Hayek's post-positivist empiricism:
Experience beyond sensation¹

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STRUCTURED ABSTRACT

Purpose: To answer the following questions: Is all knowledge based on 'experience' in Hayek's view? Was he an 'empiricist' or a 'Kantian'? In what sense?

Methodology/approach: Starting from a thorough analysis of Hayek's explicit ideas about empiricism and experience in *The Sensory Order* and some related writings, I reconstruct his epistemology but also try to improve on it with the help of some other philosophers.

Findings: Empiricism has many meanings depending on how you define 'experience'. Hayek is *not* a 'sensationalist empiricist' because he does not believe that all knowledge is based on 'sense experience'. However, given his ideas of 'pre-sensory experience' and 'experience of the race', Hayek *is* a 'post-positivist empiricist'. His empiricism can be improved upon by privileging what I call 'selective experience'.

Research implications: The next step is to analyze Hayek's market economics and philosophy of science to see which kind of experience guides Hayekian *entrepreneurs* and *scientists*. If this line of research is continued, practical and social implications might follow.

Originality/value of the chapter: The question whether Hayek was an 'empiricist' or a 'Kantian' is an old question. However, this paper is the first systematic analysis of his 'empiricist' epistemology and his concept of 'experience'. Moreover, it has value beyond Hayek scholarship since, in the general empiricism debate, epistemologists have almost ubiquitously assumed that 'experience' means 'sense experience'.

Category: Conceptual paper

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The philosophical foundations of Hayek's works are not beyond dispute (Gray 1984, Kukathas 1989, Caldwell 1992, Hutchison 1992): was Hayek a rationalist or an empiricist; did he follow Kant or Hume, Mises or Popper? Difficulties arise because these questions touch upon social theory, political philosophy, methodology and epistemology. Moreover, on different occasions, Hayek (intentionally) gave different definitions and evaluations of already complicated views such as 'rationalism' and 'empiricism'.

In this paper, I try to shed some light on the rationalism/empiricism issue by focusing on *epistemology*, where this issue really belongs. The debate there is mainly about the sources of knowledge (e.g., Markie, 2008). *Empiricists* argue that *experience* is the source of all our knowledge. This view was held by John Locke (1632-1704) and David Hume (1711-1776) but its roots go back to Francis Bacon (1561-1626) and even further to the ancient Greek Empiricist school in medicine (founded in the third century B.C. by Philinos of Kos or Serapion of Alexandria) and Aristotle (384-322 B.C.). In contrast with his teacher Plato, Aristotle believed in the 'induction' (*epagōgē*) of general knowledge from particular observations.

I will not have the space here to relate Hayek's ideas to this long history of empiricism. But I will try to refer to *David Hume* now and then, because Hayek was a great admirer of Hume's social and political philosophy and Hayek's 'Humeanism' is extensively discussed.² I will also get back to the less well known *Empiricist school in medicine*, because it has a very special conception of 'experience' which I believe to be useful to the discussion.

In contrast with empiricism, *rationalism* or 'apriorism' is the idea that some knowledge is independent of experience or '*a priori*'. Traditionally, this meant that knowledge is based on *rational intuition*, or embedded in our *rational nature* or the structure of the *mind*. If knowledge is embedded in our mind or nature, it is 'innate', which is why philosophers speak of 'innatism' or 'nativism'. Since this was Immanuel Kant's (1724-1804) view, it is often called 'Kantianism'.³ I will also use the term 'Kantianism' rather than

² What might surprise the reader is that Hume is not mentioned in *The Sensory Order*. In the index, you will find five references for 'empiricism', four for 'Locke', two for 'nativism', only one (irrelevant) reference for 'Kant' and *no references whatsoever* for Hume. Apparently, Hayek learnt about empiricism from Locke and, most importantly, from the debate around logical positivism – not alone from Otto Neurath and Rudolf Carnap but also from Ernst Mach, Bertrand Russell and Karl Popper.

³ Kant had much to say and 'Kantianism' has as many or even more connotations. (The same can be said about Hume and 'Humeanism'.) Leaving aside moral and political philosophy, which is not the topic of this paper, Kantianism is often associated with two distinct philosophical views: In addition to the 'rationalist' idea that (a large part of) our knowledge is not based on sense experience but is *a priori*, it often refers to the idea that (a large part of) reality is a construction of the mind. The latter view is often called 'idealism' and is opposed to 'realism'. This paper focuses on the rationalism/empiricism debate: It will *not* be concerned with the

'rationalism' because Hayek most often defines the latter as the false view that social phenomena are rationally designed, which is a completely different issue. Kantianism goes back to the 'innate ideas' of René Descartes (1596-1650) and the *anamnesis* of ideas in Plato's philosophy (429-347 B.C.).

Many scholars have tried to position Hayek in the Kantianism/empiricism debate. Most scholars would probably agree with Connin (1990, p. 301) that "Hayek's theory of knowledge is undoubtedly Kantian" (see also Feser, 2006, p. 300). However, many also understand that there is more to it (Caldwell, 2004, p. 273). Since 'experience' is undeniably a basic concept in Hayek's epistemology, some believe that his epistemology is a kind of synthesis between Kantianism and Humean empiricism (Horwitz, 2000, p. 25). De Vecchi (2003, p. 152) is less optimistic and says that "there is an unresolved tension between empiricism and anti-empiricism within the theory of the process of the formation of knowledge set out in *The Sensory Order*". Moreover, some have made the link with 'evolutionary epistemology' (Bartley, 1987, p. 21; Gray, 1984; Kukathas, 1989; Dempsey, 1996; Vanberg, 2002).

However, scholars have rarely wondered how Kantianism, empiricism and evolutionism can be reconciled, and, more importantly, what 'empiricism' and 'experience' mean in such a context. Just as there are as many 'rationalisms' as there are interpretations of the term 'reason', there are as many 'empiricisms' as there are interpretations of the term 'experience'. In this paper, I will reconstruct Hayek's epistemology based on a careful reading of *The Sensory Order* and some related writings. I will argue that Hayek's epistemology is best characterized as a type of 'post-positivist empiricism'.

In the first paragraph, I review Hayek's neurophysiological explanation of the mind in *The Sensory Order*. Hayek shows how the nervous system can perform the acts of classification characteristic of the working of the mind. Because the synaptic connections embody a kind of knowledge independent of 'sense experience', Hayek is *not* a 'sensationalist empiricist'. The second paragraph discusses Hayek's theory of the formation of synaptic connections. Connections are formed on the basis of what I will call 'Hayek's learning rule', which boils down to the familiar idea that *neurons that fire together wire together*. Since this means that the knowledge embodied in the synaptic connections *is* in a sense the result of 'experience', be it 'pre-sensory experience' rather than 'sense experience', Hayek *is* an empiricist after all, but one of the 'post-positivist' kind. In the third paragraph, I analyze

realism/idealism issue (I discuss this aspect in Lindemans, 2011) or with any other aspect in which Hayek's philosophy could be called 'Kantian' or not.

