The Reformatting of *Homo Sapiens*

Peter Wolfendale

Introduction: The Posthuman Nexus

We don't know whether our ability to collectively represent ourselves – to say 'we' – emerged only once in cultural pre-history, or whether it is the result of a multiple genesis, appearing independently in different collectives at different times, enabling their members to divide and unite themselves into groups as the need arose. We equally don't know when this ability turned back upon itself, transcending any particular collective in the direction of an ideal, abstract community of we-sayers.[1] What we do know is that out of these multifarious, anonymous beginnings, has grown an increasingly refined capacity for cultural self-consciousness, in which we have substituted names for this most abstract 'we' – names which have progressively accrued descriptive and normative content as our need to understand and shape ourselves has grown. Whether we prefer 'man', 'mankind', or 'humanity', the history of these words is the history of our capacity for cultural self-consciousness, and the question of whether and how to replace or repurpose them is the question of the future of this self-consciousness, and the conceptions of *agency*, *selfhood*, and *value* that are bound up with it.

If the concept of *the human* has a fundamental feature that remains more or less constant from anonymous pre-history to the modern era, it is the idea that humanity is something more than one species of animal amongst others. Western culture was founded upon myths that sever us from the animal order, reinforced by their formalisation in philosophical and theological accounts of the natural order, and consolidated by their elaboration in classical humanism. Although the concept of the human is articulated in various ways within this tradition, and these articulations evince various degrees of explicitness, it is the perennial picture of 'man' as the *rational animal* that ties them together in distinguishing us from other animals, and the institutions of *language* and *technology* that constitute the characteristic marks of this rationality. However, although modernity has encouraged a rapid intensification

---

1 Cf. Robert Brandom, *Making It Explicit* (Harvard University Press, 1994), pp. 3-7.

of these characteristic differences – in *literary modernism* and *industrial capitalism* – it has equally engendered a more gradual dissolution of the perennial picture.

This dissolution is marked by four interacting trends. Firstly, the natural sciences have progressively undermined the supposed *uniqueness* of our animality, by isolating the empirical study of *homo sapiens* from the cultural understanding of *the human.* Secondly, the humanities have aggressively critiqued the purported *universality* of our rationality, by exposing the illicit privileging of masculine, bourgeois, and European forms of life implicit in the association of *reason* with Western civilisation. Thirdly, technological advancement has begun to compound these theoretical trends, by modifying and even threatening to recreate our *cognitive capacities* in artificial forms. Finally, environmental crisis has begun to catalyse the cultural consequences of these other trends, by confronting our societies with the *impermanence* of the natural order underlying the residual vestiges of the classical worldview. It is this nexus of historical trends – the so called 'posthuman condition' – that demands a change in our cultural self-consciousness, forcing us to extricate our concepts of agency, selfhood, and value from their envelopment within the perennial picture, and thereby to develop an *inhuman* alternative to classical humanism and its modern remnants.

One increasingly popular approach to this problem is the project of *critical posthumanism*, which turns the existing resources of critical theory and philosophical anti-humanism upon the posthuman condition as a whole, with the aim of completing the auto-deconstruction of the humanities and their reconstitution as *post-humanities*. There are important differences between the forerunners of this position, such as Jacques Derrida and Donna Haraway, and variations amongst its proponents, such as Rosi Braidotti, Katherine Hayles, and Cary Wolfe, but their shared focus lies in dissolving the defining *metaphysical oppositions* of classical humanism, such as those between body and mind, nature and culture, and even biology and technology, and thereby undermining associated *normative hierarchies* in the realms of sex, class, race, and even species.[2] In essence, critical posthumanism's response to the perennial

---

2   Cf. Jacques Derrida, *The Animal That Therefore I Am* (Fordham University Press, 2008); Donna Haraway, 'A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century' in *Simians, Cyborgs and Women: The Reinvention of Nature* (Routledge, 1991); Rosi Braidotti, *The Posthuman* (Polity, 2013); Katherine Hayles, *How We Became Posthuman: Virtual*

picture is to unbind our animality from the constraints of rationality: affirming the agency of the nonhuman, dividing selves into swarms, and rejecting universal valuations. However, the *generalised animality* on which this is predicated almost inevitably demands metaphysical elaboration,[3] and it is for this reason that critical posthumanism forms natural alliances with actor-network theory, new materialism, and other neo-vitalisms that transform the surprising, stubborn, and self-organising features of material things into an *inhuman agency* shared by posthuman and nonhuman alike.

