LEROI-GOURHAN AND THE LIMITS OF THE HUMAN

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Abstract
Leroi-Gourhan’s investigation of human prehistory in Le Geste et la parole questions the boundaries, or limits, that more traditional kinds of humanism have assigned to the human, pushing back the origins of the human to include hominid forms that might previously have been regarded as ‘prehuman’, and widening our definition of the human by considering the diverse ‘externalizations’ of mind and body in different forms of technical behaviour. This article examines the different models of interpretation informing the narrative of human evolution proposed in Le Geste et la parole — for example, the pervasive but never explicitly marked concept of equilibrium, and modes of conceptualization (e.g. control, feedback) and technical practice (e.g. electronics) drawn from cybernetics. The article argues that, while Leroi-Gourhan’s theory of the technical origins of language is a compelling one, as his exposition moves from the prehistorical homme fossile to l’homme actuel and finally to the hypothetical homme du futur, he appears to delineate another limit to the human: a point in human/technological evolution at which humanity becomes not more but less human than its historical and prehistorical ancestors. The article concludes by asking to what extent Leroi-Gourhan’s semi-indictment of modern technology is consistent with the more fundamental philosophy of technology that one finds in his work.

The ethnologist and prehistorian Andre ´ Leroi-Gourhan (1911–1986) was the leading figure in the discipline of prehistory in postwar France, whose wide-ranging work also exercised a pervasive influence beyond his own field of specialization.1 His major text, the two-volume Le Geste et la parole (1964–65),2 was a cardinal reference point in Jacques Derrida’s De la grammatologie (1967), providing the scientific foundations for Derrida’s thesis of the structural continuity of speech and writing.3 Some thirty years later the philosopher Bernard

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1 The most important studies in French of Leroi-Gourhan’s work are all posthumous: Andre ´ Leroi-Gourhan ou les voies de l’homme: actes du colloque du CNRS, mars 1987, ed. by Lucien Bernot (Paris: Albin Michel, 1988); Marc Groenen, Leroi-Gourhan: essence et contingence dans la destinée humaine (Paris and Brussels: De Broek & Larcier, 1996); and Autour de l’homme: contexte et actualité d’Andre´ Leroi-Gourhan, ed. by Françoise Audouze and Nathan Schlanger (Antibes: APDCA, 2004). Since the publication of the English translation of Le Geste et la parole in 1993, there has been a steady growth of interest in Leroi-Gourhan’s work across a number of disciplines in the English-speaking world. However, with the exception of his work on prehistoric art, the majority of Leroi-Gourhan’s publications have still not been translated into English. According to prehistorian Randall White, this deficit of translation explains the historically biased reception of Leroi-Gourhan in the US; see R. White, ‘Introduction’ to Andre´ Leroi-Gourhan, Gesture and Speech, trans. by Anna Bostok Berger (Cambridge, MA: MIT Press, 1995), pp. xiii–xxii (pp. xiii–xiv).

2 Andre´ Leroi-Gourhan, Le Geste et la parole, 1: Technique et langage (Paris: Albin Michel, 1964); Le Geste et la parole, 11: La Mémoire et les rythmes (Paris: Albin Michel, 1965). References to this work will be given in the text, citing volume and page number(s).


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Stiegler, in *La Technique et le temps*, revisited *Le Geste et la parole*, advancing a theory of human cognition based on the notion of a ‘maieutic’ relationship between the technological and the mental, a relationship that, as Leroi-Gourhan had demonstrated, is conceivable only from the long durational perspective of human evolution. As these important readings of Leroi-Gourhan indicate, the enduring interest of his work is that it transcends the limitations of any one discipline, and indeed challenges that most reflexive of disciplines, philosophy itself, to rethink some of its most fundamental definitions of the human. Placed in the wider context of postwar French thought, Leroi-Gourhan’s work could therefore be seen as participating in the ‘new humanism’ that Lévi-Strauss was claiming for anthropology and the human sciences, adding diachronic depth to the synchronic picture of the human mind provided by structuralism. This form of scientific humanism questions the boundaries, or limits, that more traditional variants of humanism have assigned to the human. The purpose of this article is to explore how Leroi-Gourhan’s investigation of the human past in *Le Geste et la parole* results in a series of adjustments of these limits or boundaries, but also how, extrapolated to the present and the future of the human species, it leads to some curious, and perhaps questionable, conclusions on the fate of *Homo sapiens* in a thoroughly technicized world.

As mentioned above, *Le Geste et la parole* is Leroi-Gourhan’s masterwork, an impressive synthesis of more than thirty years of research in ethnology, archaeology, palaeontology, technology, and prehistoric art. In the book’s opening chapter, ‘L’Image de l’homme’, the author situates the discipline of prehistory in a long tradition of the human preoccupation with origins, a preoccupation rooted in the basic human need to make sense of where we come from and, therefore, of what we are and what we shall become. In a move reminiscent of the introduction to Lévi-Strauss’s *Mythologiques*, Leroi-Gourhan suggests that in this respect the modern science of prehistory is simply a more recent — albeit more objective — avatar of the myth of origination (I, 9–10). In the first chapter of *Le Geste et la parole* he therefore traces the development of the different, prescientific images of humanity from the medieval and early modern periods through to the birth of prehistory as a discipline in the early nineteenth century and its recent consolidation in the middle of the twentieth. As this narrative shows, historically there is an increasing rationalization of our image of the human both in the dimensions of space (discovery of the generic identity of humanity beyond physical or cultural difference) and time (discovery of the long duration of geological time and the extended prehistory of humanity within it),

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but also, with the advent of evolutionary theory, in relation to the animal world (confirmation of the zoological continuity between humans and all vertebrate forms). Paradoxically, it is the last of these rationalizations that, while dissolving the myth of human separateness, also permits the persistence of what according to Leroi-Gourhan is another myth, that of the proximity of human and primate. This myth has followed the history of prehistory like the shadow of its prescientific past, to the extent that even in the twentieth century interpretations of the palaeontological record — the ever-growing body of empirical evidence provided by the fossilized remains of different hominid forms — persisted in searching for a transitional form of humanity, a ‘missing link’ between primates and humans. This, it could be said, is an important part of the programme delineated in the opening chapter of Le Geste et la parole, that is, to dispel the myth of the ‘homme-singe’ and establish the essential limits of the human in relation to the animal world — what makes the human human.

