure that contextualizing shapes both their doings and those of others. In mastering alarm-calls, vervets use social learning that brings experience of different circumstances into contact with what they do. In cowbirds, sexy songs use both circumstances and an individual's salient wing-flapping experience. Apparently, Nokhukanya draws on circumstances and affective markers to *align* her behaviour to cultural expectations. Far from using TH-movements as a stimulus, she produces a real-time judgement. By acting as she does when she does she *does* what underpins agreement in judgement. In other terms, she accommodates to what her mother seeks to achieve. Thanks to sub-personal systems, the baby exerts control over activity: in the circumstances, she *acts* to let the want prevail.

Human dual control is managed in real-time. While like cowbirds in drawing on past experience and circumstances, Nokhukanya also relies on meshing what she does with concurrent events. Specifically, in a brief time-interval, she detects movement, identifies a pattern and, immediately, adjusts her doings. While Florence does not control the baby, her movements are allowed to orchestrate events. Exploiting affect, the dyad also depends on shared social biases, ABC learning, and internal processes. Nokhukanya exploits the sound and movement to fit the cultural pattern because, in real-time, she draws on experience. Both parties, then, rely on fast-working sub-personal systems that produce coherency. This is possible because of how each uses the other's experience to make future. Human contextualizing arises as joint activity is embedded in larger time domains: synergy draws on individual-based learning, circumstances and also history.

It is the historical dimension of dual control that characterizes distributed contextualizing. Bodily activity not only meshes but, as this occurs, it conforms to a local habitus. Distributed contextualizing allows the real time coherency of human action to spread across individuals and, therefore, space. An event gains consistency thanks to its feel, its timing and appropriacy. Briefly, distributed contextualizing features the following.

- It occurs in real-time in the public domain.
- It occurs in a historical context (uses macrosocial constraints)
- It exploits (we assume) affective markers present in the other's activity.
- It exploits shared experience of similar moments (however, what counts as similar is not necessarily common to the parties).
- It exploits a learned ability to anticipate what will happen.

Contextualizing later comes to rely on the ability to utter and interpret word-forms. This will require babies to develop both episodic memory and a capacity to hear and speak syllabic forms. Nokhukanya, however, has no need for this: she needs no more remembering than that which allows, say, a dog to find the path home. This is sufficient because the baby need only couple movements to give and produce real-time feedback. Relying on retrospective activity, Nokhukanya uses dual control to probe and feel out her mother. While almost certainly using perception-action mechanisms like those found in mammals, birds and amphibians (see, Preston & de Waal, 2002), she also uses her mother's feeling. Thanks to this affective regulation, her mother is moved to recognise baby's learning. Affect thus ensures that experience unites with real-time sensitivity in ways that allow each to guide the other. It is this, I suggest, that allows the baby to apprehend –not just movements- but cultural patterns. Unlike vervets and cowbirds, her biomechanical resources come to draw on cultural constraints. In agreeing about the want, S-behaviour is made appropriate by TH-movements whose value is macrosocially constrained. Acting as a Zulu, Nokhkanya steps into history.

Synergy allows her to draw simultaneously on macrosocial constraints, circumstances, and sub-systems. While using historically derived patterns, these precisely fit the timing of microbehaviour. Elsewhere I show how events in microtime shape the interpersonal sense of talk (e.g., Cowley, 1994; 1998; 2001) and have parallels across the vertebrates (Cowley, 1997). Nokhukanya shows how babies mesh social activity in two time domains. Thanks to dual control, infant and caregiver synchronise, first, in microtime and, later, in the slower 'tonic' domain (Owings and Morton, 1998). To give her mother what she wants, Nokhukanya uses instantaneous perception/action and, slowly, adjusts to cultural expectations. Thus she holds silent, not just for an instant, but for (at least) several seconds. Eventually, by so doing, a domain of thought and emotions opens up alongside affectively mediated activity. Joint action gains coherency from sub-agent systems that are more complex than those of cowbirds. Next, I turn to a model of such systems and, afterwards, ask how they could arise from natural selection.