Hayek's views on the evolution of the nervous system and the behavior it generates. There appear to be *two* kinds of 'experience' at the basis of the synaptic connections: 'experience of the individual' and 'experience of the race'. Because Hayek denies that all knowledge is due to 'experience of the individual', he is *not* an 'individualist empiricist'. However, since 'experience of the race' is also 'experience', he *is* again an empiricist in the wider sense.

What Hayek failed to notice is that experience of the race is 'post-sensory' rather than 'pre-sensory' and also in other aspects very different from individual experience. I will call it a kind of '*selective experience*', which I contrast with 'inductive experience'. Some links with Donald Campbell's 'evolutionary epistemology' are explored. In the last paragraph, I consider Campbell's idea that *all* increases in knowledge are due to selection and make some suggestions for future research.

FROM CONNECTIONS AND IMPULSES TO SENSE EXPERIENCE

Hayek's (1952, p. 37) fundamental claim in *The Sensory Order* is that we will have explained the whole sensory order when we have shown "how in a physical system known forces can produce such differentiating relationships between its elements that an order will appear which strictly corresponds to the order of the sensory qualities". That (part of the) physical order structurally corresponding to the sensory order is the nervous system or the "neural order" (p. 39).

Let us take a quick look at the working of this nervous system. The nervous system consists of nerve cells called 'neurons' (p. 55) and connections between these neurons, called 'synapses' (p. 57), which allow 'impulses' to be transmitted to connected neurons (p. 8). 'Stimuli' outside the nervous system trigger series of such impulses in the nervous system by stimulating 'receptor organs' (p. 8). The impulses carried by the neurons directly connected to receptor organs are called 'primary impulses' (p. 52). Further impulses triggered by these primary impulses and carried by neurons *not* directly connected to receptor organs, i.e. 'internuncial neurons', are called 'secondary impulses' (p. 64). Hayek calls the "bundle of secondary impulses which each primary impulse will set up through these ... connexions" the 'following' of the primary impulse.

Let me give you some simplistic examples of how the nervous system can in principle perform the operations we know the mind performs. Imagine that *two neurons*, directly connected to different receptor organs, are connected to and transmit impulses to *the same internuncial neuron*. The followings of the two 'primary sensory neurons' will have in

common the chain of impulses starting in the internuncial sensory neuron: They *cluster together*. Hence, when two different stimuli each excite another receptor organ, the nervous system will nevertheless react in the same way. Hayek would say that the nervous system puts the different stimuli or primary impulses representing these stimuli *in the same class* (p. 64). This is how the nervous system can achieve the 'simple classifications' (p. 48) which we observe in the mind.

Consider another possibility, namely that *one primary sensory neuron* is connected to and transmits impulses to *different internuncial sensory neurons* so that its following *branches off*, as it were. In that case, the primary impulse belongs to *multiple classes*. Hayek calls this a kind of 'multiple classification' (p. 50). Due to such ramifying synaptic connections, each "impulse representing an event in the environment will be the starting point of many chains of *associative processes*" (p. 118, emphasis added), and the result of the interaction of a multiplicity of streams of impulses is a "sequence of individual mental images (or reproductions)" or "mental qualities" (p. 119).

Hayek understands that there exist "obvious relations" between this view and the old *association psychology* (p. 151), which was a central ingredient of John Locke and David Hume's classical empiricism. For instance, in *A Treatise of Human Nature*, Hume (2005, p. 13) argues that connections or associations between ideas "upon the appearance of one idea naturally introduce another".

However, Hayek's theory differs from the old association psychology "by regarding the elements between which such connexions are established as not themselves mental in character but as material events which only through those connexions are arranged in a new order in which they obtain the specific significance characteristic of mental events" (p. 151).⁴ He criticizes all 'mosaic psychology' (p. 76; p. 153) which views perception as a mosaic built up from mental elements or atoms.

Gestalt psychologists have already shown that perception is determined by the 'organization of the field' (p. 77; see also De Vecchi, 2003). Hayek applies this idea not only to the perception of complex configurations or 'Gestalts' but also to the so-called 'simple' sensations (of color, for instance). Therefore, he regards his own theory as "a consistent

⁴ Quite unexpectedly, Hume (2005) *also* had a 'materialist' theory of association. While he had said earlier that he would not go beyond observation (p. 5), Hume is *afraid he must* do so in order to make sense of certain psychological phenomena (p. 44). He makes an "imaginary dissection of the brain" and conjectures that "on our conception of any idea the animal spirits run into all the nearby channels and rouse up the other ideas that are related to it. ... as the mind is endow'd with a power of exciting any idea it pleases; whenever it dispatches the spirits into that region of the brain, in which the idea is plac'd; these spirits always excite the idea, when they run precisely into the proper traces, and rummage that cell, which belongs to the idea".

development of the approach of the gestalt school" (p. 151). According to Hayek, there are no 'absolute qualities' independent of their relations with other qualities (p. 30 ff.), and there is no mental quality attached to individual impulses (representing individual stimuli) independent of the whole network of relations with other impulses (p. 11, 119). Gestalt psychologists have criticized such views under the name of 'constancy hypothesis' (p. 41).

Likewise, Hayek criticizes the idea that "sensory experience gives us acquaintance with the 'concrete' phenomena while the higher mental processes derive 'abstractions' from those immediate data" (p. 142; see also 1967, p. 52; 1978, p. 35-36).⁵ In contrast, Hayek's theory implies that all perception is abstract in two ways. First, since it would be cognitively impossible to perceive *all* the properties of objects, perception is always a selection of certain properties: It "will always reflect only *some* of these generic properties which might be ascribed to the perceived object" (p. 144, emphasis added). Second, "what we perceive can never be *unique* properties of individual objects but always only properties which the objects have *in common* with other objects" (p. 142, emphasis added). In short, "*all* we know about the world is of the nature of theories" (p. 143, emphasis in the original).⁶ Later, Hayek (1978, p. 35 ff.) calls this 'the primacy of the abstract'. These ideas debunk '*sensationalist empiricism*', as I will call it, which takes elementary 'sense experience' as the unproblematic foundation of knowledge. Note that 'sensation' refers here to the subjective 'feeling' resulting from the operation of the senses. We will now see that Hayek also criticizes these sensationalist empiricists' narrow view of what can be counted as knowledge.