Already in the final section of the first chapter, ‘Les Critères de l’humanité’, we are given the main elements of Leroi-Gourhan’s definition of the human — the fundamental evolutionary event of upright posture, correlated with a flattening of the face, recession of the teeth, and the decoupling of the hand from the locomotive function, freeing it for forms of technical activity that are quite unlike those found in the animal world:

La liberté de la main implique presque forcément une activité technique différente de celle des singes et sa liberté pendant la locomotion, alliée à une face courte et sans canines offensives, commande l’utilisation des organes artificiels que sont les outils. Station debout, face courte, main libre pendant la locomotion et possession d’outils amovibles sont vraiment les critères fondamentaux de l’humanité. Cette énumération laisse complètement à part ce qui fait le propre des singes et l’homme y apparaît comme impensable dans les formes de transition où s’étaient complu les théoriciens avant 1950. (I, 33)

Taken in isolation, this passage might seem like a scientifically informed restatement of a familiar topos of traditional humanism, that of homo faber, distinct from the animal world not only through the agency of language but also through the artificial (that is, separable) extensions of technology. However, the implications of Leroi-Gourhan’s analysis are much wider than this. As he goes on to note: ‘On peut s’étonner que l’importance du volume du cerveau n’intervienne […] mais il me semble certain que le développement cérébral est en quelque sorte un critère secondaire’ (I, 33). This prioritization of anatomical configuration over cerebral development will become an important leitmotif of the subsequent chapters of Le Geste et la parole, and constitutes a critique of a particularly tenacious — and pervasive — vision of humanity in which the brain is predicated as the driving force in the emergence of the human. What Leroi-Gourhan’s analysis in the first volume of Le Geste et la parole will insist upon are the mechanical conditions of the human, the articulation of body parts without which the emergence of human intelligence and human consciousness as we know them would be properly unthinkable. In effect, what he is describing in these chapters is a kind of natural technology that precedes human
technology, a *mécânique vivante*, as he terms it elsewhere.\(^8\) In this respect, one finds the technical already at work in the biological, before what is commonly perceived as the emergence of the technical from the (biological) human.

In the beginning is not intelligence but mobility: this, Leroi-Gourhan asserts, is the primordial fact of human evolution. The second chapter of *Le Geste et la parole* locates the conditions of possibility of the human not in relation to some lost primate cousin but within the infinitely wider context of vertebrate evolution. Leroi-Gourhan’s approach in this chapter is to track the successive bifurcations in the evolution of the vertebrate body plan, bringing out at each stage the different mechanical traits that will finally converge on the specifically human configuration. Each of these stages constitutes a further ‘liberation’, as he terms it, of living forms in relation to their environment, that is, a greater degree of mobility and a complexification of their interactions with the world. His exposition, therefore, takes the reader quite literally from the fish to the human, through the extended sequence of bilaterally symmetrical life forms where the functional requirement of nutrition and metabolism is served by what he terms the *champ antérieur*, the forward-facing organs (mouth, fin, paw, hand) that ensure locomotion, orientation, and the capture and processing of food. An important feature in the evolution of the *champ antérieur* is the emergence and complexification of different kinds of nervous system to handle the coordination of the forward-facing organs; here, and in his subsequent exposition, Leroi-Gourhan uses the cybernetically inflected vocabulary of *contrôle* and *commande* to describe such coordination (we shall return to the cybernetic model below). But he also emphasizes that the development of the nervous system is a secondary phenomenon, that is, it is an adaptation to already existing structures and functions: ‘l’aménagement nerveux suit celui de la machine corporelle’ (I, 75). At the different points of bifurcation of the evolutionary sequence, there are shifts in the structure of coordination between the different organs of locomotion and prehension. In the vertebrate line leading to the human, an important point of bifurcation occurs where organs of locomotion also come to serve as organs of manipulation and coordination with the mouth. With the advent of upright posture in early hominid forms, the hand is entirely freed from the function of locomotion and there is a total liberation of the *champ antérieur*.

It is not possible here to do justice to the depth and detail of Leroi-Gourhan’s analysis of vertebrate evolution in *Le Geste et la parole*. However, it is important to reiterate that the purpose of his analysis is as much to demonstrate the continuity of the human with the animal as to argue for its distinctness from it; we are dealing here with ‘une forme humaine encore profondément engagée dans le monde animal’ (I, 56). It is also important to note that, while

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Leroi-Gourhan explicitly marks ‘liberation’ as a key concept for our understanding of the process of evolution towards the human, there is another, unmarked term or concept that equally structures his analysis, that is, the concept of *equilibrium*. At each stage of vertebrate evolution, the adaptation and survival of different life forms is dependent on a balancing out of the forces distributed between the combined functions of suspension, locomotion, and predation, a kind of dynamic equilibrium specific to each category of organism. When noting the diverse configurations of the forward-oriented organs, for example, Leroi-Gourhan refers to ‘le rôle capital qui a été joué dans l’évolution des Vertébrés par les variations d’équilibre entre les deux pôles du champ antérieur’ (1, 57, my emphasis). In the following chapter, when discussing the evolutionarily decisive event of upright posture (bipedalism) in hominids, the associated adaptations of the feet and the pelvis permit the weight of the trunk to be sustained ‘en équilibre’, while the skull is described as resting ‘en équilibre’ at the summit of the spinal column (1, 92). As we shall see, the idea of balance or equilibrium extends beyond Leroi-Gourhan’s descriptions of animal and human anatomy, and will later be applied more generally to the relationship between the human and the technical, the human and the social, the human and the natural world.

