# Naturalizing language: linguistic flow and verbal patterns

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> "Our language can be seen as an ancient city: a maze of little streets and squares, of old and new houses, and of houses with additions from various periods; and this surrounded by a multitude of new boroughs with straight regular streets and uniform houses" (Wittgenstein, 1958 § 18).

## Introduction

The ontology of *words* is highly variable. Such patterns are spoken, heard, imagined and, in a sense, 'mirrored' in texts and programs. While moves to naturalize language usually start with words, ontologically varied entities cannot easily be grounded in either physics or biology.[1] Turning to contemporary cognitive science, therefore, the paper denies that brains or minds store verbal patterns. Rather, to naturalize language, words are treated as intrinsic to human activity. On this novel view, much weight falls on how, from birth, infants use the flow of expression. It is stressed that real-time co-ordination links nonverbal co-action with social experience. By three months, caregivers can prompt babies to use norms that index cultural contingencies. Unlike other primates, human infants orient to historical patterns that induce others to use values in responding to their doings.

In adults, modes of co-ordination shape talking, praying, shouting, silent thinking and, oddly, construing and creating written signs. Experience unites language with bodily dynamics. Co-ordination integrates speech, affect and action. While *linguistic flow* is bodily, we report words or, precisely, *verbal patterns.* Using biodynamics, we align expression, artifacts and experience while enacting social practices. Use of routines and affect also draws on convention. Events stabilize round verbal patterns or, in Love's (2004) terms, *first-order language* evokes *second-order cultural constructs*. Variable modes of expression conspire to align speaking, hearing and feeling with normative, formal, symbolic, and other descriptions. Given a first/ second order distinction, language becomes part of a person. In humans, cognition is *culturally distributed* (Hutchins, 1995a). While embodied, language is also collective. Its verbal patterns, in Wittgenstein's image, resemble an ancient city. Given its twists and turns, we talk about the charming ruins while making what we can of its resources. As our surroundings become familiar, we *master* language. Hearing enables us to integrate compressed (Shannon) information with verbal patterns. To naturalize language, therefore, we stress that dynamics matter more than symbols. The paper concludes with consequences for the language sciences.

## Cognition, structural coupling and semiosis

Classic cognitive science used symbolic information processing to model cognitive tasks. By using rules to manipulate physical symbols, task analysis was applied to systems as diverse as businesses, vision and chess. Given formal descriptions, these were modelled by programs: language reduced to ungrounded tokens and syntactic relations. As Searle (1980) saw, they meant nothing to computing machines. These operate only because rules reciprocally connect input with output. Without reversible

[1] Following Pinker and Bloom (1990), many have debated the evolution and emergence of language (e.g. Christiansen and Kirby, 2003). While some assume that brains represent linguistic forms (as physical tokens or learned invariances) others see forms as population level regularities. Taking the latter view, this paper links with the work of Dunbar (1996) and how computational tools can be used to model the emergence of communication and language (see, Lyons et al., 2007).

encoding /decoding, there would be no programming. By what is little more than a historical accident, 'language' was reduced to processing. Thus, just as linguistics rose with formalisation, it is threatened by the fall of symbolic models of cognition. Much can be gained from rejecting *code views* of language (see, Reddy, 1979; Harris, 1981; Love, 2004; 2007; Kravchenko, 2007; Linell, 2009).

Cognitive science turned away from symbolic models (e.g. Clark, 1997; 2008). While this began with connectionism in the 1980s, it was reinforced by cognitive neuroscience. Brains need no inner symbols because they manage perception and action. In guiding behaviour they use not token-types but, rather, distributed representations. As models of these (and other) kinds were implemented in robots, these too challenged classic views (Brooks, 1999; Ziemke, 1999). While machines use programs (and artificial codes), inner surrogates or outer features matter less than how sensory systems couple with action. As symbol systems ignore meaning-making, cognitive science increasingly considers living systems (Thelen and Smith, 1993; Clark, 1997; Lyon, 2006; Spivey, 2007). In animals, brains manage –not knowledge –but adaptive activity. While cognition can be modelled as computing, it evolved in the context of situated action.

While there are many challenges to symbol processing models, Cowley and Spurrett (2003 challenge the underlying *epistemic conception of mind* (ECM). They find three main weaknesses. First, by using descriptions of *human* mind, the ECM is anthropomorphic. In Cartesian and Humean tradition, cognition reduces to knowing and coming to know. Its second flaw makes minds or brains into containers. People allegedly decant 'knowledge' from experience. Communication is quasi-mechanical. Like Morse operators, we formulate messages by using rules to combine units. The third flaw reduces language to a medium. Mouths, hands, eyes and ears become sender/ receivers of a semiotic postal service. In proposing an alternative, cognitive science begins with situated co-ordination. On this biogenic view (Lyon, 2006) organisms interact with environments. Brains evolved to control movement-in-an-environment. Behaviour results from a history of body-world encounters and, in evolutionary time, organisms made increasing use of perceptually guided activity. Development and learning emerged. Given processes like biosemiosis and structural coupling, cognition is non-reversible.[2] It is dynamic, embodied, embedded, and situated. It thus co-occurs with communication and, in many vertebrates (at least), uses experience. While without definition (Bechtel et al., 1998; Harnad, 2005), cognition originates in selection. As Clark (1997) spells out so elegantly, agency connects brains, body and world. We are organism-environment systems (Järvilehto, 1998), whose genes prompt bodies to adaptive behaviour that sculpts neural function. In a human world, cognition is inseparable from culture.