A similarly popular alternative to critical posthumanism is the project of *transhumanism*, which aims to explore the practical possibilities for self-enhancement provided by the posthuman condition – empirical modification of *homo sapiens* and technological expansion of our cognitive capacities – and to elaborate their normative consequences. There is even wider variation in transhumanism and its forerunners, including thinkers as diverse as Nikolai Fedorov, Vernor Vinge, Hans Moravec, and Nick Bostrom, but the key opposition between them and critical posthumanism lies in their retention and extension of elements of classical humanism in their visions of transhuman agency, disembodied selfhood, and the universal value of self-cultivation.[4] From the perspective of critical posthumanism, transhumanism is at best naïve in hanging on to the constitutive metaphysical oppositions of humanism, and at worst hubristic in deepening them in the response to the collapse of the classical worldview.[5]

There is undoubtedly some truth to these criticisms of transhumanism, but it isn't obvious that *any* attempt to conserve elements of humanism is doomed to either naïveté or hubris. It may still be possible to locate an inhuman agency within the

---

Bodies in Cybernetics, Literature, and Informatics (University of Chicago Press, 1999); Cary Wolfe, *What is Posthumanism?* (University of Minnesota Press, 2009).

3 Braidotti gives this a name: *zoe* (*The Posthuman*, ch. 2).

4 Cf. J. Bennett, *Vibrant Matter: A Political Ecology of Things* (Duke University Press, 2010); K. Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Duke University Press, 2007); and D. H. Coole and S. Frost (eds), *New Materialisms: Ontology, Agency, and Politics* (Duke University Press, 2010).

5 There is an alternative critique of the hubris of transhumanism provided by David Roden in *Posthuman Life: Philosophy at the Edge of the Human* (Routledge, 2014). In opposition to critical posthuman, Roden articulates a position he calls 'speculative posthumanism' (ch. 2).

human as it was classically understood, rather than positing a metaphysical impulse traversing the nonhuman, through matter, animal, and machine alike. With this in mind, I propose in this paper to explore the alternative to critical posthumanism's response to the perennial picture, namely, unbinding our rationality from the constraints of animality: accounting for the distinctiveness of culture as a *relatively autonomous* system of linguistic and technological infrastructure, and explaining agency, selfhood, and value in terms of how our species has been *formatted* by and for this system. This strategy is far from unique, belonging to a nascent project of *rationalist inhumanism* developed in different ways by Reza Negarestani, Ray Brassier, and Benedict Singleton.[6] Nevertheless, the approach I will adopt here is distinctive in the way it frames the opposition between rationalist inhumanism and critical posthumanism. Most of the rest of the paper will be divided into two parts. The first part will re-examine the history of humanism leading up to the posthuman nexus, in order to highlight the features that can be extracted and repurposed by inhumanism. The second part will weave these features into an outline of a genealogy of reason, encompassing its genesis *in*, co-evolution *with*, and eventual liberation *from* the animal that is *homo sapiens*.

1. The History of the Human

The foundational myths that shape the cultural self-consciousness of the Western tradition are the Judeo-Christian myth of the fall of man and the Greek myth of Prometheus's theft of fire from the gods. Both myths describe a prelapsarian state wherein all living things have a prescribed role in the normative order of nature, as represented by the divine will. The origin of man in each case has two moments: a moment of *creation* as merely one more animal within the natural order, albeit with a distinctive quality, such as a *positive* resemblance to the divine or a *negative* absence of innate animal capacities, and a moment of *rupture* as man is wrenched from this order, only to be related to it in a new way. In the myth of the fall, it is the acquisition of *theoretical knowledge* that wrenches man from the natural order, insofar as it is

---

6   Cf. Reza Negarestani, 'The Labor of the Inhuman', Ray Brassier, 'Prometheanism and its Critics', and Benedict Singleton 'Maximum Jailbreak', all in *#ACCELERATE: The Accelerationist Reader* (Urbanomic, 2014).

only on the basis of understanding that *transgression* becomes possible. In the myth of Prometheus, it is the acquisition of *practical knowledge* that wrenches man from the natural order, insofar as it enables him to *subvert* this order and to carve out his own place within it.