Leroi-Gourhan’s argument for the secondary nature of neurological adaptation in vertebrate evolution has important consequences for his definition of the human, because, when he goes on to discuss the earliest forms of hominids, it is not the brain that is taken to be the primary driving force for human evolution, at least not in the first instance. In fact, what is striking about early human forms is the small size of the brain case (500 cc), approximately one third that of anatomically modern humans (*Homo sapiens*). Here, Leroi-Gourhan repeatedly underlines the strangeness, the uncanniness, of what in the early 1960s was the earliest specimen of a protohuman skull, the fossil named *Zinjanthropus boisei*:

Aucun fossile relativement proche de nous ne laisse ce sentiment d’étrangeté, presque de gêne ou de discordance, aucun ne donne l’impression d’un homme inhumanisé plus que celle d’un singe qui s’humaniserait. Cette gêne vient de ce que les Australanthropes sont en réalité moins des hommes à face de singe que des hommes à boîte cérébrale défiant l’humanité. Nous étions préparés à tout admettre sauf d’avoir commencé par les pieds. (1, 97)

At this lower limit of humanity, as it were, there is nevertheless a clear separation between primate and human: *Zinjanthropus* is not the fabled missing link. At the same time, the human he or she represents seems inhuman, unlike hominid remains from later periods — hence the sense of defamiliarization, of uncanniness. As Leroi-Gourhan puts it, we find it difficult to accept that we started with the feet and not with the brain: bipedalism, which ‘liberates’ the hand, is the mechanical condition of possibility of the human and precedes

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9 The English-language translation of *Le Geste et la parole* systematically renders *équilibre* as ‘balance’. While this translation choice is consistent within its own parameters, it could be argued that it eliminates the more scientific resonances of the original term.
advanced cognition. *Zinjanthropus* is already (strangely) human because this small-brained biped was also a toolmaker.10 The implications of this apparent mismatch (small brain accompanied by technical intelligence) are that we are led to revise our fundamental definitions of the human: ‘tout ce que révèlent progressivement les premiers anthropiens connus entraîne vers une révision profonde des notions classiques sur l’humanité’ (I, 98). Specimens such as *Zinjanthropus* show us that, anatomically, a form of humanity is possible before the full development of the brain: ‘les instruments corporels sont apparus, humainement constitués, bien avant que l’évolution du cerveau soit terminée’ (I, 101). This reverses the order of priority articulated in traditional humanisms — religious, atheist, or scientific — where the biological human emerges fully formed from the mind of God or the matrix of nature, as the agent and originator of culture rather than the evolved product of culture.

The lower limit of the human, as we have called it, corresponds to the period known as the Lower Palaeolithic, which extends from approximately −2.5 million years to 250,000 years BP.11 Leroi-Gourhan’s analysis traces the different stages of humanization (his term) that lead from the earliest known forms of humanity at the start of the Lower Palaeolithic through to the intermediary forms of the Middle Palaeolithic and finally to the appearance of anatomically modern humans during the Middle and Upper Palaeolithic (250,000–10,000 years BP). The fossil record itself, restricted quite literally to stones and bones, shows two parallel series of developments: on the one hand, there is a doubling of brain capacity to 1000 cc during the Middle Palaeolithic, and a further fifty per cent increase to approximately 1500 cc by the time of the Upper Palaeolithic; on the other hand, there is a visible complexification and diversification of the tools associated with human fossil remains. Leroi-Gourhan is careful to qualify that, despite appearances, this parallel development does not demonstrate a simple relation of cause and effect between brain and tool, in which a spontaneous and independent growth of brain size would determine ever higher levels of technical sophistication. First, it is the evolutionarily prior event of the upright posture that provides the mechanical conditions for enlarged cranial capacity: the brain gradually occupies the space made available by the ‘fanning out’ of the brain case, culminating in the total ‘liberation’ of its frontal regions with *Homo sapiens* (I, 110, 117). Second, the relationship between brain and tool, as Leroi-Gourhan describes it, is a reciprocal rather than a one-way relationship, one of co-evolution, co-determination, or, again to use the language of

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10 *Zinjanthropus boisei*, or, as it is currently named, *Australopithecus boisei*, was discovered by anthropologist and archaeologist Mary Leakey in the Olduvai Gorge in Tanzania in 1959. The discovery was a critical event in the development of modern palaeoanthropology. Dated to −1.8 million years BP (see note 11 below with regard to dating conventions), the presence of stone artefacts in the same geological stratum led Louis Leakey to describe *Zinjanthropus* as a protohuman, and therefore our direct ancestor. Subsequent excavations at Olduvai confirmed the overlapping presence of *Australopithecus boisei* and *Homo habilis* at the same time and in the same location, so that it is virtually impossible to be totally certain of the identity of the toolmaker. See Donald Johanson and Blake Edgar, *From Lucy to Language* (London: Weidenfeld & Nicolson, 1996), pp. 90, 156.

11 BP = ‘before present’, that is, according to current dating conventions, before 1950 CE.
cybernetics, ‘feedback’. Advanced cognition is therefore not simply the product of some chance mutation of the nervous system, but the result of the technical implication of the human in the material world, a two-way coupling of biological evolution and technical development. Moving from external to internal anatomy, from what he alternately calls the ‘architecture’, ‘instrument’, or ‘machine’ of the human body to what here could be termed its control centre, the brain and nervous system, Leroi-Gourhan notes that modern humans share with primates a highly developed premotor cortex, of which, neurologically, the greater part — eighty per cent in humans — is devoted to control and coordination of the face and hands. Topographically, the systems governing the articulation of hand and face occupy contiguous regions of the premotor cortex, a clear indication of their functional convergence. However, despite the similarities between primate and human, there are significant qualitative differences:

