

Tool and Sign in Vygotsky's Development*

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Abstract: Vygotsky's view on tools, signs and the spoken word are elaborated through a comparison of his early anthropological writings with his later works. It is argued that these relations underlie ideological tensions which persist across the human sciences to this day.

There is a tension within Vygotsky's writing, and in its interpretation, hinging around the relation of sign and tool, sometimes taken up under the heading of word and deed (or action). This contradiction turns out to be a microcosm of the tension between language and labour in the wider field of Marxist theory, which in turn evokes the class antagonisms underlying the original work of Marx and Engels, antagonisms which have continued to be reflected in the development of theory up to the present time.

Vygotsky's final position was expressed clearly enough on the last page of "Thinking and Speech" (1934), here taken up under the heading of word and deed:

"The connection between thought and word is not a primal connection that is given once and forever. It arises in development and itself develops. "In the beginning was the word." Goethe answered this Biblical phrase through Faust: "In the beginning was the deed." Through this statement, Goethe wished to counteract the word's overvaluation. ... we can agree with Goethe that the word as such should not be overvalued and can concur in his transformation of the Biblical line to, "In the beginning was the *deed*." Nonetheless, if we consider the history of development, we can still read this line with a different emphasis: "In the *beginning* was the deed." (1934, p. 284-5)

Although Vygotsky does not here touch on the question of tool and sign, this is, as will be seen, a clear and succinct statement of the relation, leaving to the reader the work of unfolding from that relation the richness and complexity of the history of intertwined development alluded to. However, there are other statements of Vygotsky, at other times and in other terms, and interpretations of his writing by other writers which oblige us to look more deeply into this problem.

Let us first review what Vygotsky himself said on the topic, which is variously expressed in terms of sign/symbol & tool, word & action/deed or psychological tool & technical tool.

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Vygotsky on the Development of Tools

The story begins with the book Vygotsky wrote in collaboration with Luria in 1929, *Ape, Primitive Man, and Child: Essays in the History of Behaviour*. Vygotsky wrote the first two chapters, mainly drawing on the reports of contemporary zoologists, anthropologists and ethnologists. Vygotsky's ideas were later tested out by Luria in an expedition to Uzbekistan to study the peasants who were undergoing a transition from feudal village life into the modern, collectivized Soviet economy.

In Chapter 2, "Primitive Man and his Behaviour," Vygotsky clarified what he meant by "primitive man" as follows:

"This term is commonly used, admittedly as a conventional label, to designate certain peoples of the uncivilized world, situated at the lower levels of cultural development. It is not entirely right to call these peoples primitive, as a greater or lesser degree of civilization can unquestionably be observed in all of them. All of them have already emerged from the prehistoric phase of human existence. Some of them have very ancient traditions. Some of them have been influenced by remote and powerful cultures, while the cultural development of others has become degraded.

"Primitive man, in the true sense of the term, does not exist anywhere at the present time, and the human type, as represented among these primeval peoples, can only be called 'relatively primitive'. Primitiveness in this sense is a lower level, and the starting point for the historical development of human behaviour. Material for the psychology of primitive man is provided by data concerning prehistoric man, the peoples situated at the lower levels of cultural development and the comparative psychology of peoples of different cultures."(Preface, 1930, Italics in the original)

By "relatively primitive," Vygotsky meant *non-literate societies*, and this was the same definition of "primitive" which Luria would take on his expedition to Uzbekistan in 1931-2. The background which frames this book is the conception that human behaviour is the product of three processes of development: (1) biological development – phylogenesis or evolution, (2) historical, or cultural development and (3) the ontogenesis of the individual person. The aim of the study was to investigate in each case just one feature of behaviour which was taken to be the essential component of development which "served as a link connecting a given stage in the development of behaviour with the very next stage of development," (p. xi) that is, that kind of behaviour which would generate a qualitative change and transition to a new type of being.

In the case of apes, Vygotsky drew on the work of Wolfgang Köhler to show that apes did use tools in the normal course of their activity, in particular they would use sticks as multi-purpose tools for digging,

eating, fighting, poking, etc., and were on occasion capable of using other objects that they found to solve problems, chiefly gaining access to food. The apes' problem solving was characterised by their perception of a problem situation as a Gestalt, so the discovery of a tool-mediated solution to a task depended on being able to fit the tool into the visual-spatial structure of the problem. Although frequently taken as the archetypical characteristic of homo sapiens, Vygotsky took tool production as that aspect of *animal behaviour* which brought about the transition from ape to human. Originating among apes, technique, that is, the production and use of tools, reached a high level of development in "primitive man." Implicit in this conception is a protracted epoch of human evolution during which cultural development, that is, development of the production and use of tools, operates in tandem with biological development in the formation of the human biological type. However, it is *not* to be tool production which brings about the transition from "primitive" to *modern* human beings. The snap shot of this development given us by observation of modern apes is a glimpse of a point in the emergence of homo sapiens of the order of 2 million years ago. Writing emerged independently in Mesopotamia c. 3200 BCE, in China c. 1200 BCE, Phoenicia c. 1000 BCE and in Mesoamerica c. 700 BCE, and spread from there to other societies while many communities remained non-literate in 1930. So the "primitive man" which is of interest are those peoples who are of the same "biological type" as modern Europeans, Americans, etc. in literate societies (a.k.a. civilization). According to Vygotsky, on the balance of available evidence, all human societies currently in existence are in fact of the same "biological type." Non-literate peoples in existence today would therefore approximate the kind of societies in existence prior to the historical emergence of writing – "primitive man."

History and Evolution

According to Vygotsky, it is not that evolution ended and history began at a certain point, rather that there are *two distinct principles of development*, biological-evolutionary and cultural-historical. Up to a certain point, cultural change, that is, the development of tools and signs and their use, was *subordinate* to, constrained by biological change – that is, the gradual change in the genotypical form of the hand and the organs of speech. But then, from some point in the past "biological change of the human organism now became subordinate to and dependent upon the historical development of human society" (p. 50). Far from holding that evolutionary change ceases when history begins, he actually suggests that "the hand and the brain, as natural organs, probably never developed so rapidly, and at such a gigantic pace, as during the period of historical development," (p. 36) and in "The Socialist Alteration of Man," written about the same time, he says of Socialism: "this change in human behaviour, this change of the human personality, must inevitably lead to further evolution of man and to the alteration of the *biological type of man*." (1930b, p. 182)

The epoch of “primitive man” intervening between the formation of the biological type of modern human beings and the creation of the first civilizations, that is, literate communities, is characterised by a highly developed *practical intelligence*, associated with the development of ‘technique’, i.e., tool production and use. Far from “primitive man” lacking in logic, as others had asserted, according to Vygotsky, “primitive man” *had to be logical* in their interactions with nature or they would die! But Vygotsky differentiates between *practical intelligence* and *verbal intelligence*. The difference is exemplified by the kind of experience which is repeated in many different forms in “ethnic psychology” research: a subject from a non-literate society is given a formal logical problem to solve verbally, but the so-called ‘logical’ solution contradicts what the subject knows from their practical intelligence, so the subject is unable to solve it correctly.