Intrinsic motive formation

Thirty years of research have allowed Trevarthen to develop hypotheses about the neural mechanisms that drive intersubjective behaviour (Trevarthen et al., 1999). His system of innate motive formation (IMF) recognizes that perception-action mechanisms allow infants to exploit social activity. Given these goals, no stance need be taken on how experience is recorded, patterns identified, or the biases' embryogenetic origins. Highlighting intrinsic organization, he relies on cross-specific neural comparisons. In contrast, I ask how neural organization like that described in the IMF model can contribute to distributed contextualizing.

Figure 1. about here

Applied to Nokhukanya and Florence, the grey shows brains and the enclosed areas peripheral body-systems that manage action and perception. (The labels P A e S E identify perception, action, expression, sensation and expression respectively). Natural selection ensures that both persons access similar IMF systems that work by using mimesis (the m-system) to form and deal with higher motivations (the M-system). While small babies are (largely) restricted to functions based on mimesis, intersubjective behaviour allows higher-level M-systems to develop. In ontogenesis, joint activity is affected by social events that influence the baby's IMF system.

While explaining the newborn's reciprocal, mimetic responses, the model also links with recent work on the neural substrate.[13] Thanks to learning, mimetic mechanisms gradually change higher level motivations. We come to use mimesis together with affect and motives whose results are explained by actions, wants and intentions. Using social learning the higher level systems later become integrated with word-forms and, in so doing, allow us to formulate explicit goals. In infancy, they function to permit basic sense-making that is consistent with such goals. As IMF components develop in tandem, we act both intuitively and in a less spontaneous domain.

Redescibed in IMF terms, Nokhukanya uses motivation that derives from an adult's affect-driven movements.[14] Without a central mechanism (or SELF), Nokhukanya brings events under dual control by gearing to Florence's activity. Without (inner) understanding she uses mimesis to respond affectively and develop experience based in utterance-activity. At the moment described, however, rather than let the m-system trigger agitated behaviour, Nokhukanya inhibits mimesis. Using experience and a nascent M-system, she freezes negative affect, and shows learning.[15] Overriding her distress, the IMF system readies her for a smile and reprimand. Social biases, ABC mechanisms and affective response give her activity a special quality. Like an affectively-charged robot, Nokhukanya couples one activity (S-behaviour), with another (TH-movement). Using inhibition, she contextualizes a want by using biomechanical resources. As a human, she uses real-time meshing and historically derived constraints to inhibit behaviour. Later, she will get better at feeling when silence is wanted and, once a motorcentric analogue develops, will exploit the mechanism to silence others.[16]

Motives and biomechanical constraints

Nokhukanya can respond appropriately to her mother's want because she is motivated to use distributed contextualizing. She has both accumulated knowledge of a pattern and, using her IMF system (or equivalent), is able to inhibit mimetic response. Instead of becoming agitated –of allowing her m-system to produce behaviour that resonates with her mother's, a higher level system *inhibits* response. By thus falling silent she acts in line with her mother's want. Given how this exploits Zulu hand and vocal patterns, Cowley et al. (in press), call this an early 'sign of culture'. The joint activity of the parties is encultured because it fits what is expected, is closely timed and both affectively and historically appropriate. It is joint activity that legitimates the judgement that the baby understands, is obedient, or shows respect.