Une étroite coordination existe entre l’action de la main et celle des organes antérieurs de la face. Chez le singe cette liaison est de caractère surtout alimentaire et cela aux proportions près est vrai aussi chez l’homme, mais en outre il faut constater chez ce dernier une coordination non moins forte entre la main et la face dans l’exercice du langage. Cette coordination qui s’exprime dans le geste comme commentaire de la parole reparait dans l’écriture comme transcription des sons de la voix. (I, 121–22)

If the liberation of the hand for technical activity remains the primary determining feature of the human, then one important corollary of this liberation is articulated language. The neurological continuity of the control of hand and face means that in evolutionary terms the technique of writing is as ‘natural’ an extension of the human mind as speech (in De la grammaïologie Derrida will use this fact to question the traditional philosophical subordination of writing to speech). Language is therefore co-emergent with technical intelligence and not — again as the traditional humanist perspective would have it — an innate capacity or a cognitive mutation preceding technology. The archaeological record shows a slow but perceptible complexification of tool stereotypes, indicating the multiplication and diversification of the sequence of gestures — what Leroi-Gourhan terms the chaîne opératoire — required to fabricate different categories of tool. The chaîne opératoire itself indicates the presence in early humans of intentional, predictive thinking directed towards a future goal. Along with the increase in brain size mentioned above, the complexification of the chaîne

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12 Stiegler uses the term ‘maieutique’, or less frequently, ‘dialectique’ to describe Leroi-Gourhan’s model of circular causation between the biological and the technical. This kind of terminology tends to draw Leroi-Gourhan’s model closer to the discursive field of philosophy, and, arguably, elides its conceptual affinities with cybernetics. Contemporary palaeoanthropology uses the term ‘biocultural feedback’.


opératoire from early humans through to Homo sapiens is indicative of a comparatively greater cognitive capacity in the latter, but the capacity for language is already present, insists Leroi-Gourhan, in the earliest forms of humanity (1, 126–27). The picture the author gives us of our prehistoric origins is therefore one of a progressive humanization, as he terms it, from the Lower to the Upper Palaeolithic, but one in which each of these successive forms of humanity remains incontrovertibly human (1, 118).

Despite this more inclusive definition of the limits of the human, it remains that Homo sapiens, both anatomically and behaviourally, represents the closest link to present-day humans. While technical and linguistic intelligence remain the most basic criteria for defining the human, Leroi-Gourhan argues that the archaeological record for Homo sapiens shows evidence of a qualitatively more complex mental and psychological life involving aesthetic and religious consciousness. This is where Leroi-Gourhan seems to delineate a second limit to the human: the point at which humanity as we know it begins. Whereas the technical intelligence of previous forms of humanity served the most limited of ends — material subsistence and survival — the (self-)reflexive form of humanity that emerges with Homo sapiens finally transcends these strictly biological limits. 15

The emergence of technical behaviour in early humans is indeed viewed by Leroi-Gourhan as a natural phenomenon, a kind of biological extension or externalization (exteriorisation) of the human body, whereas the imaginative and creative capacities of Homo sapiens are evidence of an increased autonomy of the mental in relation to the material (1, 134, 140, 151–52). In La Technique et le temps Bernard Stiegler argues that this distinction between technical and spiritual (aesthetic, religious) intelligence introduces a logical contradiction into what up to this point has been a consistently materialist interpretation of human origins. While the major part of Leroi-Gourhan’s analysis challenges the traditional philosophical conception of the human as essentially pre-technical, his postulation of distinct and non-technical cognitive capacities for Homo sapiens in effect establishes a second origin for the human that is practically equivalent to the traditional humanist position. The causes of this second origin, unlike those of the first, are not properly explained, and the problem is resolved by what Stiegler considers to be an artificial distinction:

Cependant, il reste à savoir si Leroi-Gourhan ne se contente lui-même ici de résoudre le problème par un nouvel artifice — précisément l’opposition faber/sapiens, ou technique/spiritualité. Car ce second ‘passage’ est au fond celui de l’accession à cette ‘intelligence non technique’ à laquelle Leroi-Gourhan souscrit lui-même sans réserve, et qu’il n’interroge donc pas: tout ce qu’il a pu nous dire d’explicatif quant à l’intelligence technique n’apporte aucune lumière quant à l’émergence de cette intelligence prétendument ‘non technique’. Il faut du même coup qu’au lieu une

enigmatique seconde origine. Tout ce qui est gagné grâce à l’analyse de l’‘extériorisation’ pour comprendre le surgissement du technique, en tant qu’il n’est pas le fruit d’une conscience créatrice, est reperdu dès qu’est restauré une intelligence non technique qui, elle, est bien considérée comme créatrice.\(^1\)

Stiegler’s critique of Leroi-Gourhan is a penetrating one. It would indeed be interesting to test this critique on more recent thinking in prehistory, which continues to interpret the advent of *Homo sapiens* as a qualitatively distinct phase of human evolution, using more or less the same categories of description as Leroi-Gourhan himself.\(^2\) However, despite its effectiveness, Stiegler’s reading is limited to the question of human origins and does not address what might be problematic in the wider narrative of human evolution presented in *Le Geste et la parole*. If we return to the opening chapter of the text, it will be remembered that Leroi-Gourhan presents the discipline of prehistory as a modern scientific variant of the origin myth, which attempts to make sense of where we come from, and therefore of what we are, but also of what our future will be. In this respect the book deals with three articulations of the human: *l’homme fossile*, the different humanities depicted in the palaeontological and archaeological record, representing the process of humanization described above; *l’homme actuel*, biologically the same species as the most recent of our prehistoric ancestors, *Homo sapiens*, but inhabiting a world transformed by an extended history of technological evolution; and *l’homme du futur*, the extrapolation from our past and present, *l’homme fossile* and *l’homme actuel*, to our possible future(s). In temporal terms, massively the greater part of human history is occupied by the prehistory of *l’homme fossile*, and the greater part of this prehistory itself is characterized by an extremely slow rate of technological evolution: it is only during the comparatively shorter time spans of the Middle and Upper Palaeolithic that the archaeological record shows an acceleration in technological development, visible in the complexification and diversification of tool stereotypes described above. While biologically there is a stabilization of human evolution with the advent of *Homo sapiens*, from the Upper Palaeolithic onwards the rate of technological development continues to accelerate. This technological evolution continues the process of externalization that Leroi-Gourhan identified as fundamental to the original emergence of the human: the externalization of technical functions in the fabrication of tools and other artefacts, but also the externalization of behaviour in social memory. It is within this triangle of the biological, the technical, and the social that the subsequent analysis of *Le Geste et la parole* operates.