Periodisation of the intellect

Vygotsky periodised the development of the intellect of “primitive man” as follows: (1) practical intelligence, during which human beings well understand Nature, but cannot be said to have anything like a “theory of nature,” (2) verbal intelligence is differentiated from practical intelligence but is still inadequate, and during this stage “magical thinking” is manifested and (3) verbal intelligence is stabilised in a rational understanding of nature, distinct from practical intelligence. “More advanced technical development eventually separates the laws of nature from the laws of thinking, and magical action begins to fade away” (p. 85) with the development of natural science.

Now, Vygotsky says that historical development is not marked by any significant development in the biological type of human being (there are changes, but these are relatively superficial and reversible). The point is that *a different principle of development is dominant* during this epoch. What is developing during the period prior to the emergence of literate societies, is the *tools* we have to mediate our action upon nature, and forms of social organisation corresponding to these tools. It is during this epoch that signs first emerge from tools. To be clear, at this time, Vygotsky used the term “sign” or “symbol” to mean an *artefact* which is used to regulate our behaviour by controlling our mind. *Spoken words were not counted as signs*. Vygotsky is only concerned with “material culture” in the sense in which the term is used by archaeologists, referring to enduring objects.

Just as the turning point in biological evolution was the emergence of tool-use, which is found in apes in rudimentary form, it is the emergence of *sign-use* which brings about the *cultural-historical* transition to “civilized man.” So Vygotsky expected to find sign-use amongst “primitive man,” but in only rudimentary form. Once the use of signs to control our *own* behaviour (and subsequently that of others) emerges, a *new principle of development* becomes dominant and thus begins the transition to modern literate societies. This is the principle of *cultural-historical development*.

Note that it is widely agreed that *speech* emerged at the same time as tool production expanded, and in close connection with the use of tools,

at the very earliest moment of the emergence of the human species, but at this point in Vygotsky's development, "signs" does *not* here refer to speech, only to the written word and its precursors.

Vygotsky always carried out his psychological investigations in relation to *specific psychological functions*, so he did not in fact conceptualise cultural development as a single linear narrative, allowing that each psychological function had its own path of development, including regression of some functions. This is important, because despite the totalising categories – animal, primitive man, civilised man – which imply a single narrative, his approach does allow for multiple narratives. One of the sections of his chapter on "primitive man" concerns the function of memory. In respect to memory, the problem is that without signs such as the written word, the accumulation of knowledge is limited to oral memory.

"Everything that civilized humanity remembers and knows at present, all the accumulated experience in books, monuments and manuscripts – all this colossal expansion of the human memory, without which there could be no historical and cultural development, is due precisely to external human memorization based on symbols." (1930, p. 62)

The crucial thing in the transition from "primitive man" to civilization is the emergence of *writing*. "Symbols" in this sense encompasses everything that in 1930 Vygotsky would call "psychological tools" – maps, plans, books, movies, up to computers, all of which have developed out of and in close connection with the development of industry and technology in general. It is uncontroversial today that such psychological tools have a profound effect on our thinking, not only as mediated through their impact on social relations, but immediately, in the hands of an individual user.

But, to be clear: for Vygotsky at this point, prior to the writing of *History* (1931), a spoken word is *not* a sign, because the spoken word does not, like the written word, have that irreversible "ratchet" effect which fosters technological escalation.

Periodisation of Tools

To track the transition from "primitive man" to "civilized man," Vygotsky periodises *the emergence of sign production out of tool production*, into three phases in line with the above periodisation of the intellect of "primitive man."

- (1) At first, the tools used to control nature also necessarily regulate and mediate human behaviour in the labour process. Note that tools also control the mind mediately through their action on Nature.
- (2) Then rituals, music, symbols, incantations, icons and so on are used which function to regulate human behaviour, but the people using them are unclear as to whether the rituals, etc., are controlling nature or controlling their own actions in nature. Thus technique and magic (i.e. incipient verbal intelligence) develop side by side without properly comprehending one another.

(3) Verbal intelligence, that is, the ability to represent nature and human activity symbolically, matures sufficiently to be able to provide adequate theories of nature which are capable of effective regulation of technique. That is, we have psychological tools adequately differentiated from technical tools, and with that, verbal intelligence fully differentiated from practical intelligence. Vygotsky did not use the word 'tool' in the metaphorical sense in which people nowadays use 'tool' to refer to words, concepts and techniques: a tool is a useful material artefact.

Psychological tools emerge from technical tools and are taken as a *special type of tool*, a tool which is directed inwards, rather than outwards at nature. According to Vygotsky:

“the basic components of the psychological development of primitive man are to be found in the development of technique and in the corresponding development of social structure.” (p. 84)

Note well that the inclusion of “social structure” here. In his exposition of the development of human behaviour, Engels sees homo sapiens developing from the stone axe to the steam engine through a series of *social formations* corresponding to the development of technique. Vygotsky was a psychologist, while Engels' concern was not psychology as such but social formations, which in turn determine the psychology of a people.

The rudiments of regulation of behaviour using psychological tools are to be found in “primitive man,” a epoch in which by and large, psychological tools did not figure. In turning to the development of civilized humanity, technical tools not only continue to develop and develop at a gigantic pace, but they develop in connection with the development of psychological tools.

Using a term from a later time, the development of psychological tools could be said to be the “leading activity.” The development of “technique” is the intertwined development of both psychological and technical tools, while social structures and human capacities also develop, interacting with the development of technology.

Tools and the Mind

It is widely accepted nowadays that technology and its use plays a large part in the formation of the mind. Vygotsky was one of the first to recognise this. It is obvious that the use of mobile phones and personal computers have a big impact on the psychology of this generation. The motor car and the freedom it gives to young people also affects people's thinking, but *not in the same way as the personal computer*. The use of such tools as the motor car effects a change in mentality by how it expands the scope of a person's activity, and on the other hand, by the vast changes it has wrought in social structures which in turn bring about changes in mentality. But books, computers and other tools for thinking not only transform technique, and with technique, social structures, they do so by operating on the mind. The use of technical tools is critical in the formation of a child's practical intelligence,

however. Invariably, psychological tools are implicitly or explicitly vehicles for communication, so psychological tools are intimately connected with the development of social formations as well as the mind as such.

According to Vygotsky at this point in the development of his thinking, the study of technical tool-use as *the essential factor* in the formation of the psyche, is applicable *only* to the epoch of “primitive man,” not modern, literate people. For our time, it is psychological tools which are the essential factors in the formation of the psyche. Nonetheless, it must be noted that, historically speaking, psychological tools have arisen *as a special kind of tool* for the regulation of behaviour in contradistinction to technical tools, for the regulation of nature. That is, “signs” first arose as a type of tool, and have always been an application of the best available technology of the times.

There are two aspects of “Ape, Primitive Man and Child” which do not directly bear on our topic, but which have to be dealt with so that the above reflections are properly contextualised. The first is Vygotsky’s periodisation of word-use in the transition from “primitive man” to literate societies; the second is the feature which Vygotsky would take as the essential feature of the ontogenetic development of behaviour and which is therefore distinctive for the third line of development: the development from child to adult.