## Human cognition

Human cognition is often attributed to a faculty of *reason*. On a biogenic view, this ignores how organisms –including human primates –use environments. Given bodily resources, nature uses interaction and communication such that members of a species live in a (partly) shared world. While collective modes of life are well known in ants and bees, the world sustains many kinds of social agency (see, Wilson, 2005). Using history, humans take sociality to new limits. Self-organizing bodies access public means of sustaining activity. Language, norms, traditions and shared resources

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[2] While enactivists emphasise structural coupling (e.g. Thompson, 2007), others focus on biosemiois (e.g. Barbieri, 2007). In broad terms, biogenic or DEEDS tradition views cognition as dynamic, embodied, embedded, distributed and situated (Walmsey, 2008).

distinguish us from bonobos and chimps. We use talk, institutions and material resources in ways that make humans *ecologically special* (Ross, 2007). Our social strategies rely on displays of affect and language.

Public behaviour is motivated and, often, run through with both speech and silent thinking. Events unite the feeling of thinking (Harnad, 2005) with verbal patterns, actions and nonverbal expression. Individual and social knowledge alike are grounded as we co-ordinate with external resources. Full-bodied expression takes on mediational functions as it is integrated with action and what can be spoken, heard, (and otherwise perceived). Remarkably, it took ethnography to show how causal and mediational combine in even ship navigation and landing aircraft (Hutchins, 1995a; 1995b). Previously, it had been simplistically assumed that we *process* language (whatever that means) and, later, calculate 'meaning' with respect to context. In fact, communication and cognition co-occur as we engage with the world. In Hutchins' (1995a) terms, we shift in and out of *distributed cognitive systems*. For example, silent thought may prompt us to act, talk or use an instrument. Complex tasks depend on how people and teams interact with both each other and the environment. In a classic example, a cockpit is said to manage its speed by prompting humans to integrate language and action with its resources (Hutchins, 1995b). Reaching beyond the skin, cognition is *culturally distributed*. In contrast to social insects, humans *share* physical and cultural resources. Bodies rely on real-time coupling and (what we hear as) repeated modes of expression that bear on both their material surrogates (texts) and associated institutions. Using collective resources, circumstances imbue language and action with shared values. Far from storing knowledge, human brains serve to integrate our doings with current events.

While based in co-ordination (e.g. looking at a speed dial or saying numbers aloud), distributed cognition uses socially formatted knowledge. We assimilate other people's experience into language, artifacts and institutions (e.g. flight control). In coupling with the world, we discover facts and make judgements which, crucially, are subject to revision. These arise because, while hearing verbal patterns, biodynamics link (direct) experience with events. As a result, no categorical divide separates the procedural and the declarative. Language gives us the 'objectively valid judgements' that allow us, for example, to build bridges (Craik, 1943).[3] While often seen in terms of reference, on the biogenic view, this depends on a capacity for *shared* judgements. Unlike other animals, we learn to repeat and, eventually, formalise what groups are said to *know*. By contrast, other animals lack any measure of knowledge. Their judgements appear as (inter) action. On spotting a fox, a brown hare, for example, sits 'bolt upright and signals its presence instead of fleeing' (Hoffmeyer, 2008: xiii). While hare fitness is increased by lowered energy expenditure (Holley, 1993: cited in Hoffmeyer, 2008), its action prompts a mature fox to use experience. Like many animals, foxes learn. Accordingly, Hoffmeyer (2008) stresses the value of natural play and, in another tradition, De Jaegher and Di Paolo (2007) invoke participatory sense-making. In using of shared judgements, humans go further. Individual experience connects with beliefs and wisdom that has been accumulated by communities. Given propensities for co-action, this can prompt us to realise values that extend thinking and action into the adjacent possible.

Many behavioural adaptations demand biosemiotic descriptions.[4] While defying input-output logic, these apply to the feeling of what happens and, in social

[3] While echoed in Wittgenstein's (1958) emphasis on seeing aspects, Craik's (1943) formulation permits the hypothesis that this depends on –not language –but the brain. In second-generation cognitive science, this sustains the hypothesis that human forms of life self-organize as bodies act within (selected) second order constraints. At time, they gain from making *objectively valid judgements.*