Of course, there are various other aspects of these myths that influence the development of humanism, from the sexual specificities of original sin to the persistence of the human ideal as 'unmarked' by animal traits, but it is the *primal generality* of these ruptures that is most important: man is placed in a unique relation to the nature *as a whole*, with a capacity to understand and/or exploit any aspect of it, at least in principle. It is in the element of this generality that man truly resembles the divine, or has stolen something from it, and the subsequent theological negotiation of the relationship between God and man is essentially a matter of curtailing its scope, or of folding man's rupture with the natural order back into it, so that the range of his theoretical and practical capacities is circumscribed by his natural role. As such, the legacy of these myths is twofold: on the one hand, they frame the choice of *language* and *technology* as the characteristic marks of the human, insofar as these are the obvious manifestations of our distinctive *theoretical* and *practical* capacities; and on the other, they frame the relation between these capacities and questions of *value*, as established by their reincorporation into the normative order of nature.

It is Plato who is responsible for the most cogent reconstruction of the Prometheus myth, but this is only one way into his synoptic picture of the relation between man and world.[7] The crucial idea that Plato inherits from Socrates is that, insofar as thought is an art or technique, it has a normative dimension that is irreducible to social convention. His own brilliance lies in his commitment to thinking this normative dimension on its own terms, without grounding it in any antecedent order of nature, divine or otherwise. This is the real significance of the Idea of the Good in Plato's philosophy, which binds together the intelligible realm by providing a unified account of *value as such* and its division into epistemic, ethical, and aesthetic forms. Perhaps the great tragedy of Plato's thought is that, having established the autonomy of value

---

7   Plato, *Protagoras* (Oxford University Press, 2009), 320d-322d.

by subtracting it from the sensible realm, he is then able to treat it as the *ground* of the sensible. Man can then be distinguished by his capacity to see through the sensible to the intelligible and thereby to think and act in accordance with its autonomous norms.

Aristotle revises Plato's metaphysics of value by reinstating the normative dimension of the sensible realm in a new and more systematic form. He establishes the *teleological* framework of final causation alongside the *mechanistic* framework of efficient causation, enabling the first explicit attempt to classify nature – paradigmatically living things – in terms of functions. This enables both the first distinct *anthropology*, or the explicit study of man as a living creature, and the first distinct *theology*, or the explicit study of the divine as the efficient beginning and the final end of the causal order. It is Aristotle's anthropology that is largely responsible for the perennial picture of man as rational animal, presenting a unified account of theoretical and practical reason, and identifying man's capacity to cultivate himself – to *flourish* – as his distinctive final cause. It is Aristotle's theology that is largely responsible for the fusion of Greek and Judeo-Christian myths in the scholastic tradition, and its effective containment of the mythical rupture between man and the natural order, by enabling this order to prescribe the *limits* of human flourishing.

The emergence of classical humanism in the Renaissance is not so much about abandoning the core ideas of Aristotle as rejecting the religious monopoly on the study of human flourishing established under scholasticism. This intellectual monopoly was not entirely broken until the liberation of philosophy from theology enacted by Descartes and his modern successors, but this was preceded by a growing cultural drive to examine aspects of the human condition and explore associated possibilities of human flourishing. Moreover, it is in this period that the concept of the human accrues much of the detailed descriptive and normative content that will outlive its attachment to the religious worldview: the significance of human mortality, the specificity of human emotions (e.g., the virtue of romantic love), the structure of human social institutions (e.g., the nuclear family), etc., and in this process that particular features of European civilisation are implicitly converted into descriptive universals or normative ideals. Finally, it is this renewed concern with human

flourishing that catalyses the growth of *individualism* in European culture – a cultural trait and intellectual trend which will become ever more pronounced in modernity.