Vygotsky’s periodisation of word-use in “primitive man”

Vygotsky claimed that the development of the “verbal intelligence” of non-literate peoples is manifested in the passage of word-use through three stages, “the first method of using words as *proper names* to a second method, whereby words serve as symbols for *sets*, and lastly to a third, involving the use of words as tools or means for the elaboration of *concepts*” (1930, p. 71).

The first method would imply that all the objects, situations and actions in the life of “primitive man” each bore a unique name, thus a “proper noun” in the sense that proper nouns generally indicate a unique individual. However, this is not quite what he describes; what he meant is that, for example, “young, male crow” may have a unique name, distinct from an older crow, or the female young of a different species of bird, etc.; however, each word designates a *relatively* concrete kind, just as “MG” or “Corvette” each denote a specific kind to us, *not* an individual automobile, such as the Batmobile.

He explained the difference between the second and third stages, between a set and a concept by taking a family name such as “Petrov” as an example of a word designating a set:

“A set differs from a concept by virtue of the relationship between the individual object and the group name. By looking at an object I can say with full objectivity whether it is a tree or a dog, because ‘tree’ and ‘dog’ serve as the designations of *concepts* – in other words, generic groups to which, by virtue of substantive features various individual objects belong. I cannot, by looking at a man,

tell whether or not he is a Petrov, because in order to do so it is simply necessary to know, as a matter of fact, whether he goes by such a name.”

But from the point of view of this writer (Blunden 2012), and of the Vygotsky who later wrote “Thinking and Speech,” and of Hegel, this is not only *plain wrong*, it is *upside down!* The definition Vygotsky gives of a “concept,” as a collection of objects sharing a “substantial” – evidently meaning phenomenal or visible – attribute, and a “set” designating objects the connection between which requires knowledge of the inner connection between the objects, not given to immediate perception, are the wrong way around. Fish are not fish because they live in the sea (an attribute they share with whales) or because they have scales (an attribute they share with snakes), but because of an evolutionary connection which is not immediately apparent, but depends on their “family connection” their place in some *system* of concepts, Darwin’s phylogenesis. “Whale” and “snake” are concepts; “sea creatures” and “scaly creatures” are sets. In fact, “fish” is an everyday conception which is neither one nor the other, neither a true concept nor a well-defined set. (Note that Vygotsky is not using the idea of a family name in a way comparable with Wittgenstein’s idea of “family resemblance”).

Luria took Vygotsky’s mistaken distinction between a set and a concept with him on his expedition to Uzbekistan in 1931-2 (Luria, 1979). In one of his experiments to reveal the method of thinking of the Uzbek peasant, he showed a man, Rakmat, drawings of three wheels and a pair of pliers and asked Rakmat to say which did not belong in the set because it was unlike the others. Rakmat refused to single out the pliers because “I know the pliers don't look like the wheels, but you'll need them if you have to tighten something in the wheels” (1979, p. 70).

This verifies that Rakmat could only solve the test of verbal intelligence by calling upon his practical intelligence (even though he well knew that pliers did not look like wheels). Likewise, he would not separate log from the group hammer, saw, log, and hatchet because he would need the tools for working on the log. Rakmat would not approach the artificial group of objects from a taxonomic point of view. In the terminology of Chapter 5 of “Thinking and Speech,” he was given a test to reveal what kind of *complex* he would form in a test of the formation of artificial concepts. He was judged as forming a collection complex, which Luria and Vygotsky in 1928 ranked as a set, whereas a stable pseudoconcept would have been ranked, in 1928, as a *concept*.

Luria demonstrated that some subjects who had attended school had learnt to categorise objects taxonomically according to shared visible attributes. Others however “saw no need to compare and group all the objects and to assign them to specific categories” or “tended to deal with the task as a practical one of grouping objects according to their role in a particular situation rather than as a theoretical operation of categorizing them according to a common attribute” (1979, p. 69).

By the time of writing up 1928 Sakharov’s experiments on concepts for “Thinking and Speech” Vygotsky put it this way:

“The adult’s thinking is often carried out at the level of complexes, and sometimes sinks to even more primitive levels. When applied in the domain of life experience, even the concepts of the adult and adolescent frequently fail to rise higher than the level of the pseudoconcept. They may possess all the features of the concept from the perspective of formal logic, but from the perspective of dialectical logic they are nothing more than general representations, nothing more than complexes. ...

“.. traditional psychology acted like a slave in following the description of the process of concept formation assumed by formal logic, ... representations ... can be decomposed into their constituents, into their form, colour, and size. The constituents of these representations that remain are those that correspond to one another. A process of assimilation occurs for each of these constituents, the result of which is a general representation of each feature. Following a synthesis of these representations, we obtain one general representation or concept ...”

The pseudoconcept which Vygotsky is describing in 1931 (when this chapter was written) is exactly what Vygotsky was calling a *concept* in 1929!

However, it seems that Luria *did* correctly identify an underdevelopment of verbal intelligence in comparison with practical intelligence in that Rakmat simply didn’t get what Luria was asking him even though he very well knew everything about the objects in question. As in Dickens’ *Hard Times*, when Cissy, who had an intimate practical knowledge of horses, is demanded by Mr. Gradgrind to give the definition of a horse, proving to her great embarrassment that she does not know that the answer is “4 legs, 40 teeth, etc., etc.”

The importance of this mistake is that Vygotsky appears to have established that “primitive,” that is, non-literate peoples *do not have true concepts* while “civilized” peoples do. But this claim is based on what Vygotsky himself came to see as a grave misunderstanding. In fact, what was shown is that many *schools*, especially elementary schools, only teach pseudoconcepts, and in a population where practical intelligence outstrips verbal intelligence, such instruction could, in the relevant contexts, supplant true concepts with pseudoconcepts. This might be a benefit for people in their dealings with the bureaucracy, but is a step backwards in their cultural development.

However, *contra* Vygotsky, “non-literate” peoples, *must have* had true concepts, otherwise they could never have survived as a people, not because they could not otherwise regulate their relation to nature, but because they could not have maintained and regulated their social structures. Nonetheless, the most uneducated and despised (subaltern) sections of a people could be excluded from access to true concepts, surviving rather on the basis of their practical intelligence. Archaeological findings tell us that the earliest human communities used religious rituals and seemed to believe in a life after death, which

implies that they did *not* organize their understanding of the world on a sensory-taxonomic basis., but had *concepts*. The freeing of the intellect from immediate sensual perception is the hallmark of conceptual thinking.

Further, the substitution of taxonomic categories for true concepts is a *degradation* of conceptual thought flowing from inhuman, *bureaucratic*, administrative methods of social organization. Doubtless, these bureaucratic means, adapted to the impersonal management of large numbers of people and things, is also associated with the use of writing in preference to speech. Both written speech and bureaucracy are inventions of civilization, but they are not both essential conditions for true concepts. There is little romance in the discovery that the first writings were not poems, stories or epitaphs but accounts. Bureaucracy, in fact, militates *against* true concepts, while literacy on the whole supports true concepts.

Positivist philosophers who create sophisticated concepts, when concepts are the object of study, mistake concepts for pseudoconcepts; this expresses a general law, that when we are required to carry out an operation that we do effortlessly without conscious awareness, under conscious control our performance falls to a lower level. And the same problem affected the Uzbek who very well understood the relation between logs and saws, but failed to grasp a verbal problem requiring him to say that they did not “belong together,” contradicting what he knows from his practical intellect. He actually *refuses* to do so, regarding it as *improper* to categorise things in such a way, just as we hold that it is improper to categorise people by their body shape or skin colour.