vertebrates, co-ordinated affect. However, verbal patterns and institutions also sharpen human sensibilities. While many contrast us with animals, figures as diverse as Peirce, Darwin, von Uexküll, Lorenz, Dawkins, Bateson, Gibson, Gould, Maturana and Dennett prefer to emphasise continuity. The split goes back to the *epistemic conception of mind.* Those who emphasise individual knowledge-stores appeal to verbal patterns. Since words are heard (and repeated), they are attributed to a neural origin. Do we possess a language faculty? For those who invoke symbol manipulation, this will seem beyond doubt. For the sceptic, *written language bias* (Linell, 2005) is reinforced by dubious first-person avowals. A capacity to hear sentence-like utterances is no grounds to posit a device for language generation. That is a *monological* (Linell, 2009) or *segregational* view (Harris, 1981). Instead of contrasting language with other co-ordination, it can be traced to (inter) action. The biogenic view is simpler. Use of dialogical, textual, imagined and computational resources extends primitive co-ordination. Language is embodied. Far from depending on inner symbols, alphanumeric patterns *describe* words (and much besides). No foundational units exist because, in social life, human expression is co-ordination. Given its rewards, we gain skills in, speaking, listening and so on (e.g. praying, shouting, programming). No determinate units are needed because, like the hare's posture or the fox's nonchalance, language is part of a person. We talk, shout, and engage with books, computers and bureaucrats by means of *cognitive integration* (Menary, 2008). Using linguistic flow, we realize values (Hodges, 2007). Bodies use *perceived* linguistic forms as they resonate to each other's dynamics.

**The view from everywhere**

Taking the individual's point of view, Saussure proposed an *object* for linguistics. He separated the signs of a language-system (langue) from agents and circumstances. By hypothesis speech (parole) that was executed just as it was experienced. It was said to be *linear.* Most, 20th century linguists treated language-systems as entities that prompt us to construct and parse word-strings.[5] While this *written language bias* sustains one perspective on language, there are others. Language can also be seen from that of a participant in dialogue, a community, an historian, a biologist or, indeed, in terms required for sensor or robot design. Once recognised, this leads to the view from everywhere. Given collective life (based on history), we gain dialogical capacities (see, Linell, 2009). The language meshwork connects, at least, physics, biology, material culture and human sensitivity to norms. Once engaged with this world, the baby changes what is possible. Far from relying on words, she can access a range of more and less 'linguistic' resources. To naturalize language, therefore, we ask how the meshwork affects infant development.

On the view from everywhere, language spreads in historical and individual domains. Thoughts and feelings draw on co-ordination. Given multi-scale dynamics, Steels and Belpaeme (2005) model language as a complex adaptive system. They use simple agents that detect aspects of the world (e.g. colour patches), learn from these and, using the results, co-ordinate with symbols (e.g. 00011000). First, properties of reflected light can stabilize artificial perception. Robots do not need programs to integrate signals with sensor information. Given connectionist nets, they can attune to colour patches (what we call *colours*). Thus learning-histories prompt each agent to

[4] Behaviour may well depend on biosemiosis (Barbieri, 2007; Hoffmeyer, 2008). For our purposes, it is enough that, as Peirce (1998) and others saw, it demands biosemiotic *descriptions*.

[5] The debates of 20th century linguistics concern (a) whether the (putative) atoms are formal, symbolic and/or semiotic; and, (b) whether to begin with formal or functional analysis.

develop its own *colour space*. While each 'sees' differently, they rely on the same environment and (very similar) hardware. To develop shared colour space, they co-ordinate around human *seeing*. In showing how shared symbols evolve, Steels and Belpaeme (2005) demonstrate, first, that neural networks can use a history of co-ordination to adjust robot perception (on given hardware). Second, given a learning-history, machines apply the same symbols to similar colours. Symbols thus give rise to category acquisition. Shared 'perception' uses symbols that demonstrably influence each agent's category acquisition. Crucially, this happens only because of the "structural coupling between success in the language game and adoption of the categories between the same agents" (Steels & Belpaeme, 2005: 473). Co-ordination permits contingency-based symbol grounding. Since this occurs in simulation, it is likely to have parallels in living systems.

Robots use reciprocal links between perception and communication. Without experience or understanding, dynamics shape symbol use. Human *seeing* thus gives robots a foothold in a colourful world. The general idea can be readily extended to humans. Just as robots draw on our judgements of colours, babies can use how adults express their attitudes to what can and should be done. On this view, learning to see colours is part of learning how to behave. Adult experience thus becomes crucial for infant entry into language. Pursuing this, Cowley (see, 2004; 2007a; 2007b) traces learning to talk to how caregiver-infant dyads co-ordinate action-perception. The infant *gears* to rewards intrinsic to adult displays of feelings, expectations and beliefs. By twelve months, infant vocalizations are *abstraction amenable* and, a year later, they invite analysis ('bikik allgone') (Spurrett & Cowley, 2004; Cowley, 2004; 2007b). Children use co-action while hearing colourful sound and pattern.[6] Later, they discover *words* and, eventually, the *language stance* (Cowley, 2007a). Once words are heard, they serve to inhibit action, spur repetitions, and direct people's attention. Later, we pose questions and, generally, turn language on itself. Alongside natural play, we language about language. During social co-ordination, babies discover serious uses of how adults connect perception with verbal patterns. Language is triply grounded into brains, culture and first-person experience. We learn to talk by using contingent (and valued) aspects of our shared worlds.

**First-order language**

Verbal patterns give a salient surface to human dialogue. In asking how dynamics reshape perception, we highlight *first-order language*. Since babies evoke and display more than words, contextualizing bodies meet their wants and needs. Co-ordination shapes interactions and, crucially, adult *experience* of dialogue. This plays out in multimodal conversations (Goodwin, 2002; Cowley, 1994; in press) and the gaze dynamics of reading aloud (Järvilehto et al., in press). On a biogenic view, language is complex social behaviour. In Piagetian terms, bodies accommodate and assimilate and, as they do so, sow the seeds of co-action.