There is biological stabilization of the human with *Homo sapiens*, but the technical and social infrastructures that define and support the human species continue to evolve into historical times. While Leroi-Gourhan leaves open the question of progress in social organization — it is not self-evident, he argues, that absolute progress is ever possible in this domain — perfectibility is possible.

\(^{16}\) Stiegler, *La Technique et le temps*, i, 170.

in the realm of the technical. In the second volume of *Le Geste et la parole* the author delineates the major stages of technological evolution from the end of the Palaeolithic through to the present-day situation of *l’homme actuel*. The different sequences of this evolution may be represented schematically as follows:

- Hand tool (direct manual operation)
- Manual machine (mediated amplification of manual gesture)
- Naturally powered machine (elemental or animal motors; human control)
- Industrial machine (artificial motors; mainly human control)
- Cybernetic machine (artificial motors; automatic control)

Each of these stages constitutes, in Leroi-Gourhan’s terms, a further externalization of the human and therefore an increasing degree of liberation in relation to the physical world. From this perspective the trajectory of technological evolution is an ascendant one. At the earliest, emergent stage of this evolution, human transactions with the material world are limited to the simple extension of the tool, the instrument that is made and manipulated by the hand. The second stage, claims Leroi-Gourhan, is a decisive one, chronologically difficult to situate but most probably coincident with the rise of *Homo sapiens*. This is the stage of the simple machine, the ‘machine manuelle’, such as the lever, later the sling, followed by the bow, traps, pulleys, and so on, which are devices that augment human gesture but still require direct manual intervention (II, 47). The third and, according to Leroi-Gourhan, comparatively late stage corresponds with the use of animals and the elements (wind, water) to drive more complex machines; it is the stage of motor liberation where the role of the hand is reduced to that of initiator and controller of a sequence of operations programmed into the machine. This is followed by another decisive stage of technological development, that of our liberation from dependence on naturally generated forces — animal or elemental — and the creation of artificial motors. Historically, this stage corresponds to the Industrial Revolution and to the invention of the steam engine, which permits both an exponential increase in the generation of power and a liberation of the machine from naturally (geographically) determined sources of power. However, this advanced stage of technical civilization is not the final or most recent stage: the machines of the Industrial Revolution are powerful but not ‘intelligent’ — they are, as Leroi-Gourhan puts it, ‘sans système nerveux’ (II, 51), for they still require a degree of human supervision. If previous stages of technological evolution marked the progressive externalization of human gesture — its movement from the tool to an ever-proliferating family of machines — then our current age represents a final stage of externalization, that of the human nervous system, and indeed the mind itself, in the fully programmed, automatic machine:

Il s’agit donc maintenant de suivre les étapes qui marquent une libération opératoire si poussée dans les sociétés actuelles qu’elle a atteint non seulement l’outil mais le geste dans la machine, la
mémoire des opérations dans la mécanique automatique, la programmation même dans l’appareil-lage électronique. (11, 36)

While it is not teleological, Leroi-Gourhan’s account of human technological evolution is deterministic, to the extent that the sequence of externalizations it describes is not an arbitrary development but the necessary product of the intersection of the biological (human) and the material (world). It expresses what Leroi-Gourhan in his earlier work on the history of technology had described as la tendance technique, that is, the technological deterministic dictating that humans will engage with their external environment (milieu) in predictable and convergent ways, and that the aggregate tendency of technological evolution will be towards an increasingly effective engagement with that environment.18 There is, however, a qualitative difference between Leroi-Gourhan’s prewar and postwar thinking on technology. Indeed, it could be argued that the kind of thinking about technology that one finds in Le Geste et la parole would have been impossible before the Second World War and the scientific and technological advances that occurred in its wake. I am thinking here not simply of developments within the cognate fields of prehistory, archaeology, and palaeontology, important as these were,19 but rather of a more general epistemological shift reflecting the scientif–technological culture of the postwar period and formalized in the discourse of cybernetics.

The best short definition of cybernetics remains that of the subtitle of Norbert Wiener’s classic book Cybernetics: or Control and Communication in the Animal and the Machine.20 Cybernetics originated in convergent developments in communications and engineering control technologies in the first half of the twentieth century. In cybernetic control systems the relatively lower quantities of energy required for transmission of information (communication) are mobilized to direct or regulate (control) the higher magnitudes of energy involved in the movement and articulation of complex machinery. Expressed schematically, the cybernetic system involves a coupling of programme and mechanism via a channel of communication. This coupling is not simply a linear one of cause to effect, from programme to mechanism: in cybernetic systems information on the result of the command (signal) transmitted to the mechanism is looped back to the programme itself to check and, if necessary, compensate for any deviation from the parameters set by the programme, in a circular or reflexive process known as ‘feedback’. The defining technology here is electronics: Wiener describes the articulation of programme and mechanism supported by this technology as a second Industrial Revolution.21 However, as the subtitle of his book indicates, the importance of cybernetics is not only to describe this technological

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19 See note 10 above.
21 Ibid., pp. 27–28.
revolution, but also to generalize it. The increasing complexity of ‘intelligent’ or reflexive machine systems in its turn throws light on the functional centrality of control, communication, and feedback in biological systems, from the cell to the central nervous system. Moreover — and this will be essential for our reading of Leroi-Gourhan — Wiener’s book does not simply describe the realms of the animal and the machine as homologous but separate instances of cybernetic function, but also looks at the coupling of the human animal and the machine, an association that in the twentieth century assumed new levels of complexity.