The Principle of Ontogenesis

Each critical point in the development of behaviour was considered by Vygotsky from the standpoint of that new aspect it brings to the process of development. Each stage thus provides a starting point for the higher process of development.

“We will consider as such turning points in the behaviour of the apes the use of implements, or tools; in the behaviour of primitive man, work and the use of psychological symbols; and in the behaviour of the child, the splitting of its line of development into psycho-physiological and psycho-cultural development.” (1930, p. xii)

Tool-use fostered the development of the hand and speech in our immediate evolutionary predecessors, whose further development characterised the whole epoch up to the formation of literate civilizations, and continues its involvement in development, now interconnected with the development of psychological tools. But with the formation of the human species, tool-use occurs in conjunction with the spoken word; tool-use stimulates speech and speech participates in the development of technique. Language and technique develop hand in hand.

It is the *separation of verbal intelligence from practical intelligence* which marks the cultural transition from “primitive man” to civilization. Vygotsky believed that it is only by the formation of writing that this separation becomes possible, thus his idiosyncratic interest in the exotic and antique mnemotechnical artefacts, as precursors to writing.

What child development brings is the separation of the cultural development of the personality from its *physiological*, inherited basis, that is, the unlimited cultural formation of the personality. Note that this notion includes the participation of mankind’s genetic inheritance from our hominid predecessors, and the development of practical intelligence in the handling of tools and other artefacts inherited through our culture, as well as the development of verbal intelligence through the use of words. And most importantly, each of these lines of development *interact* with one another, allowing each line of development to far surpass the limits which would be possible along one line alone.

The last paragraph alludes to material which constitutes the entirety of cultural psychology and this is not the place to elaborate any of it. What is of interest here is only problems with the concept of tool and tool-use and its relation to the concept of sign and sign-mediated action. How can the material on tool-use reported in “Ape, Primitive Man and Child” be taken forward? Where did this report leave Vygotsky’s research project in 1929?

In this context it is noteworthy that speech, which appears together with labour at the very beginning of the human species (See Corballis, 2002), played no part in Vygotsky’s schema, other than to manifest the stages of word-use which marked the distinction between practical and verbal intelligence during the epoch of “primitive man,” and in this case, Vygotsky had the relation back to front!

Instrumental Psychology

The kind of scientific activity which is suggested by “Ape, Primitive Man and Child” is an ethno-psychology or social history based on a history of artefacts. Is there any reason to believe that this is a fruitful approach to the building of a general psychology, which was Vygotsky’s aim? I think not.

I believe this is the activity to which Vygotsky was referring when he agreed with A. N. Leontyev, in a letter of 29th July 1929, that “instrumental psychology” was an unprofitable pursuit. I take this to be something quite distinct from “The Instrumental Method in Psychology,” which remains his most important contribution, and which I will touch on shortly.

The insight that the cultural and historical development of human society and psychology is tied up with the production and use of both tools and signs was by no means unique to Vygotsky. What is unique to Vygotsky is the *experimental technique* – “the instrumental method in psychology” or “functional method of dual stimulation” – which made it possible to take the philosophical insights of Marxism and classical

German philosophy *into the psychological laboratory* as an effective method for the practical investigation of the human mind. (See Blunden 2009a)

So when Vygotsky (2007) writes to his younger colleague, A. N. Leontyev on 29th July 1929:

“Dear Aleksei Nikolaevich, thank you for the letter. I wholeheartedly share your sentiments. There is some benefit to a situation in which I[nstrumental] P[sychology] winds up in the category of unprofitable pursuits. In particular, I cannot say strongly enough how highly I value (in ethical terms as well) the thought that the idea must be as pure and rigorous as possible. This is our principal task – to fight against muddled ideas and ‘making ourselves comfortable’.”

It is this historical study of instruments which seems to be “unprofitable.” In other letters collected in the same journal Vygotsky makes references to the instrumental method in psychology: “everyone should work in his field according to the instrumental method. I am investing all the rest of my life and all my energy in this” and “Most important, I want to convene a ‘conference’ in spring or summer of people working with the instrumental method,” and his later work demonstrates his commitment to this experimental-genetic approach to cultural-psychological research.

There are two reasons to believe that Vygotsky wanted to abandon a “history of tools” and *not* the “instrumental method”: (1) Much later, Leontyev uses “instruments” exclusively to refer to tools for working on nature and not psychological tools and does in fact include “instrumental psychology” in his theory, and credits Vygotsky’s “early work” for the idea; (2) Vygotsky did not in fact abandon the “instrumental method”;

This proposition throws up a number of possible sharp objections which cannot be dealt with summarily. (1) Isn’t it the production of tools which distinguishes mankind from the animals? (2) Didn’t Engels himself suggest that the history of development of the means of production was the essential narrative of human psychology? and (3) Isn’t it a basic premise of Marx that the labour process (i.e., tool-use and tool-production) which is the determining factor in social life? And (4) Is not every tool also a sign for the means of its use, through which human beings understand the natural world in the process of changing it with tools?

These are four serious objections which will be dealt with in due course. But first I want to briefly consider some of Vygotsky’s last works as to what he had to say about the relation of tool and sign. Up to this point we have only considered a 1929 work of Vygotsky which has a number of serious defects.

Tool and Sign in Vygotsky after 1930

The Instrumental Method in Psychology

At a talk given in 1930 entitled “The Instrumental Method in Psychology,” Vygotsky introduced the term “psychological tools or instruments” by analogy with “technical tools,” characterising symbolic devices such as books and maps as a type of tool – “artificial devices for mastering one’s own mental processes” as opposed to devices for controlling Nature – “labour tools.” All “instrumental acts” can “without remainder” be reduced to natural (i.e. unmediated) ones, just like a machine each part of which obeys the laws of physics, but combine to serve human purposes. Vygotsky introduced with this talk the triangular representation of “instrumental processes” which does not discriminate between psychological or technical tools.

Vygotsky goes on to explain how with the instrumental method: “We can also look at the behaviour of man from the viewpoint of his use of his natural mental processes and the methods of this use and try to comprehend how man utilises the natural processes of his brain tissue and masters the processes that take place in it.” (*LSV CW*, v. 3, p. 86) So, the “instrumental method” *in fact* concerns only the use of *psychological* tools, not technical tools.

He goes on to describe how a mental task is solved by introducing the use of a psychological tool. “Any behavioural act then becomes an intellectual operation.” The “instrumental act” is described as “an elementary unit of behaviour” for the purposes of research. He again stresses the analogy with technical tools, from which the psychological tool differs because it is used to act on the mind, not external material processes.

Then: “By its very essence the instrumental method is a historical-genetic method” (p. 88), and he points to three areas where this method can be used: (a) social-history and ethnic psychology, (b) investigating the higher mental functions in the laboratory, and (c) child and educational psychology. “The instrumental method studies the child not only as a developing, but also as an educable being.” The instrumental method provides a method for both research into the development of an individual and for education, by the introduction of a psychological tool into the activity of a child who is engaged in some task with which they are experiencing difficulty. This is an *epoch-making discovery*, unique to Vygotsky and arguably his most important legacy.