Humans have intrinsic powers to engage with others. Not only do brains unite motives with expression (both visible and vocal) but this readies the child for actions. From birth, social rewards prompt experimentation with co-ordinated events. Human babbling is attracted to colourful vocalizations. Babies gain rewards by engaging with the flow of affect. Increasingly, it is acknowledged that interaction depends on more than words. While some emphasise *contextualization* (Gumperz, 1982; Cowley, 2004; in press), others invoke *languaging* (Maturana, 1978; Becker, 1988). In bio-cognitive

[6] Co-action can be defined as occurring when agents, acting together, use the *context* of each other's actions to come up with something that they could not have done alone (Wegner and Sparrow, 2007).

tradition, structural coupling opens up a consensual domain (see, Kravchenko, 2006).[7] While we report words, utterances are connotational. For Johnstone (1996), particularities shape life-history as we learn to speak as unique individuals. Cognitive dynamics call forth perception of verbal patterns or, in Love's (2004) terms, *first-order language* is heard against *second-order constructs*. Remarkably, this seems to parallel the 'epistemic gap' between biology and physics. In Pattee's terms (2001), biological systems evolved together with parameters that fix rate-specific dynamics.[8] As Rączaszek-Leonardi (in press) spells out, these proto-symbols give new forms of measurement and control. By hypothesis, the ability to *hear* linguistic forms –or take a language stance – enables an agent to self-construct new constraints. Verbal patterns become measures and controls of linguistic flow. Virtual symbols constrain languaging. Much empirical evidence is consistent with this view. First, multimodal analysis shows that grammatical function can act to constrain how we use bodily co-ordination (Thibault, 2004a). Second, using acoustic evidence, Cowley (1994; in press) shows that while words shape conversations, much interindividual meaning is enacted by very fine vocal co-ordination. Third, interaction can be described in terms of *participation strategies* (Goodwin, 2002) where, alongside the words actually spoken, events depend on, for example, dialogical *interactivity* and *other-orientation* (Linell, 2009). Fifth, it is increasingly recognised that human sense-making treats gesture and language as one (Goldin-Meadow and Wagnar, 2005). The words which are actually spoken often matter less than we like to think.

First-order language enables co-action to influence human intelligence. Since language is dialogical, co-ordination shapes events under the control of two (or more) bodies. Often, our sense-making depends on how we prompt the languaging of others. While alien to linguistic tradition, this fits the older view that *languages* and *words* are purely theoretical. For Harris (1981; 1998), to identify languages with *a priori* systems invites confusion. Segregationalism leads to a wild goose chase as linguists identify linguistic units with symbols. To escape from reifications, Harris argues (1998), we must ask how individuals integrate verbal patterns with circumstances, experience and ongoing activity. Like Saussure –and in contrast to the view from everywhere –Harris highlights first-person avowals or the 'lay perspective'. The living subject's perspective reveals the core of language. On the distributed view, by contrast, first-person reports show how second-order constructs function through us. Lay views have no special privilege. Rather, to naturalize language, weight falls on how infants use first-order dynamics. In learning to talk, human expression prompts even small babies to realise values. While invisible to a 'lay-perspective', meaningful co-ordination may be to discover second-order norms.[9] Verbal patterns emerge once utterances are heard as utterances of something (Love, 2004). Cognitive powers depend on orienting to utterances *as if* they were verbal. Far from representing verbal patterns, brains make us hear that way. Our capacity to take lay views of language (or anything else) thus depend on *hearing* verbal patterns and using the results to adopt *a language stance* (Cowley, 2007a). By treating words as 'real', we develop our skills in languaging about language. Support for this deflationary view comes from

[7] Maturana suggests:, "We as observers exist in a domain of descriptions, and this domain as a consensual domain is a cognitive domain. In fact we operate in many different cognitive domains". Each closed domain of interactions is "defined by features of internal consistency specified in the structural coupling that determines it." (1978: 46) Kravchenko (in press) notes, our inferential skills may vary between reading and conversation. While in general agreement with Maturana, this paper rejects his radical constructivism.

[8] In Pattee's model biological systems differ from physical ones precisely in using rate dependent dynamics based on, for example, DNA. These allow them to make measures, track the world, and to control self-construction).

[9] In neglected critique of Chomskyan linguistics, Moore and Carling (1982) make the same point but –instead of emphasising dynamics –they treat language as epiphenomenal.

experimental phonetics and neuroscience. Port (2007), for example, shows that, like verbal patterns, phonological constructs are purely social. Brains respond to rich patterns as we draw on affect, accept variability, and attune to individual voices. In parallel, Elman (2004) views words as public cues to meaning. Third, hemodynamics show that the neural processes that subtend action and perception also influence language (Willems and Hagoort, 2007). Neural interaction is distributed across the brain and, conversely, areas used in languaging contribute to many diverse cognitive functions.