There is not the space here for a more detailed treatment of cybernetics, in particular the question of its reception in France. Cybernetics itself is never explicitly referenced in Le Geste et la parole, but it clearly informs a number of the book’s central arguments. We have already pointed out the cybernetically inflected vocabulary (contrôle, commande) Leroi-Gourhan uses to describe the coordination of organs relating to the champ antérieur, and the closeness of his depiction of the circular relationship between brain and tool to the concept of feedback. More generally, if the history of technology narrated in Le Geste et la parole shows a pattern of increasing acceleration in technological evolution from the Middle and Upper Palaeolithic onwards, then the decade in which the text itself is written has witnessed some of the most striking advances in the areas central to the cybernetic paradigm, that is, electronics and computing. For example, the ‘component revolution’ in electronics had seen an evolution in circuit components from valve to solid state (transistor) to integrated (monolithic) circuits over a period of less than twenty years. This revolution permitted a marked increase in the speed, reliability, and durability of circuit components, and also a dramatic reduction in their size.

For Leroi-Gourhan, the revolution in electronics represents a terminal phase in the externalization of the human, a ‘mutation’ in the history of automation in which the different functions of the human body are replicated — or simulated — in an uncanny assemblage of parts:

les perfectionnements dans l’usage de l’électricité et surtout le développement de l’électronique ont suscité, à moins d’un siècle de la mutation des machines automotrices, une mutation au delà de laquelle il ne reste plus grand-chose à extérioriser dans l’être humain. Une transformation radicale s’est produite dans la machine par le développement de petits moteurs, celui des cellules sensibles à l’action lumineuse, celui des mémoires, des transistors, de tous les dispositifs miniaturisés. Cet arsenal disparate fourni, par pièces détachées, les éléments d’un assemblage étrangement comparable à l’assemblage biologique. (II, 51)

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22 The cultural and intellectual impact of cybernetics in France, which was extensive, has not been sufficiently researched. The subject has recently been receiving more attention, notably in Jérôme Segal’s Le Zéro et le Un: histoire de la notion scientifique d’information au 20e siècle (Paris: Syllepse, 2003); Céline Lafontaine, L’Empire cybernétique: des machines à penser à la pensée machine (Paris: Seuil, 2004); and Mathieu Triclot, Le Moment cybernétique: la constitution de la notion d’information (Seyssel: Champ Vallon, 2008).


This advanced stage of human—technological evolution also possesses a revealing function: the uncanniness of the automated assemblage lies in its resemblance to the biological organism, a resemblance that in its turn throws light on the possible nature, or functioning, of the biological system itself. This kind of retroactive analogy, typical of cybernetics,\(^{25}\) can already be found in Leroi-Gourhan’s descriptions of the vertebrate nervous system in the first volume of Le Geste et la parole (pp. 112–14, 122).

One could continue this analysis of the scientific and technological context of Le Geste et la parole, a context that continues, in many respects, to be our own. In conclusion, however, it is necessary to turn to the moral or ideological dimension of Leroi-Gourhan’s account of technological evolution, and what this means for the limits of the human as he conceives it. Although, as we have seen, there is biological stabilization of the human species with the appearance of Homo sapiens, the social and cultural infrastructures that support the human continue to evolve — exponentially so. However, biological stabilization does not necessarily mean a fixed, internal ‘essence’ of the human in relation to an externalized, constructed world. For Leroi-Gourhan, if humans remain biologically the same through the different stages of technological evolution described above, nevertheless at each stage it could be said that humanity is affected by the world it has created — in Leroi-Gourhan’s words, it becomes more or less a different species (‘change un peu d’espèce’, 11, 50). While the process of biological—technological evolution that culminates in Homo sapiens is described as a process of humanization, it is difficult to escape the impression that for Leroi-Gourhan the comparatively shorter time frame of recorded history is characterized by a progressive dehumanization of the human. This decline or degradation is most marked from the period of the Industrial Revolution onwards, where machine production and hyperspecialization lead to a systematic deskilling of the working population, a fragmentation and dissolution of traditional forms of manual activity. In the contemporary period, that of the second Industrial Revolution announced by Wiener, the advent of ‘intelligent’ (cybernetic) machines capable of calculation, memorization, and discrimination extends this process of substitution into the realm of what had previously been thought of as unsubstitutable: the human mind.

The history of technology that Leroi-Gourhan describes in the second volume of Le Geste et la parole is a relatively conventional one; as we have argued, it bears the marks of a postwar period in which advanced industrial societies were having to respond to the effects and implications of radically new forms of automation. However, the distinctiveness of his analysis lies in its articulation of this contemporary history with the prehistory of humanity, situating it in the context of the