But Vygotsky also includes under the heading of “the instrumental method” an approach to social history and ethnic psychology, and I believe it is these latter pursuits which he judged, at least at that time, to be “unprofitable.” Vygotsky later called the instrumental method “the functional method of dual stimulation” and this terminology is preferable.

It is in “Tool and Sign in the Development of the Child,” evidently written in 1930, that Vygotsky first used a reference to Goethe to explain the relation of tool and sign in a short section entitled “Word

and Action.” Vygotsky here uses the word “action” to mean only “tool-mediated action,” in contrast to “word” which could be characterised as the archetypal “sign-mediated action.”

“To certain psychologists the ancient biblical ‘In the beginning was the Word’ retains all its fascination. New investigations, however, do not leave any doubt as to the fact that the word does not stand at the beginning of the development of the child’s mind. ...

“Practical intellect is genetically more ancient than verbal; action precedes the word, even intelligent action precedes the intelligent word. Now, however, while repeating this thought, very true in itself, there is a tendency to overestimate action at the word’s expense. ...

“... we have tried to show how the *word*, becoming intellectualized and developing on the basis of *action*, lifts this action to a supreme level, subjects the child to its power, stamps it with the seal of will. But since we wanted to express all this in one short formula, in one sentence, we might put it thus: if *at the beginning* of development there stands the act, independent of the word, then at the end of it there stands the word which becomes the act, the word which makes man’s action free.” (1930c, p. 166-70)

In the course of this section he says: “To consider speech as a more particular case of action means to depend upon an incorrect definition of the concept of *action*.” (p. 66) I interpret this to mean that *speech is not a type of tool-mediated action, arising from labour activity as if it were a type of tool*, something which *could* be said of writing. Speech has to be considered as a qualitatively distinct function *alongside labour*. He specifically negates any idea of the spoken word arising from tool use in the sense he had held with respect to the written word.

Development of the Higher Mental Functions

In 1931, Vygotsky wrote a manuscript which has been published in Volume 4 of *LSV CW* under the title “History of the Development of the Higher Mental Functions,” (*History*) and Chapter 2 on Research Method has a short treatment of sign and tool. He says:

“... the basis for the analogy between the sign and the tool is the mediating function of the one and the other. From the psychological aspect, they may, for this reason, be classified in the same category. ... from the logical aspect, both may be considered as coordinative concepts included in a more general concept – mediating activity.” (*LSV CW*, v. 4, p. 62)

He then refers to Hegel’s use of the concept of mediation as “the most characteristic property of the mind,” and cites the chapter in Marx’s *Capital* where Marx is discussing the instruments of production and refers to Hegel’s concept of the “cunning of reason” to the effect that in using material objects and material processes acting according to their

own natural law, they yet serve human purposes. He then quotes Marx again in connection with the tools of labour:

“[Man] makes use of mechanical, physical, chemical properties of things in order to change them into tools to act on other things according to his purpose.” (*MECW*, v. 35, p. 189-190)

He then justifies the idea of signs mediating actions, just as tools mediate actions. He also notes that the mediating role is not restricted to tools and signs “since the activity of the mind is not exhausted by the use of tools and signs.” (Presumably he is referring to thinking which is “beyond words.”) He reiterates the functional distinction: the tool is directed at changing Nature, while the sign is directed at changing a mind, and points to their interconnection in phylogenesis and ontogenesis.

“the first use of a sign signifies going beyond the limits of the organic system of activity which exists for each mental function. The use of auxiliary devices, the transition to mediated activity radically reconstructs the whole mental operation just as the use of a tool modifies the natural activity of the organs, and it broadens immeasurably the system of activity of mental functions. We designate both taken together by the term *higher mental function*, or higher behaviour.” (*loc. cit.*)

So both technical tools and psychological tools are implicated in the construction of the “high mental functions,” but the contribution to this change is *different* in the case of tools and signs. Vygotsky now has an antipathy to the metaphorical use of the word “tool” to indicate a sign:

“The indeterminate, vague meaning that is usually connected with figurative use of the word *tool* actually does not lighten the task of the researcher interested in the real and not the picturesque aspect that exists between behaviour and its auxiliary devices. Moreover, such designations obscure the road for research. Not a single researcher has yet deciphered the real meaning of such metaphors.” (*loc. cit.*)

The discussion continues in Chapter 4, where Vygotsky describes how sign-mediation is used as an *experimental technique* to investigate the development of various psychological functions in children – “the instrumental method in psychology,” a.k.a. the “functional method of dual stimulation.” He makes the point that “a tool is directed outward and a sign directed inward fulfil technically different mental functions” (p. 89), and makes it clear that it is *signs*, not “technical tools,” which are to be used in this research. Vygotsky defends the idea of the construction of an “intellectual reaction” by means of the incorporation of signs in behaviour against criticism from various sides. It is clear that Vygotsky has identified the use of psychological tools in ontogenesis as an extraordinarily fruitful area of experimental research. *Spoken words* were now recognised as the primary *signs*:

“In order to trace how the natural formation of the sign, which is not at all an intellectual discovery, develops in the child, we must deal with how speech in general is formed.”
(p. 126)

This is a departure. Previously, “signs” had referred to outgrowths of labour tools, archetypically, the written word, and Vygotsky had taken no account of the spoken word as a sign mediating speech action. But now, in 1931, for the first time he talks about spoken words *as signs mediating actions* as a means of mastering one’s own behaviour. Now, with speech and labour (word and action), developing in intimate connection with one another, even merging, they each develop at each step beyond what either line of development could have achieved separately.

Thinking and Speech

This genetic relation between two interconnected lines of development is expressed succinctly in Vygotsky’s master work, “Thinking and Speech,” in the chapter on “The Genetic Roots and Thinking and Speech.”:

- “1. In their ontogenetic development, thought and speech have different roots.
- “2. In the speech development of the child, we can with certainty establish a pre-intellectual stage, and in his thought development, a pre-linguistic stage.
- “3. Up to a certain point in time, the two follow different lines, independently of each other.
- “4. At a certain point these lines meet, whereupon thought becomes verbal and speech rational.” (*LSV CW*, v. 1, p. 112)

This general schema applies equally well to language and labour, or word and deed, and other instances of interconnected processes of development, – each has independent roots and an independent line of development, but at a certain point they intersect and transform one another.

“Thinking and Speech” opens declaring its aim to be the analysis of thinking and speech, in which the *word is a sign*. The essential process is not written words, but the *spoken word*, a unity of sound and meaning, the spoken word that has been there, together with and intimately connected to labour, from the very beginning of the existence of humankind.

In chapter 5, reporting Sakharov’s experiments on concept-formation, Vygotsky no longer refers to complexes as concepts, but simply as stages in the process of concept formation. Chapter 6 deals with true concepts. But further, Vygotsky includes in the chapter on concept formation the “potential concept.” This is a pre-intellectual form of activity which children share in common with many animals. A potential concept registers the practical significance of a situation, as a signal for some action which has become a *habitual* response to a given perceptual Gestalt. In this way, Vygotsky gives recognition to the co-existence of “practical intelligence” along with the development of

verbal intelligence which is the subject matter of “Thinking and Speech” and the role of tools in ontogenesis.