Descartes' distinctive contribution to modernity is not so much his metaphysical dualism – creating a strict separation between mind and body – but the conception of the mind on which it is based. There are three key features of this conception. Firstly, it focuses on the mind as the subject of *theoretical knowledge*, and sidelines practical questions regarding agency.[8] Secondly, it understands theoretical knowledge as consisting in *internal representations* whose correspondence to reality is understood in terms of mathematical modelling rather than pictorial resemblance. Thirdly, it treats the content and/or functioning of these internal representations as *epistemically transparent* to the subject that bears them. It is worth noting that these key features of of the Cartesian account of mind have been subject to extensive criticism from research in empirical psychology and artificial intelligence, and that critical posthumanism draws on these criticisms in advancing its own critique of humanism.[9]

There are a number of ways in which Kant modifies Descartes' approach to make it less objectionable in these regards, but his distinctive contribution to the modern paradigm is the project of *transcendental psychology*, which effectively sublimates Descartes' metaphysics of mind. Whereas Descartes is concerned with the mere fact that the knowing subject *possesses* representations, Kant is concerned with the fact that it is *responsible* for their correctness.[10] This means that, rather than asking what sort of *metaphysical substance* something must be in order to possess these special mental properties, Kant is concerned with the *normative status* of counting as responsible, and the *capacities* something must display in order to have this status. Leaving the details of Kant's account to one side, its influence is twofold. On the one hand, the sublimation of the subject from substance to status establishes a crucial difference between the *transcendental inquiry* into the nature of knowing as such and the *empirical inquiry* into our particular cognitive capacities. On the other, his concern with *theoretical responsibility* motivates a parallel concern with *practical*

---

8   Cf. Foucault, 'Technologies of the Self' in *Ethics: Essential Works of Foucault 1954-1984* (Penguin, 2000), p. 228.
9   Cf. Antonio Damasio, *Descartes Error: Reason, Emotion, and the Human Brain* (Vintage, 2006).
10 Cf. Brandom, *Making It Explicit*, pp. 7-11.

autonomy that formalises the emergent individualism of classical humanism and becomes central to the political culture of modernity.

It is difficult to efficiently summarise the changes wrought by modernity upon the concept of the human, and to explain how they bring about the posthuman condition to which we are responding. For this reason, I am merely going to discuss the analyses of these changes that have had the most influence upon the discourse of posthumanism, namely, the interlinked accounts of the *death of God* and *death of Man* provided by Nietzsche and Foucault. For both of these thinkers, modernity is characterised by the gradual dissolution of the very idea of a natural order inherited from religious myth and formalised by the scholastic appropriation of Plato and Aristotle. For Nietzsche, this means that the religious concept of God's role as an *ascetic ideal* underlying the social systematisation of value had begun to be usurped by the humanist concept of Man, only for the latter's dependence upon the former to threaten the collapse of value, or *cultural nihilism*.[11] For Foucault, it means that the natural sciences had liberated themselves from the *representational constraints* imposed by the assumption of a normative order, reconstituting the human as a *transcendental-empirical doublet* torn between the normative legacy of classical humanism and the new descriptive programs of linguistics, economics, and biology.[12] In predicting the death of Man, he is indicating nothing more than the inevitable dissociation of this doublet, as our implicit understanding of *who* we should be is forced to confront our explicit understanding of *what* we actually are.