The abstractions which precede the concrete phenomena we experience are embedded in the network of synaptic *connections* between neurons. It is important to distinguish the latter from the volatile *impulses* which are transmitted through this network. The network of synaptic connections is the 'hardware' of the brain. On the other hand, sticking to the computer analogy, the impulses are not even the 'software' but rather the electronic signals flying through the transistors of computer chips when the computer is running a program.

⁵ This is related to the idea of "the hypothetical 'pure' or 'primary' core of sensation", which is supposed "either to involve some direct communication of properties of the external objects, or to constitute irreducible mental atoms or elements" (p. 165), or "the old belief that the sensory qualities constitute in some sense a reproduction of corresponding attributes of the objects of the external world" (p. 142), or, more technically, "the conception that the nervous impulses transmitted some attribute of the stimulus to the brain" (p. 10).

⁶ Hayek says in footnote that this manner of formulating it comes from Popper "who, however, may not entirely agree with this use I am making of his ideas". Indeed, by saying that all knowledge is 'theory', Popper means that all knowledge is *fallible* rather than fully certain, while Hayek wants to say that all knowledge is *general* rather than fully particular. This does not mean that Hayek would not also agree with Popper's idea that all knowledge is fallible (cf. *infra*)!

Hayek believes it is useful to employ “the simile of the *map*” to refer to the “network of connexions”, since it “in a somewhat analogous manner reproduces some of the relations which exist in certain parts of the physical world” (p. 109, emphasis in the original). The connections between impulses thus represent relationships between stimuli. They embody a kind of ‘knowledge’ (p. 167-168). More specifically, the map represents “the kind of world in which the organism has existed in the past, or the different *kinds* of stimuli which have acquired significance for it” (p. 115, emphasis in the original).

On the other hand, Hayek regards the “pattern of impulses which is traced at any moment within the given network of ... channels” as “a kind of *model* of the particular environment in which the organism finds itself at the moment” (p. 114, emphasis added). This pattern of impulses acts as “a sort of representation or picture of the momentary environment” (p. 113). Like the map, the model is a kind of physiological ‘memory’ consisting of traces left behind by stimuli and reproducing relations between external events (p. 114-115).

While they are both representations of the environment, the map and the model are very different. The map is stable but the model ever changing, so that Hayek speaks of “the ‘static’ and the ‘dynamic’ aspect of the system of sensory qualities” respectively (p. 44; see also 115-116). This difference in stability is related to what maps and models aim at representing. While the model represents the ‘momentary environment’, the stable map represents the kind of world in which we have ‘always’ lived. The map “provides the different *generic* elements from which the models of *particular* situations are built” (p. 130, emphasis added). It is “a theory of how the world works rather than a picture of it” (p. 131).

Because of the many synaptic connections, the whole pattern of impulses represents “both the actual state of the environment and the changes to be expected in that environment” (p. 118), so that “the organism must live as much in a world of expectation as in a world of ‘fact’” (p. 121). Obviously, the ‘primary impulses’ represent the *actual* environment. The ‘following’ then represents the potential *effects* of (groups of) elements of the situation (p. 119). It consists of “chains of symbolic representation” of consequences (p. 121).⁷

Given what Hayek said about the ‘knowledge’ of the map, “it is then clearly not true that all that we know is due to [conscious sense] experience” and “John Locke’s famous fundamental maxim of empiricism that *nihil est in intellectu quod non antea fuerit in sensu* is therefore not correct” (Hayek, 1952, p. 167). This supports Gray’s (1984) claim that “The entirety of Hayek’s work – and, above all, his work in epistemology, psychology, ethics, and

⁷ Note that, for Hume (2005, p. 53 ff.) too, the most important principle of association is that of *causation*, which enables *causal reasoning* from cause to effect and *vice versa*.

the theory of law – is informed by a distinctively Kantian approach” (p. 4) and that “Hayek’s uncompromisingly skeptical Kantianism is strongly evidenced in *The Sensory Order*” (p. 5; see also Kukathas, 1989, p. 48, 52-53).

While *The Sensory Order* mentions Kant only once and merely in an anecdotal way (p. vi), Kant is often implicitly present in the text.⁸ Hayek’s contention that “the operations of both the senses and the intellect are equally based on acts of classification” (p. 108) resembles Kant’s idea that, like the ‘understanding’, the ‘sensibility’ contains ‘*a priori* forms’, namely of space and time, and not just purely *a posteriori* information. This was Kant’s criticism of empiricism. Likewise, according to Hayek, perception is “always an interpretation, the placing of something into one or several classes of objects” (1952: 142). Much of *The Sensory Order* is ‘transcendental aesthetic’ in Kant’s sense: the study of the (*a priori*) conditions which enable sensation.

Hayek’s Kantianism is further illustrated by his views on the ‘knowledge’ of the map. This ‘knowledge’ is “implicit in all sensory experience” (p. 168). Clearly alluding to Kant, he says that the order of sensory qualities “provides the ‘categories’ in terms of which sense experience alone can take place” (p. 167). Therefore, the ‘knowledge’ of the connections “can never be contradicted by sense experiences” and “must be true of all that we can experience through our senses” (p. 168): It is “*a priori* true” (p. 169). The ‘knowledge’ of the map is “knowledge which is embodied in the definitions of the elements” or “tautological” (p. 170). In contrast, the knowledge of the model is “knowledge which is subject to control by experiences”. This distinction resembles the traditional epistemological distinction between *a priori* and *a posteriori* knowledge, which goes back to Hume (2005, p. 50 ff.).

Strictly speaking, philosophers call “knowledge which is embodied in the definitions of the elements” ‘*analytic*’, as opposed to ‘*synthetic*’. Hayek himself speaks about “analytical or tautological” statements (p. 171). For instance, the proposition ‘this book is red’ is synthetic, while the proposition ‘this book contains pages’ is analytic. ‘Analytic knowledge’ conceptually differs from ‘*a priori* knowledge’: The latter is traditionally defined as ‘knowledge independent of experience’. The whole discussion is whether all *a priori* knowledge is analytic, as the empiricists claim, or whether there are ‘synthetic *a priori* judgments’, as Kant argued.⁹

⁸ Hayek (1978, p. 45, n. 14) would later remark about a talk on similar themes that he took the obvious Kantian link for granted.