None of this detracts, however, from the significance in social history of the invention of the writing and other psychological tools, nor of the impact of literacy in ontogenesis. It does emphasise, however, the importance of restricting our use of the word ‘tool’ to *material artefacts being used to act upon material*, and to not mix up the specific meaning of the word ‘tool’ as Vygotsky used it, with the metaphorical use of the word ‘tool’ as the means and applicable to concepts, methods, theories, techniques of activity, etc.

I shall now deal with some issues which arise from the Marxist tradition of which Vygotsky is a part.

Marx and Engels on “Just So stories”

The idea that the production and use of tools was not just an essential characteristic of the human species, but was the essential process which, through Darwinian natural selection, *created* the human species, was Engels’s original idea, published only 17 years after the publication of Darwin’s *The Origin of Species*.

It is hardly possible that a leading ideologist of the workers’ movement of the nineteenth century, based on the *industrial working class*, was unaware of the ideological implications of the claim that industrial labour created the human species. It was not the Christian God who created humanity, and nor was it competition and survival of the fittest, but industrial labour.

As Engels had written in 1875:

“The whole Darwinian theory of the struggle for existence is simply the transference from society to animate nature of Hobbes’ theory of the war of every man against every man and the bourgeois economic theory of competition, along with the Malthusian theory of population. This feat having been accomplished – (... I dispute its unqualified justification, especially where the Malthusian theory is concerned) – the same theories are next transferred back again from organic nature to history and their validity as eternal laws of human society declared to have been proved.” (*MECW*, v. 45, p. 107-8)

The bourgeois ideological interpretation of natural selection has since been challenged, with the anarchist Pyotr Kropotkin, for example, emphasising the role of cooperation in natural selection. These kind of “Just So Stories” (Kipling 1902) were not the invention of the 19th century. Marx wrote in 1867:

“The use and fabrication of instruments of labour, although existing in the germ among certain species of animals, is specifically characteristic of the human labour process, and [Benjamin] Franklin therefore defines man as a tool-making animal. ... It is not the articles made, but how they are made, and by what instruments, that enables

us to distinguish different economic epochs.” (*MECW*, vol, 35, p. 189)

alluding to a comment by Franklin published in 1780. Later, he noted wryly:

“Aristotle's definition is that man is by nature a town-citizen. This is quite as characteristic of ancient classical society as Franklin's definition of man, as a tool-making animal, is characteristic of Yankeedom.” (*MECW*, vol, 35, p. 331)

So Marx well understood how social classes and movements legitimise themselves by elevating their particular mode of activity and social position to be the essentially human one. The Marxist Evelyn Reed, for example, continued the defence of the origins of the human species in tool-making in the 1960s against claims for the brain, distinction, speech and aggression being the essence of humanity responsible for the origin of our species. In 1970, she participated in the furious debate amongst feminists to establish that early human society was matriarchal, and that the patriarchy was instituted as part of the transition to feudalism, in which the women were robbed of their inheritance.

So let us be clear. Origins stories are always interesting; but they are also invariably *ideological*, discovering in ancient history and Nature conceptions which in reality have their origin in today's issues. I believe that this was why the project of “Instrumental Psychology” proved to be an unprofitable way to approach the construction of Cultural Psychology. In the end, Vygotsky discovered what was before his eyes in the first place: *speech*, which originated at the same time as labour and in close connection with it. It was the production of artefacts in combination with speech which created mankind.

Labour and Language

The “linguistic turn,” beginning in the 1960s, could not but impinge on the ideological differences over the essential features of Cultural Psychology. In his day, Marx said:

“One of the most difficult tasks confronting philosophers is to descend from the world of thought to the actual world. *Language* is the immediate actuality of thought. Just as philosophers have given thought an independent existence, so they were bound to make language into an independent realm.” (*MECW*, v. 5, p. 446)

The struggle over the priority of language or labour has long been the arena for a struggle for supremacy between the professional middle class and the working class. However, the linguistic turn came at a time when the industrial working class itself was losing its hegemonic position in progressive politics, at the same time as the most advanced sections of the working class, were increasingly becoming a class of “symbolic analysts” more likely to be operating a keyboard than a hammer. So one should not be too quick to judge the ideological content of the tension in Cultural Psychology between Activity

Theorists and Semioticians or Discourse Analysts. *Science needs to follow its own logic.* It is inevitable that social tensions arising from the development of the productive forces will intrude into science and determine its directions. But the scientist must try to remain above that, and thereby anticipate social movements, rather than be driven blindly along by them.

The same is true of choosing whether to use the term “labour” or “activity.” Insofar as these terms are correctly used in Cultural Psychology, they are co-extensive. The labour process is the determining factor in *historical* development, that is true. Nonetheless, “activity” means purposive activity, activity aimed at changing the world, and is inclusive of activity in the labour process. All that “labour” brings to cultural psychology is *connotations* which emphasise (wrongly) industrial labour in contrast to other kinds of activity, such as child’s play, child rearing, political activity, supervision of labour and intellectual work. Ideological prejudices do no favour to science or to the social movements they serve. Vygotsky began his social history and ethnic psychology project on the assumption, shared by most of the Marxists of his time, that it was the development of the *means of production*, i.e., tools, which were the decisive factor in history. But this is not the case. According to Marx, the first steps in the accumulation of capital are (1) primitive accumulation, which means outright robbery, driving the peasantry off their land thereby creating a class of labourers who do not own their own means of production (*Capital*, v. 1, part viii); (2) the subsumption of the existing labour process under capital as wage labour; (3) the transformation of the labour process into capitalist production and the concomitant revolutionising of the forces of production (*MECW*, v. 34, p. 424ff). So in fact, it is not the means of production themselves, but the social relations in which these means are utilised which are decisive. Were this not the case, capitalism would have emerged centuries earlier in China, not in 18th century Britain.

Vygotsky got there in the end, with the inclusion of the spoken word as a sign, and his formulation of the relation between word and deed as independent lines of development each with their own roots, but mutually interpenetrating and transforming one another – but in the *beginning* was the deed. This captures the relation free of the distorting lens of ideology. The relation is *not fixed once for all*, but changes in the course of development.

Vygotsky underwent at least two major reversals at the time of writing *History* (1931): he reversed his idea of set *vs.* concept, and the spoken word replaced the tool in centre stage. What brought about this reversal? It seems to this author that Hegel lies behind it. A study of references to Hegel in Vygotsky’s *Collected Works* ([Blunden 2009](#)) suggests that it was only from the time of writing *History* that Vygotsky had more than a superficial familiarity with Hegel. But it seems unlikely that even at that time, that he had read more than a paragraph or two of Hegel. Vygotsky did get involved with some supporters of the Hegelian-Marxist Abram Deborin in 1930, so this may be where the Hegelian influence came from. This is a problem for further research.

A. N. Leontyev on Labour and Tools

The mediation of actions by tools was taken up by Vygotsky's younger colleague, A. N. Leontyev, as part of Activity Theory and continues to play a role in the Activity Theory of Yjro Engeström. So Vygotsky's work on tool-mediation did not go to waste. Before outlining the use to which tool-mediation has been put by Activity Theorists, I should mention a rather unpleasant manifestation of the ideological use of the word/deed relation by Leontyev in the toxic political atmosphere which prevailed in the decades of the Soviet Union after Vygotsky's death.