Florence does not *cause* her daughter's response. Rather, she triggers an intrapersonal sub-system that, in the circumstances, produces inhibition. Importantly, were the motive for distress greater, the baby would go on quite differently. In other words, as Wittgenstein advises us, we avoid any supposition that the action is (or requires) a 'process' of understanding. Metaphorically, the events are like the threatening and parrying of boxers in that the child no

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[13] None dispute that this occurs. Further, the discovery of mirror neurons (e.g. Rizzolatti, & Arbib 1998) provides evidence that other primates have such abilities. What is controversial is how to account for microtemporal events that, following Ballard et al. (1997) can be said to occur at the embodiment level. While most accept that we use perception-action mechanisms (see, Preston and De Waal), Trevarthen's dedicated IMF system is more controversial. The model stands in decided contrast not only with standard views of social learning (e.g. Stern, 1977; Kaye, 1982) but also representation based theories (e.g. Melzoff & Moore, 1997).

[14] At 14 weeks, infants are not yet able to reach for things and put them in her mouth. Sucking actions emerge when an object is placed in (or near) the infant's mouth or, interestingly, in her hand.

[15] Interestingly, she puts her fingers to the mouth, invoking an accommodatory schema

[16] Biomechanically, the most important outcome of such behaviour is that it leads to anticipatory control: if a social cue can trigger recognition of what is coming, the infant can gain a deeper sense of what social life is like.

more chooses to meet the mother's want than the mother herself chooses how to act. Silencing the child is, literally, part of a Zulu form of life. Without rules, the events show cultural regularity which has a triple strategic function. The mother gets silence, the child approval, and, together, they perform a cognitive trick. Discovery of coherency shows that, in social life, *different* behaviour often serves a single social function. Without words, Nokhukanya acts in line with the belief that, sometimes, babies must be silenced without fussing or soothing.

Even if the details are wrong, Trevarthen shows how synergy can transform social life and, in specific settings, contribute to distributed contextualizing. Specifically, it exploits a two-part motivational system that allows real-time adjustment to affectively modulated patterns. Utterance-activity is a cognitive resource which, while beyond the body, contributes to development. Sub-personal systems thus allow the child to use scattered causes in picking up on an abstract pattern. Nokhukanya exploits experience, current activity, circumstances, her mother's goals and activity in the social environment. Their dual control allows her to use utterance-activity in binding her body to the social world. Given something like IMF, infants develop biomechanical resources. While learning from statistically-based contextualizing, infants come to act strategically. For caregivers this is seen as involving generalizations and, for this reason, they act to encourage socially-relevant learning. Just as might be expected, bonobos also elicit socially appropriate human behaviour (Cowley & Spurrett, 2003). It thus seems that, using inhibitory mechanisms and ABC learning, individuals can come to act in ways that shape affectively based social repertoires. By laying stress on motivational systems, this account overcomes difficulties of both classic nativism and naïve empiricism. Next, therefore, I will consider what kinds of selection pressures might have made human IMF systems sensitive to the scattered causes that drive, for example, TH-activity.

Niche construction and co-evolution

While suggesting that each party uses IMF systems to couple with the other, the analysis extends Trevarthen's view. Emphasising the effects of utterance-activity, I claim that each person uses the other's experience as a cognitive resource. Nokhukanya exploits a caregiver's real-time motives by learning to inhibit m-system response. Florence, perhaps, makes sense of what her baby does and, especially if she puts this into words, can use it to change future interaction. While using perception-action mechanisms, distributed contextualizing provides a basis for coming to agree –and, later, disagree- about what it is that we judge. In a suitable environment, moreover, bonobos use similar mechanisms and effects (Savage-Rambaugh et al, 1998). Thanks to something like an IMF system, Kanzi exploits English and lexigrams in a "North American" style (see, Cowley and Spurrett, 2003). Below, I use this finding to speculate about the phylogenetic underpinnings of talk.