⁹ Note that empiricists like Hume (who himself lacked the Kantian terminology, of course) do *not* say that we do not have ‘*a priori*’ knowledge: In fact, they say that the *only* infallible knowledge we have is *a priori* (cf. Hume, 2005, p. 50). However, all *a priori* knowledge is ‘analytic’ for empiricists. In the passage quoted, Hume refers to

Hayek believes that some generic knowledge about the world, about causal relations between things in that world, is independent of experience. For instance, if 'red' and 'warm' are connected, it will be known *a priori* that 'red objects are warm', while there is nothing in 'redness' which makes it warm. Hence, with Kant, Hayek believes in *synthetic* propositions which are yet known *a priori*.¹⁰ The map is our *a priori* knowledge of the world, and the model is our *a posteriori* knowledge of the world. Moreover, Hayek believes that, as a general rule, *all a posteriori* knowledge presupposes some *a priori* knowledge. There is "on every level, or in every universe of discourse, a part of our knowledge which ... cannot be controlled by experience, because it constitutes the ordering principle of that universe by which we distinguish the different kinds of objects of which it consists and to which our statements refer" (p. 169-170). In all explicit knowledge, something remains implicit which makes the explicit possible.¹¹

This *a priori* 'knowledge' of the map is a very peculiar kind of knowledge. Traditionally, Kantians as well as empiricists regard knowledge as a (justified, true) *conscious belief*. The knowledge of the map, however, is *not consciously experienced*. The quotation marks Hayek sometimes uses – the '*knowledge*' of the map (p. 167-168) – probably signal the fact that Hayek does not use the word 'knowledge' in its usual meaning.

We have already seen that the *elements* which are connected are not consciously experienced as such. That the 'knowledge' of the map is not conscious means that even the *connections* themselves are not fully consciously experienced. The associations we have mentioned occur already on pre-conscious levels (p. 121). The relationships which determine consciously experienced qualities "are present in consciousness only in [an] 'implicit' manner and are not explicitly experienced" (p. 142). Hayek says that "we are not explicitly aware of the relations between the different qualities but merely manifest these relations in the

knowledge about relations between ideas which depends entirely on the ideas. An anonymous referee made the interesting comment that, if Hume's so-to-speak '*a priori* knowledge' is based entirely on the ideas which are being related, and ideas are derived from impressions and thus ultimately from sense experience, then this knowledge is not really *a priori*. Perhaps we should distinguish between *proximate* and *ultimate priority*. Humean knowledge that 'this book contains pages' is proximately *a priori* because one knows it prior to observing *this* book. However, it is arguably not ultimately *a priori* because one cannot know it prior to observing *any* book: You must have had the impression of at least a book to form the idea of 'bookness' on which the knowledge is based. (However, see note 28 for the role of human *nature* in Hume's epistemology.) We will immediately see that Hayekian knowledge could also be called proximately *a priori* but ultimately *a posteriori*, although Hayek will *not* ultimately reduce knowledge to *sense* experience!

¹⁰ The way Hayek formulates his ideas might confuse the reader. In Hayek's view, the fact that a proposition about the relation between elements is *a priori* known *changes the definition of these elements*. Red means warm, and *vice versa*. Nevertheless, it is clear that Hayek believes in the *a priori* knowledge of contingent facts about the external world, whether you would call that knowledge 'analytic' or 'synthetic'.

¹¹ An anonymous referee remarked that this becomes totally obvious when you think in neural terms: Impulses could hardly travel without the high-way of synaptic connections!

discriminations which we perform”: we ‘know how’ to apply these relations but do not ‘know that’ there are such and such relations, in Gilbert Ryle’s terms (p. 19). Therefore, we do not *experience* sensory qualities as something relative: We experience them as something *absolute*. Later, Hayek (1978, p. 45) calls them ‘super-conscious’, in contrast with conscious and subconscious mental events. Hayek even doubts whether we can ever be as conscious of abstractions as of concrete perceptions. In short, sensationalist empiricists are naïve in restricting knowledge not only in its origin but also in its *character*. Not all knowledge is based on sense experience, and not all knowledge is transparently ‘believed’.

LINKAGES AS PRE-SENSORY EXPERIENCE

Hayek’s idea of how the nervous system with its synaptic connections can perform the classifications we encounter in the human mind is only half or even *one third of the story*, as we will later find out. What is important about the synapses is that they “are not permanent or invariable features of the nervous system but can be created and modified in the course of its operation, probably as a result of the simultaneous occurrence of impulses in two or more adjoining neurons” (p. 57). This is often called ‘associative learning’, ‘Hebbian learning’ or ‘Hebb’s rule’¹². It is often expressed in the slogan ‘*neurons (or cells) that fire together wire together*’. Because of this learning rule, my earlier claim that the map is the ‘static’ aspect of the sensory order needs to be qualified, as you will all have anticipated: The map is merely “semi-permanent” relative to the constantly changing model (p. 115). Accordingly, our computer analogy should be revised in the sense that the map should be seen as *software* rather than hardware.¹³

Hayek makes it clear that the formation of connections is not conscious: We are not even conscious of the impulses before the connections are formed which enable

¹² Donald O. Hebb is often considered to be the father of neuropsychology. His book *The Organization of Behavior*, published three years before *The Sensory Order*, was a landmark in the development of psychology. Hayek became aware of Hebb’s work “too late to make full use of it” (p. viii; see also p. 53, n. 1). Other papers in this book will probably deal more extensively with the Hayek-Hebb comparison.

¹³ Note that I refer to the difference not between *abstract programs* and *concrete, physical objects* but merely between what is *changeable or ‘soft’* and what is *fixed or ‘hard’*. Like software, the map is clearly *soft*. The popular brain-computer analogy can be confusing though, and Austrians often dislike it because it has a *scientistic* touch to it. But Hayek “does not exclude the logical possibility that the knowledge of the principle on which the brain operates might enable us to build a machine fully reproducing the action of the brain” (p. 189), which justifies my analogy. Like in computers, the rules on how it can be ‘reprogrammed’ are present *in* the brain, while the actual inputs for this reprogramming ultimately come from *outside* the brain. An anonymous referee rightly remarked though that computer programs (software) falsely suggest an *intelligent programmer*. The external environment which ‘does the reprogramming’ is not consciously aiming at something – although some activities, like propaganda, could be interpreted as real neural programming.

discrimination (p. 104). Hayek uses the term '*linkage*' to describe the formation of connections. 'Linkages' are "the most general lasting effect which groups of stimuli can impress upon the organization of the central nervous system" (p. 108). Not only is there no suggestion of a mental event, it also stresses that learning necessarily consists in *creating connections* between, or *linking*, several physiological events (p. 105).