For empirical enquiry the distinction between second-order cultural constructs and first-order language needs to be sharpened. Indeed, while all language draws on face-to-face dialogue, agency changes. Modes of co-ordinating vary in, say, praying, making legal decisions, programming computers and shouting. Phylogenetically and ontogenetically, our cognitive powers depend on a history of connecting actions with objects and bodily and neural resources. Ignoring dynamics, linguists have typically ignored the particulars of language. As Kravchenko (in press) argues, those who use code models typically conflate different *cognitive domains*. They forget that, in dialogue, *words* ('forms') typically matter less than circumstances. They are deaf to the anticipatory dynamics of languaging (see, Thibault, 2004a). As we co-ordinate, we actively perceive while engaging in motivated activity. To naturalize language, we can begin with the dynamics of linguistic flow.

## Crime scene investigation

Distributed cognition also highlights process. Since Hutchins' work on ships and planes, the view has been applied to, among other things, Shakespearean theatre, remembering, problem solving, how scientists work, and medical emergencies. In work on crime scene investigation (CSI), Baber et al. (2006) highlight the variability of Love's (2004) *first-order language*. This is striking because of how evidence is identified and, at later stages, reformatted using artefacts and argument. As investigators arrive at the scene, they typically integrate object observation and manipulation with talk and silent thinking. At this stage, informal languaging ('narrative') dominates. Later, increasing importance is given to how evidence can framed by material surrogates of second-order constructs. Wearable technology thus has many uses in later stages of investigation.

Investigators use abduction to uncover evidence. They begin by seeking out content that will later be reformatted in terms of facts and deductions. For Baber et al. (2006), they draw on four principal 'resources for action'. They engage with *objects* in the *environment* by using *procedures* to develop *narratives.* These consist in "fairly loose, informal discourse that contains sufficient information for an account (363)." Even if reliant on striking observations, these draw on verbal accounts. In many cases, investigation begins with a phone-call (to a call-handler) about a possible crime:

| | |
|---|---|
| 1 Handler | hh Midcity emergency |
| 2 Caller | hhh Yeah uh(m) I'd like tuh: -report (0.2) something |
| 3 | weir:d that happen:ed abou:t (0.5) uh(m) five minutes |
| 4 | ago, 'n front of our apartment building? |

The call-handler treats as utterances are *objects* or resources. Rather than attend to linguistic or discursive aspects, she makes decisions while eliciting narrative. Without concern for transcriptions, she records events in an incident log. Expertise prompts use of *environmental* resources to glean valuable information. Using procedures and experience, she focuses on facts and, of course, unspoken hints. She integrates thinking with cues in the call:

> "Sense-making occurs in discourse rather than simply in minds or representations. Sense-making is a collaborative process in which different agents contribute to an interpretation of events" (Baber et al., 2006: 362).

Verbal patterns become traces, affordances and cues to decision making whose long-term outcomes can impact on subsequent events.

Before going to the crime scene, the incident log can be used to ready an investigator. Abductive processes serve in gathering materials for narrative sense-making. This can be exemplified by the investigator's use of gaze at the scene of a (simulated) break-in. While saying nothing, she begins with how (and whether) an intruder entered. Cognitive dynamics serve in *looking*. Having inspected the door for forced entry (there were none), she turns to the desk (1) and, then, the open drawer (2). She is seeking to build a narrative based on possible evidence.

[Figure 1 about here]

Using experience, in (3) she checks whether the drawer had been forced. As money has been stolen, in (4), she turns to the cashbox. While saying nothing, she later reports fingermarks in the dust and on the handle. Silent thinking co-occurred with shifts of gaze in (5) and (6). Next, in (7) she notes loose coins on the desk and turns to the in-tray (8). Following 11 seconds of initial inspection, she scans the room (9) to locate signs of entry or exit. In moving towards narrative, verbal reports influence experience and action. However, nothing is said. Seeking evidence makes no more use of pure physical patterns than first-order language depends exclusively on the words reported. The activity's particular sense depends on, above all, who is acting, where they look, and current thinking. In action, the world takes on circumstance-relevant values. Languaging is no different. Far from generating sentences or 'using' constructions, we draw on all available resources.

In crime scene investigation, aspects of the environment become salient though observations, informal discourse and (silent) thinking. While facts and logic are initially secondary, observations can be reformatted for the trial. Once the narrative is clear, the investigator embeds artifacts into what becomes an argument. Gradually, cues become material records. Surrogates of second-order constructs – words and clues –shape content to the requirements of the court. In viewing texts as *language,* weight falls on wordings (and rhetoric). In legal tradition, we treat verbal patterns as a mode of displaying what we believe to be *true.*

**Compressing information**

In playing different roles a crime scene investigator exploits many different modes of co-ordination and, by extension, first-order language. This shows, above all, that we can repress the dynamics of linguistic flow by giving weight to wordings. Wearable technology serves, above all, for formatting cues and hunches in terms of second-order constraints. The prosecution's argument is thus supplemented by material traces. Since cognition is distributed, these can be re-integrated with looking, moving, speaking and hearing. In court, much depends on objects, texts and verbal displays. Since events centre on first-person phenomenology, material evidence and appropriate legal pronouncements have special status. Although, literacy is important, its role should not be exaggerated. Thus, all societies value skilled performances that match circumstances to verbal (and other) formulae. With literacy and education, fictional *languages* tend to dominate institutional life. As a result, spoken formulae and silent thinking are often subordinated to skilful use of physical surrogates that are believed to 'mirror' second order constructs.