\(^{25}\) Cf. Wiener: ‘I have been occupied for many years with problems of communication engineering. These have led to the design and investigation of various sorts of communication machines, some of which have shown an uncanny ability to simulate human behavior, and thereby to throw light on the possible nature of human behavior’ (Norbert Wiener, The Human Use of Human Beings: Cybernetics and Society (London: Eyre and Spottiswoode, 1950), p. 1).
longue durée of human evolution. His argument is that there is a progressive divergence of the biological reality of the human, which he describes as a ‘fossile vivant’, from the technological world that the human has, quite literally, secreted. Here, it is not simply a question of the inhuman nature of the industrialized world — its imposition of accelerated modes of existence and its widespread degradation of the natural environment. While Leroi-Gourhan criticizes these features of contemporary technology, he is also concerned with what effects different modes of technological substitution may have on the human itself, and more precisely on the cybernetic circuit of gesture and speech, hand and brain, that has defined the human. On the one hand, it is logical that the process of externalization that is specific to human evolution should affect what is traditionally considered to be the motor of that evolution, the brain or mind: Leroi-Gourhan clearly does not subscribe to the conventional humanist—essentialist critique of the mechanization of human functions (II, 75–76); nor does he give any credence to the science-fictional scenario of an intelligent machine revolution that would replace humans — as always, the ultimate threat of violence lies within the species itself (II, 61). On the other hand, his diagnosis of the current state of Homo sapiens — l’homme actuel — is that there is something out of balance, a mismatch between the biological infrastructure of the human as it has evolved in concert with the tool, and the technological world itself that, in every sense of the word, exceeds the human. This returns us to the question, and concept, of equilibrium, which, as we saw above, was a central, if unarticulated, element of Leroi-Gourhan’s account of the evolution of forms. This concept is especially important as Leroi-Gourhan begins to extrapolate from the past and present of human evolution to its future, to the possible forms that l’homme du futur, as he terms it, might assume. Inevitably, to a large extent his extrapolation is based on what he believes humanity to have become in the present, that is, a species out of step with its externalized world: ‘L’ajustement des individus qui conservent le cerveau et la carcase corporelle de l’homme de Cro-Magnon se fait par une distortion grandissante.’ (II, 57–58). The present rate of technological evolution is such, he argues, that it is difficult to imagine a humanity that would not, in the longer term, respond to this divergence, this mismatch between the biological and the technical: ‘Il est seulement à craindre un peu que dans mille ans l’homo sapiens, ayant fini de s’extérioriser, se trouve embarrassé par cet appareil ostéo-musculaire désuet, hérité du Paléolithique’ (II, 52). The question is whether such a hyperevolved form of humanity would still be Homo sapiens, or whether it would more correctly be described — as it is in the first volume of Le Geste et la parole — as homo post-sapiens (I, 107). The prefix post-, as it is used here, does not necessarily refer to

26 The idea of evolutionary mismatch has a long history: it is already clearly formulated in Rousseau’s Second Discours (1755), for example. It has produced a contemporary ‘scientific’ variant in evolutionary psychology and in the work of thinkers such as Steven Pinker, but can also be found closer to home, so to speak, in paleoanthropology itself. For example, in Johanson and Edgar’s book, cited above, one finds the following speculation: ‘Perhaps, in some manner of speaking, it is this imbalance in the clocks, an imbalance between our biological and cultural evolution, that is at the root of our modern dissatisfaction, our sense of unease and uprootedness, of being out of tune with nature’ (From Lucy to Language, p. 111).
some superior form of humanity; on the contrary, for Leroi-Gourhan it seems to imply a reduction rather than an augmentation of human reflexivity and creativity. As we have learned from his theory of language evolution, the human body plan and, above all, the hand turned to technical production are the evolutionary singularities that make human cognition possible. With the advent of advanced computing and control systems, described above, the externalization of body functions has reached a point where one can envisage their ultimate subsumption in machine systems, rendering the body itself redundant. The atrophy of the body, and especially of the hand, is for Leroi-Gourhan the atrophy of thought. In this context he refers to the ‘regression’ of the hand, a regression that clearly troubles him:

Il serait de peu d’importance que diminue le rôle de cet instrument de fortune qu’est la main si tout ne montrait pas que son activité est étroitement solidaire de l’équilibre des territoires céphaliques qui l’intéressent. […] ne pas avoir à penser avec ses dix doigts équivaut à manquer d’une partie de sa pensée normalement, philogénétiquement humaine. Il existe donc à l’échelle des individus sinon à celle de l’espèce, un problème de la régression de la main. (II, 61–62)

The withdrawal of the hand from articulated interaction with the world threatens to become a species-wide phenomenon, ultimately affecting the future evolution of the human body and nervous system. Whether or not one shares Leroi-Gourhan’s views concerning the redundancy of the hand, it is interesting to note that he conceives such a shift in terms of disequilibrium; under this scenario, neurologically the ‘equilibrium’ between the areas of the premotor cortex that control manual articulation is disturbed or disrupted. The atrophy of digital manipulation, it is suggested, means the loss of an evolved, and uniquely human, capacity for thought. At this upper limit of the human, paradoxically, the human will no longer be human: it will have become something else.

This concern — and pessimism — regarding the future of humanity continues to haunt the conclusion of Le Geste et la parole, appropriately titled ‘La Liberté imaginaire et le sort d’homo sapiens’. Here, Leroi-Gourhan anticipates four potential outcomes for the human species (II, 267–68):

1. Atomic annihilation. This particular threat is a corollary of the evolutionary ‘mismatch’ described above. According to Leroi-Gourhan, the advanced technological knowledge that has allowed us to master atomic energy is not matched by the capacity to master our own aggression, an effective adaptation for the hunter-predator of prehistoric times, but a dangerous residual trait in l’homme actuel.

27 It is curious that, despite Stiegler’s critique of Leroi-Gourhan’s postulation of a second origin of the human, discussed above, his reading of Le Geste et la parole falls to track this symptomatic use of the opposition equilibrium/disequilibrium. This may be because his own diagnosis of the contemporary state of technological civilization, our sense of mal-être, as he puts it, is based on a concept of ‘disorientation’ not dissimilar to Leroi-Gourhan’s idea of disequilibrium. See Stiegler, ‘Genèse de la désorientation’, in La Technique et le temps (II, 81–116), where his commentary of the second volume of Le Geste et la parole reiterates Leroi-Gourhan’s thesis of evolutionary mismatch without critical qualification.