Infant activity, like that of other primates, draws on biases or prepared learning. While using species-specific adaptations, this is no reason to think that learning to talk exploits specific 'language' genes (or suites of genes). Indeed, some may find it more likely that infants draw on phylogenetic mechanisms whose evolutionary origin is bound up with prospecting and retrospecting patterns in utterance-activity. In short, such mechanisms are likely to serve the rise of distributed contextualizing. Given that this varies across cultures, times and dyads, natural selection may well have promoted –not public forms- but, rather, underlying capacities. Rather as seems to be the case for number systems, it seems unlikely that we have (or need) adaptations for grammar or meaning.[17] If so, this provides grounds for returning to the traditional view that (most) grammatical constructions and verbal units are second-order historical entities. If cognition is distributed, however, this position nonetheless raises interesting questions about the role of language in both evolution and development. Rather than focus on symbol manipulation, what comes center stage is how historically-based conduct can serve in shaping underlying systems and, at the same time, establishing and maintaining cultural organization. Accordingly, I proceed by using co-evolutionary theory to ask how vertebrate abilities for dual control might lead to selection for distributed contextualizing.

Natural selection does not rely only on phenotypes. As Dawkins (1982) stressed, selection also uses aspects of the environment. In beavers, for example it uses bodies, the forests that provide wood for dams and, of course, conditions that dams produce. Drawing on extra-somatic selection, beavers have become unusually social rodents with large teeth and flat tails. Crucially, while selection uses the world beyond the body, it also exploits epigenesis. Since human development has an evolutionary history, the embryogenetic basis of language may lie in biases and social learning. Not only may many ontogenetic facts depend on a child's communicative infrastructure, but aspects of culture may use natural selection. In IMF terms, an infant may draw on (something like) motivational systems geared to dynamic patterns in human activity. Once distributed contextualizing starts, an encultured caregiver can guide the child to social complexity. If early joint activity relies on mimesis (or m-systems), by 14 weeks, cultural patterns are already insinuating themselves into infant-caregiver relationships. The biological basis of talk may thus lie in how, in phylogenesis, neural sub-systems come to control how infants participate in utterance-activity.

On a co-evolutionary model, the object of selection is the organism-in-a-niche (Laland et al., 2001). Genotypes adjust to environments that their bodies modify. The phenotype includes a 'niche' which, when constructed, affects reproductive success. Unlike in Lamarckian theory, the gene pool uses –not acquired characteristics- but individual variations. What is 'selected' is a species-constructed world or phenogenotype (ibid, 2001). Just as beaver brains, bodies and behaviour allow for the gnawing of trees that fall into lakes, over time, it led to dam-building and oversized teeth. Other characteristics drawing on niche-based resources helped beavers become resistant to socially-transmitted diseases, unusually monogamous and intolerant of running water (Sampson, 1997). Other examples of how an organism-in-a-niche influences/is influenced by natural selection are found in earthworms, the Galapogos woodpecker finch (Laland et al. 2000) and in human pastoralists. Human populations with a history of herding have higher lactose tolerance than those lacking such traditions (see, Feldman & Cavalli-Sforza, 1989). Where milk is a nutritional resource, efficient digestion enhances reproductive success because those unable to use it have lowered fitness. In evolutionary time, herding populations come to have a higher concentration of lactose tolerance genes.

Co-evolution and the human IMF system

Close examination of how Nokhukanya comes to fall silent gives reason to think that learning to talk uses the affect that regulates utterance-activity. Using IMF mechanisms, human infants are predisposed for distributed contextualizing. While what follows is speculative, I suggest that this

[17] Of course, we may still rely on biases akin to those which allow, say, pigeons and monkeys to draw on their own ways of representing quantity to gain practical understanding of human number systems (e.g. Gallistel, 1980; Boyson et al. 1996).

depends on co-evolutionary processes. In so doing, I follow Laland et al. (2001) in pointing out that pressures depend on 'how an organism obtains its resources or defends itself in an environment'. What happens reflects both selection pressures on individuals and niche-based constraints. Distributed contextualizing, I suggest, arose as selection favoured infants who used utterance-activity to obtain protection and resources.