I could tell a more comprehensive story of this slow demise, and the specific roles played in it by evolutionary biology, neuropsychology, cybernetics, and other disciplines. However, I'll return to some of these themes soon enough, and it is more important to end our history of humanism with Nietzsche and Foucault. The reason for this is that they see the twin deaths they describe as transitions in the evolution of more general phenomena – transitions which offer opportunities for increased self-consciousness. For Nietzsche, the ascetic ideal is only one form of value among

---

11 Friedrich Nietzsche, 'What is the Meaning of Ascetic Ideals?' in *On the Genealogy of Morals and Ecce Homo* (Vintage Books, 1989); 'Book One: European Nihilism' in *The Will to Power: In Science, Nature, Society, and Art* (Random House, 1973).
12 Michel Foucault, *The Order of Things* (Routledge Classics, 2002), part II.

others, and its passing opens the way for the *re-valuation of all values*.[13] For Foucault, the transcendental-empirical doublet is only one regime of self-relation among others, and its dissolution opens the way for experimentation with *technologies of selfhood*.[14] More importantly, not only do these more general accounts of *value* and *selfhood* point beyond the human, but they are grounded in genealogies of the social forces that transform human bodies into subjects, agents, and selves. They each describe the *ensouling* of the body as the imposition and internalisation of a social role, and thereby suggest a way to combine Kant's transcendental psychology with evolutionary socio-biology in a *genealogy of the inhuman*.[15]

2. The Genealogy of the Inhuman

Before leaping into this genealogy it is worth explicitly formulating both its *philosophical aims* and its *methodological constraints*. We are now in a position to see that our stated goal of unbinding rationality from animality is a matter of disarticulating and realigning the two halves of Foucault's transcendental-empirical doublet. This means explaining how the normative structure of *reason* can be autonomous and nevertheless be implemented by the causal structure of *homo sapiens* and its techno-linguistic infrastructure. The major constraint imposed by genealogy is that we must be able to show how this implementation could emerge naturally in the socio-evolutionary history of *homo sapiens*. This in turn implies that we must be able to show how the characteristic features we wish to retain from humanism – *theoretical representation* and *practical autonomy* – can be bootstrapped out of common features that the partisans of animality will find unobjectionable.

With these constraints in mind, I will frame my account as a genealogy of *information processing systems*. This has two obvious benefits. Firstly, the concept of information is the rosetta stone connecting the discourses of biology, psychology, and computer science, and enables us to draw on and respond to elements of each. Secondly,

---

13 Nietzsche, 'The Antichrist' in *Twilight of the Idols and The Antichrist* (Penguin Classics, 1990).
14 Cf. Foucault, 'Technologies of the Self', 'The Ethics of the Concern for Self as a Practice of Freedom' and 'What is Enlightenment?' in *Ethics: Essential Works of Foucault 1954-1984.*
15 Cf. Nietzsche, '"Guilt", "Bad Conscience", and the like' in *On the Genealogy of Morals and Ecce Homo*; Foucault, 'The Body of the Condemned' in *Discipline and Punish: The Birth of the Prison* (Penguin Books, 1977).

although information should not be confused with either meaning or representation, these notions can be understood in terms of information.

i) The Informatics of Animality

We will begin by considering the simplest information processing system common to biology and psychology: the *drive*. The simplest drives are reflexes that transform a given *sensory stimulus* into a specific *behavioural response*, but in general they can be understood as causal systems that take *variable inputs* and produce *systematically correlated outputs*. We tend to understand this systematic correlation in terms of a specific *problem* which it solves. For example, we can see the iterative growth of plant roots as driven by the need to optimize the search for nutrients and water. However, this does not mean that the information processing systems that constitute these drives *represent* the problems they are solving. In the case of plant roots, there is no integrated representation of the space they are traversing, nor the resources and obstacles it contains, but only distributed feedback loops formed by the hormonal signals governing branching and extension.[16]

It is also important to understand that a single system can contain a multiplicity of drives that causally overlap, and that their behaviour can as easily *conflict* as it can *converge*. Drives can develop shared mechanisms for receiving environmental information and adjusting the environment in accordance with it without thereby forming an integrated system for solving a larger problem. It is only once higher level drives emerge that filter and regulate the competing *impulses* produced by the lower drives that we can begin to talk of their organisation. For example, the complex affective modulation of libidinal impulses carried out by the various components of the limbic system in most mammals.[17] However, the crucial evolutionary advances in the integration of disparate drives are the transition from sensation to *simulation*, and the transition from behaviour to *control*.