28 In some respects Leroi-Gourhan’s formulation of homo post-sapiens seems similar to Alexandre Kojève’s reference to the regression of contemporary humanity to a ‘post-historical’ state of animality (Introduction à la lecture de Hegel (Paris: Gallimard, 1947), pp. 434–37, n. 1). The resemblance, however, is a superficial one. Leroi-Gourhan’s analysis is primarily natural–historical in perspective and has little in common with the quasi-Hegelian thesis of an ‘end of history’ proposed in Kojève’s text.
The end of evolution. This refers not to biological extinction as such, but to the Jesuit philosopher-palaeontologist Teilhard de Chardin’s ‘Omega point’, the idea of an apocalyptic termination of the evolutionary process. This mystical vision of the fate of humankind has the limitation of all apocalyptic thought: even as one waits for the end of history, there remains the mundane task of organizing the world.

Genetic alteration. In other words, the long-term adaptation to the evolutionary ‘mismatch’ between a phylogenetically stable Homo sapiens and the volatile, accelerated evolution of its artefacts. For Leroi-Gourhan, such an adaptation would signal the ultimate disappearance of Homo sapiens as we know it.

Active intervention. This final outcome, or alternative, is an existential one, that is, it involves a prise de conscience of the situation of l’homme actuel and an assertion of our desire to remain human. This means rethinking both the relationship between individual and society and our relationship with the natural world, in particular with respect to problems of demographic growth and environmental change. Actively addressing these problems amounts to a readjustment, or rebalancing, of the disparate forces that determine the contemporary situation of Homo sapiens.

While the first three scenarios envisaged in the conclusion of Le Geste et la parole are in their different ways passive responses to the fate of humankind, the fourth scenario is a pragmatic and voluntarist one. It is visibly the solution favoured by Leroi-Gourhan; indeed, he claims that it is inevitable. This is because — and these are the very last words of the book — ‘l’espèce est encore trop liée à ses fondements pour ne pas chercher spontanément l’équilibre qui l’a portée à devenir humaine’ (II, 268). While the reader might agree with Leroi-Gourhan’s quasi-existentialist view of human evolution, one that emphasizes our collective responsibility for managing the material world and (therefore) our own future within it, nevertheless the formulation of this final sentence remains conceptually problematic. This is due to the conceptual weight or stress, so to speak, placed upon the term équilibre, which, as one reaches the conclusion of the two volumes of Le Geste et la parole, has become thoroughly overdetermined. As we have seen, the concept of balance, or equilibrium, is operative at a number of levels of Leroi-Gourhan’s narrative of human evolution, governing descriptions of structural and functional adaptation in vertebrate and hominid anatomies, neurological complexification relating to human manual articulation, the cybernetic relationship between hand and tool, and the relationship between individuals and the different forms of social organization mediating technological change.29 At the same time, unlike more explicitly marked concepts such as externalization, liberation, and the champ antérieur, the concept of equilibrium is never properly

29 Leroi-Gourhan’s use of the term équilibre is in fact more general than in Le Geste et la parole and is traceable from his early ethnographic and archaeological work published in the 1930s and 1940s through to his later work on prehistoric art in the 1970s. It could therefore be described as a conceptual leitmotif of his thought, inflected in the 1950s and 1960s by the homeostatic, ‘steady state’ models of cybernetics.
elucidated. The problem is that, while this concept may be useful in describing certain aspects of biological form and functional adaptation, its extension to qualitatively different levels of relation and organization is not self-evident. The implication of the final sentence of *Le Geste et la parole* is that humanity possesses a *natural* point of biocultural equilibrium to which it will spontaneously seek to return, whereas the macroscopic narrative of *Le Geste et la parole* has in fact described a series of departures from equilibrium that have at each stage *altered* the mental and physiological configuration of the human animal.

To conclude, the narrative of human evolution proposed in *Le Geste et la parole* challenges traditional humanist conceptions of the limits of the human, encouraging us to rethink the origins of humanity (a plurality of early human forms) and underlining the essentially extended and externalized nature of the human mind — hence its influence on philosophers such as Jacques Derrida and Bernard Stiegler. Unlike more traditional variants of humanism, Leroi-Gourhan’s account locates the passage from nature to culture not in language but in the cybernetic (feedback) relationship between technology and cognition, hand and face, a relationship of co-determination that is the evolutionary condition of possibility of the emergence of language. This enlarged humanism extends the definition of humanity to the different forms of ‘prehuman’ toolmakers inhabiting our distant past, and demonstrates the anatomical and cognitive continuities linking this past to our present. At the same time, *Le Geste et la parole* seems to repeat the basic reflexes of a more traditional humanism in its response to our present state of technological evolution. Paradoxically, this seminal book expresses a profound ambivalence with regard to the ‘brave new world’ that has provided the paradigm through which it has been possible to conceptualize the emergence of the human. In the mid-1960s, humanity’s first spectacular steps into space seem for many to mark the end point of a long process of evolution and the start of a new era. The mythical ‘homme-singe’ of the origins of humanity modulates in our present to the figure of the astronaut, the ‘homme-machine’, and in our future to the figure of the robot, the ‘machine-homme’ (II, 64). The evolutionary emergence of the human from the animal reaches its terminal phase in the cybernetic coupling of the human with the machine, the human merging with the machine, and the machine converging on the human. For Leroi-Gourhan, such coupling is not balanced; its extension and externalization of the human is disproportionate, and his response can be characterized as what Derrida once termed *humanisme* — a humanism of the hand — the apprehension that what most essentially defines the human is under threat of extinction.

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30 In *Le Toucher*, Jean-Luc Nancy (Paris: Galliée, 2000) Derrida notes the recurrent use of the figure of the hand in Western philosophy as the distinguishing feature of the human in relation to the animal. Reading Maine de Biran from this perspective, he writes: ‘Or cette main est la main d’homme. Comme *animal* rational. L’homme est le seul être à disposer d’une main, seul il *touche* au sens le plus fort et le plus stricte. Il touche plus et il touche mieux. La main figure le propre de l’homme, le toucher est le propre de l’homme: c’est la même proposition. On pourrait appeler cela sans trop jouer, l’*humanisme* de Biran. Il implique la même hiérarchie téléologique, et les mêmes présupposés, quant à l’animal’ (p. 176, emphases original).