In 2005, the *Journal of Russian and East European Psychology* published a formerly unpublished article by Leontyev entitled "Study of the environment in the pedagogical works of L. S. Vygotsky." This work was a rather scurrilous attack on Vygotsky, labelling him as an idealist. (See [Blunden 2014](#)) The charge of idealism is based on Vygotsky's "linguistic turn":

"What, indeed, is communication as the term is used by Vygotsky? We are aware of two usages of the term: first, its usage to signify the general fact of people's interrelations, which encompasses their "material dealings," and second, its usage in the ordinary, more narrow sense, in the sense of "spiritual" relationships, that is, in the sense of communication using language. Obviously, for Vygotsky, it has only the second, narrower meaning. So, the process of verbal communication is defining for the child's psychological development; and consequently, the child appears in Vygotsky's work as *social*, and first and foremost as *a socialized* being. But, behind the superficial similarities of these two words lies a gulf separating their sense—the same gulf that separates materialism and idealism." (2005, p. 19)

This is an empty criticism because it is *real* – that is to say – *material* relations which are communicated and psychologically appropriated by words, and the central weakness of Leontyev's position is that he overlooks that the *concept* a person forms of their situation frames their psychological response to it, and that concept is generally formed only through the mediation of words. But Leontyev "sets aside [Vygotsky's] complicated idea of the different course of development of the 'spontaneous' and 'scientific' concepts" (p. 18), made possible by his analysis of word meaning.

Tools and Operations in Activity Theory

Origins play a very significant role in Leontyev's approach to psychology. He spent a major part of his scientific life tracing the emergence of life from its simplest manifestations through the animals to human adults, and his highly structured theory reflects its genetic derivation.

The most primitive forms of activity are *operations*; these are movements which originate as a simple reflex response to a situation, whether conditioned or innate, and cannot be said to have any aim

distinct from the operation itself, as the organism has no conscious awareness of the operation. More complex activities necessitate the concatenation of multiple operations to achieve an objective, and these operations now have an aim which differs from their immediate goal. The organism must now be consciously aware of that object in order to control the operation, and these operations are called *actions*. Actions facilitate the division of the *activity*, which is constituted by a series of actions, between different members of a community, via a division of labour. Only humans and the higher animals can carry out activities.

Conversely, when an action is carried out habitually, so that it can be executed and adapted to conditions without conscious awareness, it reverts to the status of an operation, until something upsets the operation, and it springs back into conscious awareness and is subject to conscious control. What can be done habitually can be done by an algorithm or by a machine.

Tools are made by a routine operation being *objectified*. In the epoch of “primitive man” the natural means of production were common property, like the language.

“The need for awareness of operations already arose in the transition to the fashioning of differentiated tools, and especially of composite ones. The earliest tools, as archaeological finds have shown, could still have been the result of simple ‘adaptation’ of natural objects to the conditions of labour activity (for example, the ‘natural retouching’ of universal stone implements in the course of using them).” (2009, p. 14)

In apprehending a tool, and knowing how to use it, a person forms a concept of the human labour operation objectified in the tool. The invention and fashioning of tools is the process whereby human communities form concepts of Nature, in the form of all the operations by means of which human beings interacted with and changed nature, and the material means by which they did so. *A tool is an objectified operation*. Every action, once it has become habitual, is ripe for objectification as a tool. The consciousness of primitive man was composed of “potential concepts” (to use Vygotsky’s term) based on tools, objects which exist outside of consciousness and can be sensuously apprehended like other objects and processes. Language developed in the labour process and as each operation was mastered, do far as possible, it was objectified in tools and the relation between them, and named in the language. In this way, the practical intellect of human beings was constructed from the tools we use to interact with the world around us.

Leontyev credited Vygotsky for the ideas behind this theory:

“The idea of analysing activity as a method of scientific human psychology was proposed, as I have already said, in the early works of L. S. Vygotsky. The concept of tool (‘instrumental’) operations, the concept of purposes, and later the concept of motive (‘motivational sphere of consciousness’) were introduced.” (1978, p. 98)

This approach also underlay Davydov's (1990) idea in which a tool which objectifies an operation forms the "germ cell" from which a more concrete concept can develop. Yjrö Engeström (1999; 2015) has further developed this idea. For James Wertsch (1985), on the other hand, "It is Vygotsky's later interpretation of signs and their mediational capacities that will be the primary focus." These writers all acknowledge that their work is based on Vygotsky's concept of the "artefact-mediated action."

Postscript: Engels and Vygotsky

It is very clear from Vygotsky's writing that he was an avid reader of Engels' popularisations of dialectics. "The Part Played by Labour in the Transition from Ape to Man" (1876) and its more developed version as the Introduction to "Dialectics of Nature," must have been a big influence on him. A couple of observations on this essay are in order.

Engels was the first to say that it was labour which brought about the transition from not-yet-human apes to human beings. "Labour begins with the making of tools." Freeing the hands by the adoption of an erect gait led to the making of tools, that is, labour, and this led to the expansion of the brain, language and sundry other changes, and eventually to the emergence of human beings as a species. So

"... the development of labour necessarily helped to bring the members of society closer together by increasing cases of mutual support and joint activity, and by making clear the advantage of this joint activity to each individual. In short, men in the making arrived at the point where *they had something to say* to each other ... and the organs of the mouth gradually learned to pronounce one articulate sound after another.." (MECW v. 25, p. 455)

and summing up

"First labour, after it and then with it speech – these were the two most essential stimuli under the influence of which the brain of the ape gradually changed into that of man." (*loc. cit.*)

Vygotsky seems to have paid attention to that! In the introduction to "Dialectics of Nature," published in Russia in 1925, Engels says:

"With men we enter *history*." (MECW v. 25, p. 330)

That is, once the human species has arisen, thanks to the biological transformation of the ape effected by labour, a new principle of development takes the lead. Engels then presents a short history of human activity from the stone axe to the social revolution:

"the more that human beings become removed from animals in the narrower sense of the word, the more they make their own history consciously." (MECW v. 25, p. 330)

Engels placed the history of the human race in the context of the eventual extinction of life on Earth and the death of the solar system itself, but he makes no particular distinction between the cultural-historical, psychological and biological development of human beings or the principles governing these processes of development. He also

told this story as if it were a single undifferentiated line of development encompassing all of human history in a single “grand narrative.” Engels’ concern was with the possibilities for the transformation of social relations, not psychology. So in terms of constructing the foundations of cultural psychology, Engels left all the work still to be done.

Nonetheless, it is remarkable that 140 years after Engels speculated, it is now widely accepted that tool making and language developed side by side in the predecessor species before the emergence of *homo sapiens* and evolved the vocal apparatus used in speech, and that it was at this point in evolutionary development that the brain underwent its most rapid expansion. The eons over which *homo sapiens* then evolved were marked by cultural evolution and relatively modest anatomical change, and brain size actually decreased during the last 15,000 years – perhaps because we have been able to rely more on our “extended mind”!