We have seen that, in Hayek's view, the synaptic connections embody a kind of 'knowledge'. This makes sense in the light of Hayek's learning rule. If neurons that fire together wire together, the formed connections "will evidently reproduce certain regularities in the occurrence of the external stimuli acting on the organism" (p. 107; see also p. 42). These connections are then "a sort of record of past associations of any particular stimulus with other stimuli which have acted upon the organism at the same time". Hence, the sensory order constitutes "a sort of accumulated 'knowledge'" based on learning (p. 167).

In a sense, Hayek's theory of linkages clearly continues his criticism of *sensationalist empiricism*. More specifically, it criticizes the conception of an 'invariable core of pure sensation' attached to the impulse and independent of past experience (p. 41). He mentions Bertrand Russell who regarded this independence of experience as the essence of sensation.

Moreover, Hayek's connectionist theory of physical memory contrasts with "the 'storage' theory of memory" which holds that the mind or the brain stores mental entities representing the experienced sensations (p. 105). According to Hume (2005, p. 11-12), for instance, the memory is a faculty that copies impressions into considerably lively ideas and preserves also their original order of appearance. Hayek already wrote in his student paper of the twenties, on which *The Sensory Order* is based, that "we do not first have sensations which are then preserved by memory, but it is as a result of physiological memory that the physiological impulses are converted into sensations" (p. 53).

However, Hayek realizes that there are many meanings of the term 'empiricism'. He thinks that, usually, the 'empiricism' dispute also involves the "question whether the order of sensory qualities can be understood as having been formed by ... experience ..., or whether it must be regarded as something unaccountably and unexplainably existing apart from the effects which the environment exercises on the development of the organism" (p. 42; see also p. 106). With regard to this question, his "thesis belongs to the 'empiricist' position".¹⁴ Note

¹⁴ At first sight, Hayek's empiricist position seems to contrast with "the strongly anti-empiricist attitude of the gestalt school" (p. 106). Hayek is "not certain, however, that the opposition of the gestalt school to an empiricist explanation of gestalt qualities as being 'built up' by experience from sensory 'elements' need apply to a theory which, as the theory developed here, traces all sensory qualities, 'elementary' as well as gestalt qualities, to the formation of a network of connexions based on linkages between non-mental elements".

that, in Kant's philosophy, the *a priori* forms are not only invariable but also in a sense 'something unaccountable and unexplainable': they are the 'transcendental' conditions of the possibility of all knowledge. Hence, contrary to Gray (1984), I claim that Hayek's 'general philosophy' was *not* Kantian.¹⁵

Moreover, Hayek's *a priori* knowledge is also *fallible*. In Hayek's view, the fact that our *a priori*, pre-sensory knowledge is necessarily true about the phenomenal world (cf. *supra*) does not mean that it is also necessarily "true of the physical world" (p. 168). The synaptic connections, and thus the map, will constitute "not only a very imperfect but in some respect even a definitely erroneous reproduction of the relations which exist between the corresponding physical stimuli" (p. 108). Hayek's *apriorism* is not as extreme as that of Kant, and more in line with Hume's fallible knowledge of cause and effect.

Hayek says that the system of connections which enables classification is acquired "by a kind of 'experience' or 'learning'" (p. 53), so that the whole of sensory qualities can be called an "interpretation based on experience" (p. 41-42).¹⁶ However, "[s]ince the impulses between which these first connexions are formed would not yet occupy a place in an order of sensory qualities, and no such order would yet exist, their occurrence could not yet be described as experience in the ordinary meaning of the term" (p. 104). Hayek distinguishes between, on the one hand, what he calls "experience in the ordinary meaning of the term", "experience in the narrow sense" or "conscious sense [or sensory] experience" (p. 167) and, on the other hand, what he calls "'experience' in a somewhat special sense" (p. 103) or "pre-sensory experience" (p. 167). Pre-sensory experience is "a sort of learning to discriminate which may occur before any discriminations are yet possible" (p. 104): it is experience *before* sensation.¹⁷ Hence, it is a purely physiological event rather than a mental event.

Sense experience and pre-sensory experience are both "experience in the wider sense" (p. 167). However, they are so different from each other that the meaning of the word

¹⁵ Hayek's general philosophy is *analytic* (Anglo-American) rather than *continental* (German or French). I believe that this is also an important reason why Hayek's methodological subjectivism is *scientific* or *naturalistic* rather than *hermeneutic* (cf. Vanberg, 2004).

¹⁶ Note that Hume's (2005) ideas on how *experience* is the basis of the connections between ideas are similar to Hayek's. The most important principle of association is that of *causation*. Hume describes how the imagination connects ideas on the basis of the principle of causation. We relate ideas as cause and effect when we *repeatedly* experience that impressions are *contiguous* in time and space and one impression (the 'cause') occurs *prior* to the other (the 'effect'). Repeated experience implies that the cause-impressions *resemble* each other, as do the effect-impressions. Hume's 'constant conjunction of impressions' at least resembles Hayek's 'simultaneous occurrence of impulses'.

¹⁷ The relationship between 'pre-sensory experience' and 'conscious experience' is made clear when he says that "the distinctions between the different sensory qualities of which our *conscious experience* appears to be built up are thus themselves determined by *pre-sensory experiences* (linkages)" (p. 167, *emphasis added*). Accordingly, Hayek can say that "experience is not a function of mind or consciousness, but ... mind and consciousness are rather products of experience" (p. 166).

'experience' becomes unclear. There are several important clusters of meanings for the word 'experience' which are often confused. The *Oxford English Dictionary*, for instance, teaches us that the noun 'experience' (1989) can refer to, on the one hand, "The fact of being consciously the subject of a state or condition, or of being consciously affected by an event" or "The actual observation of facts or events, considered as a source of knowledge" and, on the other hand, "Knowledge resulting from actual observation or from what one has undergone". On the basis of these definitions¹⁸, the German philosopher Fritz Heinemann (1941, p. 570) distinguishes between, on the one hand, 'immediate experience' or 'experience as action', namely "what we immediately feel or undergo during the course of our life", and, on the other hand, 'mediated experience' or 'experience as result', which "presupposes repetition and memory and is the result of experiencing in the first sense of the word".¹⁹ When philosophers, including Hayek, speak about 'sense experience' or 'experiences' in the plural, they mean 'active experience'. When they say 'experience' *tout court*, it often but not always refers to 'resultant experience' based on repeated 'experiences'.