By thus shifting attention to underlying systems, it can be posited that the primate IMF systems contributed to the formation of biases used in managing and assessing multimodal activity. And, strikingly, even today, infant behaviour is managed around manual movements and vocal patterns. Before weaning, babies rely on relatively primitive utterance-activity. Natural selection, therefore, may have favoured tricks that benefit the infant-in-a-niche. Nokhukanya's lesson may even be that IMF systems developed to allow infants to assess and manage parental behaviour by using cultural dispositions. While bonobos (and, other primates) also use IMF systems, humans are specialised in discriminating and producing vocalizations. This diagram below sketches this simple idea. I have used circles of various sizes to suggest the extent to which IMF systems are likely to affect behaviour by juveniles of each species.

Figure 2 about here

My view is that an earlier form of IMF (shared by bonobo and human ancestors) gradually adjusted to the demands of utterance-activity. Given conflict between parties (an infant has 50% of her mother's genes), infants may have set off an assessment based arms race that changed adult cognitive resources. Especially when times are hard, an infant who monopolises resources is more likely to survive than siblings. Natural selection, then, may favour individuals whose behavioural assessments successfully shape social events. While assessment-management is a communicational universal (see, Owings and Morton, 1998), human utterance-activity allows prospective and responsive activity to coincide (e.g. Cowley, 1994; 1998). Further, alongside this relatively primitive behavioural co-ordination it also becomes organized in the relatively slow domain of verbal thinking and action. How we speak and move, it seems, has a symbiotic relationship with a community's encultured sound patterns. Parental behaviour is managed both intuitively (thanks to an m-system) and around forms of conduct consistent with local values and beliefs (using M-systems). Once babies learn to participate in this dispositional matrix, they begin to use salient events as a basis for remembering past outcomes. Viewed in this way, it seems that natural selection built our kind of IMF system by relying on how perceptual and motor discriminations helped us become affect-seeking primates who exploited social learning. The relevant biomechanical systems, therefore, became tuned to prosodic and visible subtleties. Independent as they are of word-forms, such changes could go back 2 million years or more. In our ontogenetic niche, IMF may have changed in tandem with how we assess others and, of course, cultural ways of controlling babies.

Niche construction illuminates both species specific aspects of brain-body systems (IMF systems) and physiological capacities for using utterance-activity as a cultural resource. Further, if infants live in a niche until (roughly) the end of the first year, this may explain why they forge syllable-based resources. As contextualizing develops, it focuses on 'abstraction-amenable' aspects of talk (Spurrett & Cowley, in press.). As infants are drawn to structured sounds they also find themselves producing 'canonical syllables' (Oller, 2000). By the end of the first year, culture permitting, adults treat infants as if they both understand and know 'what to say'. Using capacities for active attention, this probably also uses prepared learning. Indeed, older infants become biased to hearing utterance-activity around culturally-specific 'sounds' (Kuhl, 1998). Though not sufficient for language learning, this is an important step. Coming to engage with utterance-activity, then, is also a matter of adjusting an IMF system to the local environment. Learning to produce syllables shapes a brain-body system around distributed contextualizing. The child needs, not an adaptation for language, but ways of assessing and managing others that sustain encultured and word-based judgements. As this happens, the child moves from the edge of history to take up new roles in its community.

On the edge of the historical present

Having established how Nokhukanya becomes able to act with coherency, I outline why this may be necessary in learning to talk. Given restrictions of space, I stress the following:

- By acting with coherency the baby induces major qualitative changes in a caregiver's utterance-activity
- By acting with coherency the child learns, in some circumstances, to act consistently.
- Thanks to intrinsic motives, change and coherency set off a dynamic process of distributed contextualizing.
- Distributed contextualizing nudges the infant towards local forms of behaviour.
- Discovering what social behaviour is 'about' leads to formation of functional categories that, in principle, map onto words and values.