Tool and sign have each had independent roots in the development of Marxism and Cultural Psychology. These two lines of development continue to interact and transform one another in the work of Cultural Psychologists and Activity Theorists, an interaction which can surpass what either line of development could achieve separately.

Addendum on the Evolution of Language

Although information from palaeontology, archaeology, anthropology, zoology, genetic microbiology and neurology continue to advance at an impressive rate, we still do not have clear answers to most of the important questions about the origins of human language in general and speech in particular. Treatises on the topic are more often written in order to use the evidence to confirm suspect philosophical prejudices than to criticise the evidence from philosophical premises. Since I have no new data to contribute, I will confine my speculations to some broad principles.

The Co-evolution of Behaviour and Biology

The biological make-up of an animal species evolves under selection pressures determined by the relationship between the organism’s behaviour and its environment. The behaviour of the species co-evolves with its environment, within the constraints of its biological make-up. Natural selection determines that the biological make-up of the species will tend to evolve so as to enhance the fitness of the species for the given behaviour in the given environment.

That is, *behaviour leads biology*.

One qualified exception to this rule is *exaptation*, in which biological changes which have developed under selection pressure arising from one behaviour incidentally enhance another behaviour. So long as we take behaviour as a whole (rather than specific behaviours separately) this is consistent with the general rule.

It is widely agreed that the *hominin* group emerged about 6 million years ago, with about 20 different species having been identified by palaeontologists, all but one of which, *homo sapiens sapiens*, are now extinct, and that what uniquely characterised this entire group was *bipedalism*. That is, it is the adoption of the bipedal gait which set off the train of evolutionary changes which led to the modern human beings.

We don't know what rudimentary bipedal behaviours and environmental pressures led to the departure. No-one knows, but like everyone else I will speculate. It seems to me that bipedalism would have enhanced the pre-existing behaviour of *carrying* things, a behaviour which exists in rudimentary form in our ancestor species. Carrying things enhances division of labour, the establishment of fixed camps supported by extended foraging and hunting, and thereby cooperative living, but most especially *delayed gratification*, which is a psychological pre-condition for cooperative living. Indeed, without delayed gratification only immediate individual consumption of Nature is possible. Delayed gratification provides the opening into which conscious awareness can enter.

Delayed gratification entails important psychological adaptations, namely the formation of representations of the activity associated with an item collected, extracted from its natural setting and carried home with a view to sharing its consumption. These representations are retained and shared in the use of the objects themselves. All that is required psychologically is awareness of the subject's own behaviour. In other words, practical abstraction and 'recursion' (that is, the inclusion of one behaviour as an element of another behaviour) lays the basis for psychological abstraction and recursion, which can be embodied in language.

These anatomical and psychological adaptations entailed in bipedalism and carrying incidentally enable better use of the hands in tool making and gesturing, both of which behaviours exist in rudimentary form in the evolutionary predecessors of *hominins*. I do not place a great deal of weight on the observation that bipedalism 'frees up' the hands for gesturing, though this may have been a contributing factor. It is the practical abstraction and recursion made possible by bipedalism which is most significant.

I learn from Corballis (2002) that dropping of the larynx, one of the anatomical preconditions for articulate speech, may have also arisen by exaptation from bipedalism. But note: a necessary but not sufficient precondition.

Language, Gesture and Speech

I agree with Corballis that the first manifestation of language properly so-called was signed language – gesturing with the hands, face and body, including mime, pointing and conventionalised signs. The vocalisations of our predecessor species are direct emotional reactions not under voluntary control, but hand-use is under voluntary control even amongst our primate forebears. It is unlikely then that, lacking the capacity for articulate, voluntary control, *hominin* vocalisations could

have constituted the rudimentary speech which would make the transition to spoken language properly so-called.

Gesturing would have been supported by the pre-existing range of associated vocalisations which would not initially have been under voluntary control, in the same way that modern day humans use facial gestures which are not under conscious control while communicating with speech. The anatomical and psychological preconditions for this adaptation have been provided by bipedalism and associated behaviours, foremost among which is living in collaborative relationships in relatively large bands beginning simply with carrying things back to camp for later shared consumption.

It is these large groups engaging in collaborative activity enabled by bipedalism, which is the principal behaviour driving further development of language creation and use. The result is anatomical and neurological adaptations which enhance collaborative activity which mark the species.

We know from our Deaf communities that signed languages are fully developed languages with the same capacities as spoken language, and that they develop spontaneously under equivalent cultural conditions as spoken languages. Children are driven by the same compulsion to acquire the signed language in their environment, if this should be the locally dominant mode of communication, as compels and facilitates children to acquire a spoken language in circumstances which make this possible.

The 'language drive' is equally directed at acquiring language, whether signed or spoken, and the evidence is quite clear that this drive is part of our biologically inherited make-up, even though *which* language and which mode we use is determined by cultural conditions. (See [Blunden 2014a](#)).

The point is that *language must have evolved before the anatomical prerequisites for speech were in place*. Child-talk, creoles and home-signing aside, there is no such thing as a 'primitive language' in existence anywhere today. There is no reason to suppose that the language used by the first *homo sapiens sapiens* was not also fully developed, having arisen from a language based on gesture which had hundreds of thousands of years of cultural development behind it.

The alternative proposition that a sophisticated anatomical and psychological apparatus enabling voluntary, articulate speech evolved without playing any role in behaviour and then one day humans *discovered* they could speak! It takes hundreds of thousands of years for anatomical changes to evolve, during which time creatures have ample opportunity to explore their capabilities.

It is a matter of fact that once our ancestors of the *homo* species began to use language, effective, controlled use of vocalisation gradually expanded while the gestural components gradually receded, even though they still continue as part of our normal speech to this day. This would be an instance of selection pressures based in behaviour driving the evolution of physiology and anatomy.

Again, I do not place a lot of weight on the argument that speech ‘freed up’ the hands for labour, but it may have been a contributing factor in the gradual transition from signed language to spoken language. This change of behaviour unfolded in the context of collaborative social life, where selection pressure forced the biological change to better subject the vocal apparatus to conscious control, as gestures were already.

While carrying things, facilitated by bipedalism, is I would suggest the first behaviour exhibiting practical abstraction and recursion, the manufacture, sharing, instruction in and use of tools is the next. This development in behaviour has been prepared for by the development of controlled use of the hands and greatly improved communication, and incidentally, an emergent facility in hands-free communication.

A very important precondition for language use is the capacity to read the intentions of your conversational partner. By far the most important condition for mutual comprehension of intentions is participation in *collaborative projects* in which the partners all share a common object, or motivation.

Division of labour within a common project demands that the shared object is pursued by means of immediate practical goals. Participation in such a form of social life provides all the psychological preconditions necessary for the development of language, without the need for constructs like ‘mirror neurons’, Language Acquisition Devices and so on.

Hegel said: “The word is the tool of Reason.” Tool-making and tool-use, in which a concept has a specific material shape is an archetypal form of collaborative project which facilitates abstraction in behaviour, the necessary conditions for abstraction in thinking. Today’s tool is tomorrow’s word. The most impressive proof of this is the history of colour words, which shows that no matter how prevalent a colour may be in a community’s environment, historically, a word for the colour enters the language only when a community had learnt how to manufacture the colour.

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