---

16 Cf. Wolfgang Busch and Philip B. Benfey, 'Information processing without brains – the power of intercellular regulators in plants', in *Development*. 2010 Apr 15; 137(8): 1215–1226.

17 Cf. P.J. Morgane, J.R. Galler, and D.J. Mokler 'A review of systems and networks of the limbic forebrain/limbic midbrain' in *Progress in Neurobiology*. 2005 Feb 12; 75(2): 143-160.

Simulation emerges when a system possesses a functional subsystem that combines information from its various drives into a single store that is made *globally available* to them more or less *simultaneously*.[18] This subsystem doesn't need to retain information about previous states of the environment, or to extrapolate information about future states, but only to tie together the information processing performed by the various drives with something like a *common information format*. It is on this basis that we can begin to see the system as possessing something like an articulated *representation* of its environment, which contributes to the problem solving success of the various drives insofar as its elements correspond to things *within* that environment. Control then emerges when a system moves from integrated processing of sensory inputs to integrated processing of behavioural outputs, which requires the system to simulate *itself* and its behaviours as a distinct part of its environment. This primitive separation between self and world enables the system to move from *modulating* its impulses to *selecting* between the corresponding behaviours.

These capacities for simulation and control mark the emergence of psychology from biology, but it is important not to overestimate their informational role. On the one hand, they vary quite radically in character and complexity – including the whole range of creatures with central nervous systems. On the other, they do not by any means integrate the whole range of biological information processing upon which they supervene – excluding complex mechanisms of bodily self-regulation and simple reflexes hard wired into the nervous system.

ii) The Informatics of Rationality

This schematic overview of the sort of information processing that characterises *animal cognition* now puts me in a position to suggest the crucial difference between it and the sort of information processing that characterises *rational cognition*. However, before saying anything else about this distinction, it's important to insist that the relation between the two is much the same as that between the biological and

---

18 This is the function ascribed to consciousness by the *global workspace theory* (cf. Richard Robinson 'Exploring the "Global Workspace" of Consciousness' in *PloS Biol.* 7(3): e1000066). This is developed further by Thomas Metzinger in his account of the world-model (*The Ego Tunnel: The Science of the Mind and the Myth of the Self* (Basic Books, 2010), part I).

psychological dimensions of information processing just discussed: the rational comes in various forms, and it supervenes upon the animal without incorporating it in its entirety. Bearing this in mind then, the difference which makes this distinction takes us back to the myths with which we began: it is the *in principle generality* of theoretical and practical reason that distinguishes it from animal cognition.

The information processing capacities displayed by animals have evolved to solve certain *parochial* problems, and this is reflected in their innate capacities to simulate their environment. This is no less true of *homo sapiens*, whose neural architecture has been honed by millions of years of biological adaptation to excel at solving certain sorts of problem – from fine manipulation and episodic recall to facial recognition and social signalling – and to simulate an environment composed of a certain range of sensible items at familiar spatio-temporal scales. This is not to deny that our brains can be repurposed – that our imaginations can be stretched to *visualise* grand cosmic scales, strange quantum effects, or higher dimensional shapes our actual *vision* can't handle – but simply to insist that this is as much, if not more a matter of the *social structure* doing the repurposing as the *neurological structure* being repurposed.

The *frame problem* posed by research into artificial intelligence provides a useful way of making this point.[19] The problem is a difficulty faced by traditional symbolic approaches to AI based on linguistic models of theoretical and practical reasoning, and consists in the fact that the attempt to encode practical abilities to solve extremely simple problems in the form of means-ends reasoning (e.g., cooking an omelette) requires making explicit a seemingly intractable set of implicit assumptions about what information is and is not *relevant* to the task (e.g., that changes in the weather will have no effect on the denaturing of egg proteins). This is not an issue faced by simple animals that have evolved to solve relatively complex problems, or by humans whose *neural plasticity* enables them to learn to do the same, precisely because the