But there seems to be another, even more fundamental kind of ambivalence in the meaning of the term 'experience'. This ambivalence is illustrated by the *OED*'s definition of (resultant) experience as 'knowledge resulting from actual observation *or* from what one has undergone'. There is a difference between observing and undergoing something! This ambivalence is also present in the *OED*'s definition of the *verb* 'to experience' (1989), in its active meaning, as "To have experience of; to meet with; to feel, suffer, undergo". Not all of these actions are necessarily conscious! Moreover, the *OED* notes that *things* can also 'experience' something in the sense of "To meet with, undergo". For instance, *uninhabited* lands can 'experience' floods. Likewise, *people* can meet with or undergo events unconsciously, in a thing-like manner.²⁰ On the other hand, people can consciously experience an event without meeting with a real physical event, for instance, when dreaming.

I conclude that Hayek's 'experience in the wider sense' refers to (*learning from repeatedly) undergoing events*, consciously or unconsciously. 'Sense experience' is (learning

¹⁸ Heinemann quotes from the first version published as *A New English Dictionary on Historical Principles* in 1894 (although he gets the date wrong).

¹⁹ Hume (2005) also uses the term 'experience' as 'resultant experience', and what he calls 'perception' is 'active experience'. At the beginning of the *Treatise*, he advocates an "experimental philosophy" founded on "experience and observation" (p. 4). Causal inferences, which are based on the *constant* conjunction of ideas, start from 'experience' (p. 61). The "nature of experience" is remembering having perceived (through one's senses) two objects as well as their constant conjunction.

²⁰ While Heinemann did not notice the ambivalence I have pointed out, he did criticize the "Aristotelian restriction of experience to its intellectual meaning" (p. 562, emphasis omitted) and argues that experience belongs "to all the sense-organs, in a certain sense to all the organs and to the whole body" (p. 571, emphasis omitted).

from repeatedly) undergoing events *in a conscious way*, and 'pre-sensory experience' is (learning from repeatedly) undergoing events, namely the simultaneous co-occurrence of impulses, *in a pre-conscious way*.

Due to his distinction between 'sense experience' and 'pre-sensory experience', "the whole problem of the relation between experience and knowledge assumes a new complexion" (p. 167). While Hayek denies that all knowledge is based on sense experience, Hayek agrees with the basic idea of empiricism that "all our knowledge ... is due to experience" (p. 172).²¹ Hayek concludes that "in so far as we have been led into opposition to some of the theses traditionally associated with empiricism, we have been led to their rejection not from an opposite point of view, but on the contrary, by a more consistent and radical application of its basic idea" (p. 172). I will call the view that all knowledge is based on 'experience in the wider sense' rather than being unaccountable and unexplainable '*post-positivist empiricism*': empiricism after the logical positivism of the Vienna Circle.

SELECTIVE EXPERIENCE OF THE RACE

So far, we have discussed only, say, *two thirds of the story* (cf. *supra*): from stimuli to receptor organs and the afferent fibers. However, the story continues: *from the efferent fibers to the motor organs and behavior*. That we have to wait until the fourth chapter before Hayek discusses behavior is because Hayek deliberately restricted his focus to the nervous system in reaction against the neglect of it by behaviorism (p. 79). But behavior is also central to Hayek's theory of the sensory order.²²

The importance of the nervous system constructing a model of the environment is that this model is capable of directing the organism towards a particular course of *action* (p. 123-124). Purposive behavior is based on the ability discussed earlier to anticipate consequences. In addition to a model of the environment, action also requires a *drive*, for which Hayek turns to biology (p. 96 ff.). For something to become a goal of action, "it must be evoked by, or form part of the following of, the reproduction of the actual environment and of the governing

²¹ But not all experience results in infallible knowledge! Hayek wants to get rid of "the habitual assumption that all we have learned from experience must be true" (p. 168).

²² The emphasis on practical consequences is actually already present from the beginning of *The Sensory Order*. Hayek defines 'sensory qualities' as "all the different attributes or dimensions with regard to which we differentiate in our responses to stimuli" (p. 2). Now, people differentiate in their responses to stimuli, or 'classify' stimuli, in both conscious and *unconscious* action (p. 23). 'Sensation' is thus not necessarily conscious in Hayek's view, which is of course yet another difference with traditional sensationalist empiricism.

state of drive or urge" (p. 124). A goal is thus an effect which is "both possible in the existing external situation and 'desirable' in view of the state of the organism".

In later writings on psychological topics, Hayek (1978) attaches even more importance to practical consequences, asserting that "it is meaningless to speak of perceiving or thinking except as a function of an acting organism in which the differentiation of the stimuli manifests itself in the differences of the disposition to act which they evoke" (p. 42). He defines concepts like 'quality', 'recognition' and 'knowledge' purely in terms of behavior, saying that "the various 'qualities' which we attribute to our sensations and perceptions are [the] dispositions which they evoke", "the 'recognition' of [features of the environment can be regarded as] the activation of the kind of disposition adapted to them" and "all the 'knowledge' of the external world which ... an organism possesses consists in the action patterns which the stimuli tend to evoke" (p. 41-42). This is what he believes to be "the limited truth contained in behaviorism" – a limited truth with rather far-reaching implications for Hayek!

Gray (1984, p. 13) says that "one of the most distinctive features of Hayek's Kantianism" is "its pragmatist aspect".²³ I do not think that pragmatism is a feature of Hayek's Kantianism: it belongs to the essence of his *naturalist* view of man as an animal. Hayek's naturalistic epistemology resembles Donald Campbell's (cf. Kukathas, 1989, p. 50; Vanberg, 2002). Campbell (1960, p. 380, n. 2) defines 'knowledge' very broadly as "a stored program for organismic adaptation in external environments", which was part of "an effort to put 'the problem of knowledge' into a behavioristic framework which takes full cognizance of man's status as a biological product of an evolutionary development".²⁴ In primitive animals, "knowledge represents 'if-then' rules" (Campbell, 1997, p. 19). Campbell's broad definition of knowledge is an alternative to the traditional confinement of knowledge to 'beliefs' – philosophers have traditionally defined knowledge as 'justified true belief'.

In addition to the definition of 'knowledge', Campbell offered an alternative to the traditional correspondence theory of 'truth'. In contrast with the traditional view that beliefs 'represent' facts, Campbell (1997, p. 19) says that the 'if-then' rules have "competence of reference" when their "activation produces a response that is on the average adaptive". In an

²³ Hayek probably dismissed pragmatism because William James makes some of the mistakes sensationalist empiricists make (1952, p. 30, 153; see also 1978, p. 44). Moreover, Hayek did not like the methodological and political views of pragmatist John Dewey (e.g. Hayek, 1960, p. 17 and 424, n. 21-22) – or his student Wesley Claire Mitchell!