[Figure 2 about here]

In crime scene investigation, we concoct stories, select evidence and prepare materials. Among other things, we use images or, technically, bit-maps of Shannon information (as in Figure 2). The prosecution invites jurors to see a specific image (and its bit-map) as *evidence*. They may see, for example, that a drawer has (or has not) been forced. While constrained by where and how a bit-map was made, looking must be integrated with written signs, evidence, and argument. Indeed, while using (Shannon) information, arguments are needed to bring a jury to a shared perspective. Agreement in judgement depends on a narrative that is revealed through argument and images, objects and inscriptions. Little is decided by the words actually spoken or the physical properties of the objects on display.

Many images carry the 'same' factual information (e.g. that the drawer was/was not forced). This will only count as such when people integrate compressed (Shannon) information with contingency-based learning and active perception. This is akin to how information is used by the colour-categorizing robots. Unlike such devices, however, our skills draw on *individual* life-history. Like other 'designed' systems, we escape from physics by using what Dennett (1991) calls *real-patterns*.[10] Functional equivalents to bit-maps serve in tracking environmental cues. When learning occurs, we modulate action in relation to circumstances. As Dennett (1987) sees, actions are thus predictable. Evolution, development and flexible behaviour all draw on compressed (Shannon) information. Strikingly, Steels and Belpaeme's (2005) robots perform similar functions. In tracking colours, their co-ordination uses human seeing. Their doings are mediated, as we have seen, by human judgements and, indirectly, how we apply *words* to colours. In this respect, they differ from organisms. It is, however, just as remarkable that even simple organisms make flexible use of compressed colour information.

Hawk-moths use colour in deciding where to feed (Raguso and Willis, 2002).[11] Far from being instinctual, choice of flowers depends on balancing relations between, among other things, odour and colour cues. They draw on synergistic learning. This has important implications. First, only written language bias leads us to picture cognition in terms of discrete symbols (input) that are processed in program-like ways.[12] Second, Dennett is correct that biology draws on real-patterns. Third, even if not applicable to hawk-moths, lived experience often matters. For example, foxes use learning to sensitise to hare posture. While like robots in using compressed

[10] For detailed discussion, see Ross (2000). Real-patterns (RPs) are defined as projectible under at least on possible physical perspective (i.e. can be differentiated by some kind of possible instrument). Thus a RP encodes information (about the structure of an object or event) where the encoding is more efficient than a bit-map encoding of E. Further, for at least one possible physical projections under which RP is projectible, at least one aspect of E can be tracked when the encoding is recovered from the perspective in question.

[11] In experiments with paper flowers, odour or visual cues alone were shown to be "redundantly attractive to naïve M. sexta males within 5 m of a flower". Feeding arose where there was "simultaneous perception of these stimuli -actions were "synergised by multimodal cues. They rely on action-perception systems that function both in real-time *and* on memory formation for 'colour discrimination'. This synergistic process integrates cues from two sensory modalities while using prepared learning (Wilson, 1998).

[12] If human type symbols reveal the brain's,way representing knowledge, we depend on mentalese or a language of thought (see, Fodor, 1975). This can, of course, be traced to the ECM: appealing to propositions –not shared judgements, Fodor supposes human uniqueness, uses knowledge as the paradigm of cognition and supposes that, to the extent that language in communication, it is a semiotic postal service.

information, they draw on learning biases. Like hawk-moths they use cues in picking out potential opportunities and threats.

Humans too use experience in compressing information. Indeed, once we hear utterances as utterances of *words*, languaging becomes part of our cognitive world. Our intelligence gains a collective dimension as verbal patterns give us the measure of what we and others are likely to do. Using life-history, we learn to act in ways that exploit people's expectations. Gradually, we come to formulate (and reformulate) judgements and, as Vygotsky (1986) stressed use them in guiding our own action. In Ross's (2007) terms, we *partition* the world (much as others do). Individual experience is thus reshaped as we engage with ready-formatted values, beliefs and practices. This is why, to a juror's eyes, an image can show that a drawer was (or was not) forced. We can endorse or contest what our fellows say. A bit-map comes to be evidence for (or against) the prosecution's case.

There is a perceptual hierarchy in use of compressed information. At the bottom, robots rely on what *we* perceive in (Shannon) information. At a higher level, interaction-based judgements promote synergistic learning in hawk-moths and foxes. Action-perception cycles promote sense-making which, in evolutionary time, gave rise to individual experience and the feeling of what happens. Humans take the next step. Using co-actional experience, we extend learning into a collective domain. In our cognitive world, we reach (and challenge) *agreement in judgements* (Wittgenstein, 1958: 242). As a result of hearing verbal patterns, we become adept in reformatting experience. We perceive objects (and bit-maps) in many ways. This occurs when we see a patch as *red* or, for that matter, a drawer as *forced*. Using compressed information, we integrate experience with perception as we act (together). While merely virtual, verbal patterns link life-history with the flow of compressed information. Unlike robots and animals, we build cognitive skills (by 'learning to think'). We can learn to see if a drawer is likely to have been forced or, indeed, to grasp and construct valid arguments. We rely, above all, on using cognitive dynamics to reintegrate perception, experience and verbal patterns.