---

19 Cf. J. McCarthy and P.J. Hayes, 'Some philosophical problems from the standpoint of artificial intelligence' in *Machine Intelligence.* 1969, 4: 463-502; Murray Shanahan, 'The Frame Problem' in *The Stanford Encyclopedia of Philosophy* (accessed 4/11/2015).

cognitive heuristics they have adapted to the situation can't assess the *consequences* of information from outside their parochial frames.[20]

What may initially seem like an unsurpassable problem for linguistic accounts of intelligence actually reveals the distinctive feature of language, namely, that insofar as its meaning consists in the *functional role* that sentences play in reasoning, or in the whole social economy of *perception*, *inference*, and *action*, there is nothing *in principle* constraining the extent of their possible theoretical consequences, or their potential practical relevance.[21] There is thus nothing preventing them from encoding information stored in any more parochial information format. This means that the in principle *generality* of theoretical and practical reason derives from the in principle *extensibility* of the social norms which encode the content of its representations. The real significance of language is the capacity it grants us to make explicit and selectively modify the heuristic frames implicitly embedded in adapted cognitive heuristics. This is to say that the distinctive feature of rational cognition is its capacity for *un-framing* problems.

iii) Technology and Language

It now remains for me to complete my genealogy by describing how the intertwined emergence of language and technology have formatted *homo sapiens* for rational cognition. The first step is to acknowledge that social signalling and tool-use are displayed by a wide variety of nonhuman animals: for example, bees dance out vectors and distances to food sources, and crows fashion twigs into rudimentary manipulators. We must be careful not to identify language with the mere *communication* of environmental information between animals, or technology with the mere *supplementation* of innate bodily capacities. However, we must also

---

20 The major issue is the *monotonicity* of consequence, or the fact that additional information cannot invalidate prior inferences. The frame problem thus spurred the development of various *non-monotonic logics* (cf. David Mackinson, 'How to Go Non-Monotonic' in the *Handbook of Philosophical Logic*, 2nd edition, Volume 12, ed. D.M. Gabbay and F. Guenther (Springer, 2005)).

21 This picture was originally developed by Wilfrid Sellars in 'Some Reflections on Language Games' (*Philosophy of Science*, Vol. 21, No. 3. (Jul., 1954), pp. 204-228.) and has been substantially elaborated by Brandom (cf. *Making It Explicit*). In particular, Brandom has developed a compelling account of the role of non-monotonicity in chapter 4 of *Between Saying and Doing* (Oxford University Press, 2010).

recognise these as crucial *pre-adaptations* that make possible language and technology proper. I will now attempt to trace this path from proto-technology and proto-language to the complex cultural infrastructure of rational cognition.[22]

There are various stages of animal tool-use: from the *ad hoc* exploitation of immediately available resources, through the deliberate crafting of permanent tools, to the establishment of techniques of usage and enabling forms of social organisation. It is at the latter end of this spectrum that we find *homo sapiens*. However, the crucial *proto-technological* feature of such tool-use is the manner in which it enables early humans to break down practical activities into their component behaviours and resources, and thereby both to improve these components and relate them in new ways. This ability to identify, copy, and teach discrete chunks of behaviour allows a distributed signalling network to form within tool-using groups, which can effectively store a relationally articulated set of solutions to common problems. The propagation of practical innovations through this network then constitutes a sort of distributed *social cognition* capable of processing environmental information their neural systems were not adapted to simulate. It is also important to recognise the role that the tools themselves play in storing and processing this information, by encoding and propagating practical innovations in a manner orthogonal to social signalling. This integrated system of tools and associated *functional norms* governing their use marks the real beginning of cultural evolution.[23]

There are equally various stages in the development of animal communication: from the uncontrolled emission of context specific signals, through the controlled co-ordination of simple co-operative behaviours, to the transmission of variable information in co-ordinating complex forms of co-operation. The complexity of *homo sapiens'* capacity to communicatively co-ordinate co-operation grows in tandem with its relational organisation of the relevant activities, and becomes *proto-linguistic* at the point that *words* become tools with determinate roles within these activities.[24] This

---

22 My account draws on that provided by Wolfgang Wildgen in *The Evolution of Human Language: Scenarios, Principles, and Cultural Dynamics* (John Benjamins Publishing, 2004).