²⁴ Later, in an attempt to stay closer to traditional epistemology, he would reject the broad definition of his "1960 model" (1997, p. 7-8).

evolutionary context, 'true' means 'useful' (p. 9). This is what philosophers call a 'pragmatist theory of truth'. All these ideas fit Hayek's views very well.

In many ways, David Hume, foreshadowed Hayek's and Campbell's naturalistic epistemologies: The section 'Of the reason of animals' in the *Treatise* (Hume, 2005, p. 118-120) is a good illustration. In a Kantian framework, it is impossible to conceive of reason as animal-like. Hayek's psychology is then clearly in the spirit of Hume rather than Kant. Hence, it makes sense to call Hayek a 'post-positivist *Humean*'.

In both Hayek and Campbell's frameworks, the *pragmatic* nature of knowledge and truth is due to the fact that knowledge has *evolved* through the selection of knowledge-guided behavior. Hayek (1952, p. 127) sketches the evolutionary origin of mental order in what he calls a 'super-model' of the model-object relationship. He starts from "a self-contained system or universe consisting of a cloud of particles", from which soon "stable structures" emerge (p. 128).²⁵ Stability of structures is defined as "the probability of their persistence in the face of the action upon them by the environment". Now, more complex structures will be stable only if "they can respond appropriately to certain events, and even in some measure anticipate their occurrence, i.e. perform the appropriate response as soon as certain other events occur which indicate the imminence of the harmful one" (p. 129).

Hayek thinks it is "conceivable, though not very likely" that structures will emerge which "just happen [to respond appropriately] to all or most events which usually precede those which would destroy them" (p. 129). For instance, the organism that instinctively connects 'smoke' or 'brightly colored animal' with 'RUN!' will outlive those who wait until they are burned or bitten. It is thus possible that very primitive organisms behave on the basis of genetically determined connections between stimuli and behavior, or between the receptor organs and motor organs, without ever learning new connections: Their *map* of the *kind* of environment they live in would be entirely innate.²⁶

²⁵ This reminds me of Stephen Dawkins' immortal tale of the origin of 'replicators' from the 'primeval soup' in Chapter 2 of *The Selfish Gene* (2006 [1976]). Surprisingly (or *not*), a similar evolutionary cosmogony can be found in Hume so that we can truly call Hume an 'evolutionary naturalist' *avant la lettre*. In Part 8 of the *Dialogues Concerning Natural Religion*, first published posthumously in 1779, Hume has one of the dialogists suggest "a new hypothesis of cosmogony, that is not absolutely absurd and improbable". It is argued that design in our universe can be explained by the fact that if matter is *not* composed in a stable form "a chaos ensues; till finite, though innumerable revolutions produce at last some forms, whose parts and organs are so adjusted as to support the forms amidst a continued succession of matter". Hume speaks about the "constancy" or "stability in the forms".

²⁶ Note that it would also be theoretically possible that the *model* of the *particular* environment would be innate: that *all* knowledge would be innate and no knowledge *a posteriori*. Think about organisms with 'behavioral dispositions' (or just principles of ontogenetic development) but without receptor organs or senses which can change these behavioral dispositions. This is arguably the case with some plants (but not even of sun flowers, for instance). Since such organisms would never have sense experience, the 'experience of the race' (cf. *infra*) at the

However, the “chance of persistence of any given structure will evidently be increased” if it “also possesses the capacity of retaining a ‘memory’ of the connexions between events which frequently precede such influences and these influences themselves, and thereby becomes capable of ‘learning’ to perform the appropriate response whenever those signals appear” (p. 129).²⁷ For instance, the organism which can *learn* to connect ‘smoke’ with ‘fire’ or ‘brightly colored animal’ with ‘poison’ – and thus to connect its reactions to fire and poison (‘RUN!’) also with respectively smoke and brightly colored animals – is more likely to survive than those with a fixed map. Therefore, more advanced organisms learn new connections between stimuli and behavior on the basis of individual experience. The Hebb-Hayek rule that *neurons that fire together wire together* is one possible learning rule. A learning rule is the capacity to *change* the map. Hence, while the map consists of simple dispositions, learning rules are what Hayek calls “dispositions to change dispositions” (1978, p. 49, 59). While the map is learnt, the learning rule itself is not learnt: It is *innate*.²⁸

Here again, we can ask whether Hayek's theory is ‘*empiricist*’. One of the questions in the ‘*empiricism*’ dispute is whether “the ‘learning’ process which can account for the determination of the order of sensory qualities takes place entirely or predominantly in the course of the development of the individual” (p. 42; see also p. 106). With regard to this question, “our contention does not take side in the dispute between the ‘nativists’ and the ‘*empiricists*’” (see also Hayek, 1978, p. 42). Hayek admits his ignorance about exactly which part of the map is due to individual learning and which part to biological evolution.

On the other hand, his position seems to be in between the extremes: It is “in the course of its phylogenetic *and* ontogenetic²⁹ development” (p. 42, emphasis added) that the organism learns to differentiate between stimuli. Hayek's belief in *some* innate knowledge

basis of this innate knowledge of the model could be called ‘*non-sense*’ experience rather than pre- or post-sensory experience.

²⁷ A similar idea is expressed in the following passage: “The continued existence of those complex structures which we call organisms is made possible by their capacity of responding to certain external influences by such changes in their structure or activity as are required to maintain or restore the balance necessary for their persistence. This involves, even in the most primitive organisms, some *capacity of discriminating responses to different physical stimuli*, and perhaps even some *capacity of ‘learning’*, although we know very little about the nature of such individual learning (as distinguished from the processes of hereditary selection of such individuals as show appropriate adjustments)” (p. 82, emphasis added).

²⁸ Hume (2005) too denies that the principle of association on the basis of cause and effect is the result of experience. Rather, it belongs to our *nature* (p. 120).

²⁹ Ontogeny is the ‘genesis’ of a ‘being’, namely the development of the individual organism from fertilized egg to mature organism. Phylogeny, on the other hand, is the ‘genesis’ of a ‘race’, namely the evolution of the species from bacterium or eukaryote to *homo sapiens*.

makes him a Kantian *nativist* rather than an empiricist in the traditional sense. In any case, Hayek is *not* an '*individualist empiricist*', as we might call it.