**Language is distributed**

Placing language within the mind draws on pedagogical tradition. Taking the (mature) learner's perspective, language is viewed from the language stance. Accordingly, it is reduced to sentence-structure, logic, rhetoric, word-meaning (etc.). The results ignore how, as living beings, we rely on first-order language. They overlook dynamics and action. No attention is given to how languaging enables us to meet our needs by using historically derived constraints. We rely on dynamics –and co-ordinating–to connect across time-scales. Reinstating action, we challenge cognitive centralism and views that identify agency with an agent (see, Wilson, 1998). Since dynamics dominate, we use both each other and artefacts in managing and assessing linguistic flow. Since we hear verbal patterns, they need not be inner. Rather, first-person phenomenology and a capacity to repeat utterances (or, signing) is sufficient to open up the local cognitive world. During ontogenesis, verbal patterns increasingly constrain how children feel, think and act. Infants connect first and second-order by orienting to local expectations. Indeed, caregiver activity motivates even infants to assess and manage their doings. As they become familiar with culture and verbal patterns, dynamics prompt children to draw on extant evaluative standards.

While verbal patterns shape a normative world, linguistic flow engages us with both each other and material objects. As in seeing colour, bio-dynamics connect the world beyond the skin with compressed information and experience. Given social action-perception cycles, we discover verbal, symbolic, semiotic and other aspects of language. As we engage with the meshwork, language becomes part of who we are. In spite of beginning with a biogenic view of cognition, we thus return to a familiar place. Language is like an ancient city, a maze in which we walk as we discover human *forms of life.* The distributed view is novel only in tracing this to how bio-systems use compressed information. A dynamical history is deemed sufficient to lead us into Wittgenstein's city of language. Instead of setting out to *explain* words, sentences, rules and so on, these are merely descriptive. While framing thoughts, they are cultural constraints used to reformat certainties. [13] With training (and, above all, education) we expand the city's boundaries. Indeed, language is constantly being rebuilt as, acting together, we find new ways of realising values. While most results are best forgotten, in historical time, continuous innovation changes the meshwork. As others have noted (see, Deacon, 1997), verbal patterns appear virus-like. As they emerge, they enable us to prefigure and align with possible worlds. Whether talking, praying, using computers or creating and construing texts, we connect biology (and perception) with natural features, artifacts, people and verbal patterns. In history, language grows: it encompasses little streets, new boroughs and, today, gated communities and ecotowns.

Language self-organizes as individuals connect. In shared worlds, familiarity with verbal patterns (and normative traditions) shape how we act, feel and think. Since we *perceive* ever changing verbal patterns, we can construct both habits and more deliberate actions. With self-control, we privilege ways of connecting artefacts, values and modes of expression. Above all, we rely on other people's expectations. As value-realizing action, language shapes our identity, our actions and how we think, perceive and feel. Grounded as it is in first-order signalling, we rarely need to attend closely to what is actually said. Using intrinsic motivations –and acting together –we spark off narratives. As in CSI, we integrate expertise with objects, procedures and environmental resources. The ontogenetic roots of first-order language give us abductive powers. As seen in infants, these exploit full-bodied co-ordination that soon gives rise to modes of co-action. Gradually, we discover how to make strategic use of the values and artifacts of our local worlds.

First-order language is co-ordination. In scanning a desk at a crime-scene, our dynamics are faster than words. While using narrative, we feel out the world by anticipating how to use past experience. We prefigure opportunities. Evoking second-order patterns, neural motivating systems use resources to induce action (and inhibition). Individual biomechanics (shaped by history) ready us for future encounters. We modulate languaging by engaging with other people, across activities and (by extension) higher-order resources. Given dialogue, we develop both neural functionality and exquisite sensitivity to how our familiars will respond. First-order language thus brings individuals into contact or, indeed, enables them to use ancient traces of body-world experience.

While Saussure saw the language was both collective (langue) and individual (parole), he mistakenly posited a single 'object' of enquiry. Linguistics privileged first-person experience. In advocating the study of language-systems, linguists made the gratuitous assumption that we 'use' determinate forms and meanings. While of pedagogical value –and needed in legal arguments –this makes narrative-based thinking obscure. Yet, the model survived, and, in Chomsky's work, fused with

[13] Wittgenstein writes, "At some point one has to pass from explanation to mere description (1980 § 189)." He has in mind how hard it is to clarify certainties. This paper applies the lesson to how verbal patterns appear as a result of a history of languaging together.

individualism. In a toxic combination, we came to see ourselves as symbol processors with von Neumann like brains. Linguistic form was separate from co-ordination, dynamics and human agency. Action mattered little because, by fiat, language was program like. On the distributed view, by contrast, compressed information becomes part of linguistic flow. Acting together, we grasp and manipulate (putative) facts for strategic ends. By so doing, without inner intent, we realise values.