23 Cf. Heidegger, *Being and Time* (Blackwell, 1962), pp. 91-120. This is the essence of Heidegger's account of worldhood and significance.

24 Cf. Heidegger, pp. 203-210. This is essentially what Heidegger means when he says: "To significations, words accrue." (p. 204)

organisation thus provides the social scaffolding required for genuine language to develop, which only happens when these words become tools in a general linguistic practice capable co-ordinating various specific activities. This general practice emerges in at least two stages: the abstraction of *declarative sentences* that compress information humans can already simulate from *imperatives* and *directives* that feed this information into specific tasks,[25] and the abstraction of *inferential norms* governing the relations between these sentences from parochial capacities to update simulations in response to them.[26]

There is obviously a great deal more that can be said about the structure of language, and how our grasp of these inferential norms is manifest in the process of making, challenging, and justifying assertions by providing *reasons* from which they can be inferred. However, a simple example of the way this enables our linguistic representations of the environment to unframe our innate simulations of it will have to suffice: the difference between *weight* and *mass*. Weight is obviously a ubiquitous feature of our environment that has an affect upon most physical tasks, and we have evolved to simulate the weights of objects and ourselves in order to factor them in to solving such tasks. Nevertheless, the frame governing our practical understanding of weight is fixed by our evolutionary confinement within the earth's gravitational field. By contrast, insofar as the concept of mass is defined by precise inferential norms governing its relation to the concepts of *force* and *acceleration*, it has enabled us to un-frame our understanding of weight and apply it to other gravitational contexts, as well as to mathematically decompose and calculate solutions to terrestrial problems too complex to be held in the human imagination. This is the case with all empirical concepts produced and refined by the natural sciences: their representational content has less to do with individual neural simulation than collective inferential modelling.[27]

Finally then, it is important to see that the emergence of technology proper coincides with the emergence of language proper. This is because language transforms our socio-cognitive store of common solutions into a range of possible *means* and *ends*

---

25 Cf. Ruth Millikan, 'Pushmi-pullyu Representations' in *Language: A Biological Model* (Oxford University Press, 2005).
26 Cf. Brandom, *Making It Explicit*.
27 Cf. Brandom, *Between Saying and Doing,* ch. 4.

available for practical reasoning, and extends this range further by enabling the representation of ends for which there are no established means: from the primeval desire for warmth and shelter on the open plain, to the promethean dream of taming the nuclear fire at the heart of the sun. Far from subsuming the distributed socio-cognitive role of proto-technology then, the development of explicit practical reasoning enhances it, catalysing an explosive growth in capacities for action whose eventual result is modern industry. The co-evolution of language and technology thus leaves *homo sapiens* with a more or less integrated cultural infrastructure through which its innate abilities to simulate and modify its environment become dynamically extensible.[28]

However, it is important to see that the increased adaptability provided by these new modes of cultural evolution drives corresponding changes in biological evolution: the path from *homo habilis*, through *homo erectus*, to *homo sapiens* in its modern form is characterised by the reinforcement and enhancement of the morphological and computational preconditions of cultural adaptability.[29] This means that the gradual emergence of techno-linguistic rationality reformats the biology of the human *species*, in order that it can better reformat the neurology of human *individuals*. Nevertheless, there is no reason to think that the institution of rationality is irrevocably tied to these specific morphological and computational forms. The inhuman system that *ensouls* our bodies – transforming us into *subjects* responsible for our thoughts, *agents* responsible for our actions, and *selves* responsible for our own cultivation – can ensoul entirely alien somatic forms. Nietzsche's re-evaluation of values and Foucault's experimentation with selfhood may demand a substantially similar information processing *protocol*, but they may equally take place on a substantially different information processing *platform*.

---

28 This presents an alternative way of conceiving of what Roden calls 'the Wide Human (WH)' (*Posthuman Life*, ch. 5).
29 Cf. Wildgen, ch. 4; Timothy Taylor, *The Artificial Ape* (Palgrave Macmillan, 2010).