Thanks to intrinsic motivations, utterance-activity promotes discovery of historically-based constraints. Distributed contextualizing encourages the child to exploit consistent activity that maps onto local values. When Nokhukanya acts as if knowing that TH-movements are meant to invoke S-behaviour, her mother 'feels' her baby's understanding. Activity that uses simple mechanisms changes how a caregiver acts. Based on past experience the infant begins to exploit utterance-activity as a cognitive resource. Ceasing to be purely affective, her activity now serves, among other things, to prompt and probe Florence's wants. Thanks to intrinsic motives, the child finds that culture is, among other things, a matrix of dispositions.

Distributed contextualizing allows the infant-in-a-niche to lock onto encultured patterns. Affective response enables her to assess and manage caregivers while gaining protection and resources. Indeed, this may be why humans use primate biases in perceiving sounds. As these are highly susceptible to cultural patterning, I speculate that intrinsic motive formation brought new synergy to vocal learning. Internal and external motives came together to ensure that utterance-activity ceased to be purely affective or, in other terms, fell under macrosocial constraints. Today, IMF based affective movement may be both necessary and sufficient to lead affectively-charged humans into a cultural world. Further, since biomechanical constraints serve the infant's interests, we gain from conforming to our affective heritage. Rather as a child comes to exploit culture, encultured caregivers thus use the child's ABC learning to persuade her to meet wants and needs. Adults gain from fitting their doings to children's capacities for attuning to cultural patterns. Acting consistently can incline the infant to certain values and beliefs. Not only does its mimetic system tune to the caregiver's but, as this happens, higher level constraints lead to adjustments in behaviour. Brains become profoundly biosocial.

Distributed contextualizing uses a caregiver's adjustments to base practical knowledge on its functional properties. While Nokhukanya's ability to *thula* is based in biology, it exploits cultural conduct. Without inner understanding, habitus draws her into acting consistently with goals. Later, similar processes help her discover local sounds. While based on affect, human dual control use coherency to induce practical understanding. Long before activity is analysed, adult beliefs shape biomechanical constraints. Before pursuing this, however, I ask how language relevant capacities are shaped by attuning to *what it is that is judged*.

Biomechanical constraints in language: getting started

Biomechanical constraints emerge as utterance-activity organizes early behaviour. Not only do past interactions influence current events but, using synergy, a child develops motorcentric routines to integrate activity with historically derived patterns. Given her predispositions, Nokhukanya gains practical knowledge of what her mother wants. In the terms above, she discovers distributed contextualizing. Over time, this changes her biomechanical constraints and, as a result, she learns to assess her mother's doings and, immediately, cope with consequences. Utterance-activity comes to be used –not just affectively- but also to alter another's immediate and mid term behaviour. While Nokhukanya uses inhibition, babies later use other mechanisms to control what they do. In short, by acting jointly, synergy enables a caregiver to guide the child in learning to assess and manage others.

Nokhukanya makes a step toward acting in line with the belief that talk consists in acts whose sound structure enables us to achieve goals. This view depends on individual members of a group all being able to draw on a matrix of consistent behaviour. Conversely, by coming to act with coherency the child makes a step towards becoming a social player. Unknown to the baby, co-evolution has equipped her to use scattered causes in aligning with expectations. Drawing on Florence's feeling/moving, therefore, sub-personal systems motivate Nokhukanya to act appropriately. Distributed contextualizing exploits social motives that, unlike physical causes, depend on word-mediated conduct. In discovering a social world, Nokhukanya integrates events with patterns allowing *de facto* verbal judgements. Even at 3 months her behaviour can be explained in terms of goals. At the end of the first year, it is heard around sound patterns and goal directed speech acts.