**Implications for the language sciences**

Deflating verbal patterns is a step towards naturalizing language. Far from relying on first-person phenomenology, language is social activity. The dynamics of bodily co-ordination trick us into *hearing* verbal patterns. This has parallels in learning to talk. Using circumstances, learning biases sensitise babies to (Shannon) information as they act and understand. Later, they come to hear 'words' and, eventually, adopt the language stance. Using first person phenomenology, they discover verbal patterns and, thus, the magic of wordings. Skills develop from meshing these with the events of (inter) action. It is likely that hybrid language co-evolved with human primates. We became ecologically distinct as our ways of life made increasing use of collective patterns. On this view, culture is partly constituted by skills in integrating linguistic flow with norms and artefacts. In co-evolutionary time, people were selected to value singing, praying, legal judgements, shouting, silent thought or, generally, ways of using compressed information. Language prompts innovation and diversity. Its spread demands interpretation from the many traditions that shape the view from everywhere. These include embodied-embedded cognitive science, dialogism, cultural-historical activity theory, cognitive semiotics, ecological psychology, conversation analysis, game theory, and, from linguistics, formalist, systemic-functional, integrational, ecological and bio-cognitive theories.

Language-activity and human life reshape each other. As self-organized and person-motivating systems, brains make languging part of experience. Biology thus enables us to use verbal patterns in meshing collective and individual experience. As a result, we can explore the adjacent possible. Once code views are rejected, cognitive science can reconnect with social and literary theory. When dynamics gain priority, three issues come to the fore:

- How linguistic, verbal and semantic categories change in historical and cultural contexts.
- How linguistic flow is constrained by second-order constructs and, conversely, how first-order resources influence use of second-order patterns.
- How language flow and its consequences differ as individuals move between and within activity-types.

While older than synchronic linguistics, recognition of compressed information gives new life to the first question. For virtual categories to function in space and time, they must exploit behavioural or cognitive reality. This raises issues about how we create and construe. While using neural processing, human agency also depends on how human subjects participate in our forms of life. Thus social change brings about new ways of engaging with verbal, semantic and linguistic patterns. The second issue, however, opens up unexplored country.  While Linell (2009) and his collaborators show how dialogue contributes to social life, few have even asked how first and second order language interact. In outline, Hodges (2007) seems to be correct in viewing languaging as values realizing activity.[14] Further, as Rączaszek-Leonardi (in press) argues, linguistic symbols may shape co-ordination rather as biological proto-

[14] In ecological psychology the idea comes through Martin and Davenport (1999), Reed (1996) and Gibson (1950).

symbols constrain physical processes. Somehow, we create and construe second-order constructs or how making/interpreting texts affect feeling, action and thought. Making a start on how this is possible, Bottineau (in press) asks how the verbal patterns of various languages constrain linguistic flow and Menary (2007) reconsiders how written signs exert their cognitive potential. Stressing historical change, Kravchenko (in press) posits that code-models and changes in the cognitive domain of written signs are undermining our inferential skills.

Work on first-order language draws on how Gumperz (1982; 2003) and Goodwin (2002) (among others) trace interaction into embodied action. Language unites gesture and visible expression which, as Thibault (2004a) shows, link events across time-scales. These shape human agency and consciousness (Thibault, 2004b). In psycholinguistics, while Järvilehto (in press) takes a dynamic view of reading, Rączaszek et al. (1999) explores the subtlety of understanding. In phonology, Port (2007) emphasises the richness of hearing. As illustrated by Steels and Belpaeme (2005), much is learned when robots to simulate linguistic phenomena (see, Lopes & Belpaeme, 2008; Cowley, 2008). Finally, there are implications for learning to talk (Thibault, 2004a), the applied language sciences (Kravchenko, in press) and issues in cognitive psychology (Fioratou & Cowley, in press).

**Conclusion**

When we identify language with the verbal, we are puzzled that forms do not reduce to physics (or biology). By contrast, if words use the dynamics of co-ordination, language is intrinsically hybrid. As we talk, we integrate virtual patterns with dynamics and the world. What we call *language* derives from a capacity to hear verbal patterns as individuals co-ordinate bodily activity. It is because of its symbolic and dynamic base that, as we language, we connect time-scales. In our cognitive domains, we use compressed information that inheres to dynamics. We mesh action with phenomenology that displays experience of a shared world. Without this, we would lose collective intelligence by coming to rely on contingencies and physical invariants. Like robots, we would exist without facts or literal meanings. In fact, languaging transforms human infants into persons. They learn how first-order expression connects with *other* people's experience. Given motivated reward-enhanced activity, children orient to norms and find a place in history. They become values-realizing agents who discover and dispute judgements. Using the distributed properties of language, they connect linguistic flow with second-order constructs. As babies become persons, they construe first-order experience against the collective domain of cultural traditions.

To naturalize language, biology needs information theory. Using compression, biodynamics shape experience and, in humans, nature adds a trick. By coming to *hear* verbal patterns, we link rewards with reciprocal engagement. Once we distinguish linguistic flow from verbal patterns, new horizons open up for the language sciences. First, 2$^{nd}$ order cultural constructs become population level constraints. Second, reciprocal interaction connects high-level constraints, linguistic flow and traditions that sustain human practices. Third, first-order languaging is inseparable from how feeling, expressive bodies contribute to human forms of life. All of this depends on bodies that see *colours* rather as they hear *words*. By hypothesis, virtual entities evolved as first-person phenomenology began to self-motivate action, speaking and feeling. Skills with language make us living subjects who sustain the language meshwork. This values realizing activity enriches lives as we animate the human relationships of the cultural world.

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