Consistent behaviour feeds overinterpretation. When judgements reflect social facts, we use patterned behaviour/information to make construals. Especially if a baby acts in line with verbal ascriptions, adult responding reinforces this way of acting. The pattern, moreover, is consistently found in early development. Low-level cultural patterns encourage the expected and, subsequently, aid the child to acting with coherency. Without hesitation, babies fit their doings to the matrix. As patterns repeat and generalize the baby later gains understanding of acts and consequences. Agreement about *what is judged* is thus necessary in learning to talk. When a baby 'knows when to fall silent', her activity can be used to encourage this kind of behaviour. The child can be trained to act in line with ascriptions to which it has no access. Further, many ascriptions fit the same events. Given the example, Nokhukanya may be encouraged to continue acting 'like a good girl' or, perhaps, to go on 'showing respect'. While what is judged is coherency or real-time behaviour, how this will develop depends on judgements that reflect a higher cultural level. Social life develops from activity about activity.

Biomechanical constraints use the reflexivity that arises from exploiting utterance-activity. In later years, activity about activity gradually becomes talk about talk. At three months, it suffices to act as if different vocalizations/movements have the same functional value. The child can use this to enact social events with predictable outcomes. Indeed, anticipating reward may be necessary in learning to act prospectively. Thus, seeking to fulfill another person's wants may precede having wants of one's own. Relevantly, in the next weeks, Nokhukanya will reach for objects to put in her mouth. While also a way of achieving coherency by integrating information from different cognitive systems, this allows what is seen to be co-ordinated with complex manual activity. Early interpersonal integration thus gives way to contextualizing within the child. In Piaget's (1952) terms, it allows for 'secondary circular reactions'. Later, once she can relate to a familiar material environment, object-object co-ordination will give way, after 9 months, to triadic behaviour. The baby will use gaze, for example, to contextualize wants or in using a caregiver to see if a situation is threatening. Finally, once wants couple with syllables, adults will hear these as 'words' (e.g. up, more, ball)

As Nohkukanya learns to use distributed contextualizing she adjusts to cultural practices. Responding to wants allows her to probe others while giving off affective information. Judgements derived from a mimetic system are thus slowly reshaped by higher motivations. The encultured element in her intrinsic motives begin to decouple from affect driven mimesis. In Croce's (1938) terms, her judgements cease to derive, immediately, '*from an act that is being undertaken'*. Instead, they come to be dominated by what he terms the 'coscienza' (conscience/ consciousness) of the act.[18] The baby becomes ever more reliant on historically specific ways of knowing. What she thinks binds with what, now, she says and does. As reliance on agreement in judgements and behavioural consistency diminishes, new changes arise. In time, she may, for example, come to give great weight to 'literalness' and agreement in definitions. Probably, she will follow the rest of us by coming to believe in the 'reality' of languages, minds and selves.

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[18] Contemporary history ceases to be that which "nacsce immediatamente sull'atto che viene compiendo" and, in so doing, becomes 'come la coscienza dell'atto'.

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Appendix: Transcript/description of how Nohkhukanya 'enacts her mother's want'. The frames shown on the three images in the text are marked in bold.

Frame	Time	English	isiZulu	Mother	Child
1.	**05.10**				**Takes fingers from mouth, lifts arms**
Not shown	06.00			Smiles, points and moves right hand	Synchronizes and nearly touches hand
Not shown	07.04	Sings "ing na bel"	*"ing na bel"*	Raises arms	Breaks gaze; cries
Not shown	08.13	No no no	[njega njega njega]	Waves hands twice; brings hands together in front of child	Gazes again
Not shown	09.00	No	ngeke [nge.ke]	'Zulu wave'	Child relaxes
2.	**10.07**			**Responds, lowers hands and smiles**	
Not shown	11.00	I don't want it	angifuni	'Waves' both hands 3-4 times	Starts to suck fingers
Not shown	12.23	No	ngeka (mumbled)	Moves forward; beams	
Not shown	13.00	I'm going to get you	mina ngizothatha wena	Ticks off twice and gentle prod	Child removes fingers
3.	**14.23**			**Pouting mother open to child**	**Child open to mother**
Not shown	15.00	Where's your father now?	kuza baba manje		
Not shown	16.00	Your father's coming	ubaba wengane		