But, in contrast with nativists such as Kant, Hayek refused to accept innate knowledge as an unexplainable foundation. Gray (1984, p. 10) notes that there are "striking affinities" with the later Karl Popper's 'evolutionary epistemology' (see also Kukathas, 1989, p. 49).³⁰ Like Donald Campbell (1997: 6) and Karl Popper, Hayek believes that Kantian innate, *a priori* knowledge is the result of evolution – but note that Hayek also says that a part of our *a priori* knowledge is individually learnt. Biologizing Kant was also the ethologist Konrad Lorenz' project. Several times, Hayek (1952) cites Lorenz' article 'Die angeborenen Formen möglicher Erfahrung' (1943) – the title is of course an allusion to Kant's *a priori* 'forms'.

Hayek views biological evolution as the 'experience of the race'³¹, while individual learning is the 'experience of the individual' (1952, p. 42, 106). Like individual pre-sensory experience, 'racial experience' is a physical rather than conscious event (cf. *supra*). But it is a kind of experience or 'undergoing' nevertheless. Again, Hayek confirms that knowledge is based on 'experience in the wider sense', in which it includes experience of the individual as well as the race, so that we can again conclude that Hayek is above all an *empiricist in the broadest sense*.

While Hayek is agnostic about the role of individual learning and biological evolution, one of the simplifying assumptions Hayek employs in *The Sensory Order* – which I have adopted in the preceding paragraphs – is that he proceeds "as if" all connections are formed during the development of the individual (p. 60; see also p. 81, 102-103). This boils down to the assumption that at the start of an individual's life there are no synaptic connections in the nervous system.

The justification for this simplification is that it appears to Hayek that "the principle which determines the formation of the mental order may operate either in the ontogenetic or in the phylogenetic process" (p. 103). We have seen earlier what this principle is: Connections between neurons are created on the basis of the co-occurrence of impulses. Whether Hayek's belief that the same principle guides both individual and 'racial' experience is true depends on how you interpret his learning rule.

³⁰ Hayek says that to his friend Karl Popper he is "much indebted for reading and commenting upon earlier drafts of this book" (1952, p. viii-ix).

³¹ Strictly speaking, in biology, *races* are subgroups of one *species* with some genetic differences. However, when Hayek says 'race', he means the whole 'human race', which is the entire '*homo sapiens*' species. Of course, no *racist* connotations are intended either. In one place, Hayek says 'experience of the species' (p. 166).

In its *weak version*, the rule says that there is *some mechanism* through which synaptic connections are formed between neurons in which impulses occur simultaneously. In that case, the evolution of the brain might indeed be subject to Hayek's learning rule, on the condition that it is useful for the organism to know on forehand which neurons tend to fire together. If this allows the organism to be faster than sense experience and to be prepared even before the second impulse (representing a destructive event) occurs, evolution might indeed result in the wiring together of neurons which fire together.

In the *strong version*, however, the rule says that there is a specific (though perhaps unknown) *anatomical or physiological mechanism* through which the co-occurrence of impulses causes synaptic connections to be formed between neurons – and it appears that Hayek had this strong version in mind (see p. 52). In this case, however, Hayek's learning rule does *not* guide the evolution of the brain. What is learnt on the basis of Hayek's learning rule will *not* be inherited – if we neglect the theoretical possibility that (part of) the result of individual learning is inherited *epigenetically*.

Hayek thus neglects some fundamental differences between individual and racial³² experience. The term 'experience' in Hayek's 'experience of the race' has a very specific meaning, which is nicely illustrated by yet another cluster of meanings of the term 'experience' which can be found in the *OED*. It defines the noun 'experience' (1989) also as "The action of putting to the test; trial" or "A tentative procedure; an operation performed in order to ascertain or illustrate some truth; an experiment". Heinemann (1941: 570) calls this third category "tentative experience" but sadly fails to discuss it.

The word '*empiricism*' originally had the same connotation of 'trials' and 'experiments'. It comes from the ancient Greek 'empeirikos', which means *experienced*, and is derived from the verb 'peiran', meaning *to attempt, try, test, experiment*. It found its way to Latin where it first denoted the physicians of the ancient Greek Empiricist sect. What this Empiricist school in medicine called 'improvised experience' (e.g. Frede, 1988, p. 85) is clearly a kind of 'tentative experience'.

³² Furthermore, he does not clearly distinguish (yet) between the 'biological experience' and the '*cultural experience*' of the race, namely the experience the race accumulates through respectively biological and *cultural evolution* (cf. Hayek, 1988). There is one passage in *The Sensory Order* where it is clear that Hayek also thinks about the *cultural* experience of the race, namely when he says that symbolic communication is important because, "in learning the system of symbols developed by his race, the individual can utilize, in ordering his current experience, not only his own experience but in some measure also the experience of his race" (p. 135). In *The Constitution of Liberty*, we again find the expression 'experience of the race' in its cultural sense (Hayek, 1960, p. 64). In that sense, it used to be an expression not uncommon among scholars (e.g. James, 1897, p. 17; Veblen, 1910, p. 183).

The word '*experience*' comes from the Latin '*experientia*' and ultimately the verb '*experiri*', which has the same meaning and even the same origin as '*peiran*'. In the word '*experience*', we hear the word '*peril*' or, in Latin, '*periculum*', which, in addition to *danger*, means *attempt, trial, test, experiment*. Tests are always dangerous because they might falsify the conjecture. In the word '*experiment*', we have preserved this original meaning, while the word '*experience*' gradually meant (learning from repeated) *observation*. However, the Latin verb '*observare*' means *to watch, regard, attend to* and comes from '*servare*' or *to keep, save, protect, pay heed to*. While observation is conservative and safe, experience is progressive and dangerous!

Like experience from observation, experience from trying seems to require *repeated meetings*. However, experience from trying is the result of daring variation rather than monotonous repetition. We say that a pianist is 'experienced' not only because he has repeated thousands of times the *same* notes, i.e. because he has 'practiced' (cf. Hayek, 1952, p. 153). He is experienced also because he has played many *different* kinds of music on *different* pianos in many concert halls with *different* kinds of audience. The experienced pianist is somebody who has encountered many new problems and tried out different new solutions. Difference, not similarity is the mother of experience: novelty, not mere repetition.

Likewise, while 'individual experience' is based on monotonous repetition, Hayek's 'experience of the race' is based on daring variation. There are important differences between these two kinds of experience. In the case of individual experience, new synaptic connections are the result of the co-occurrence of impulses and the neurophysiological learning rule *that connections are formed on the basis of the co-occurrence of impulses*: The new connections are 'induced'³³ by the co-occurrence of impulses. In the case of racial experience, new synaptic connections are caused by *random mutations*: They are 'conjectured' without any grounds. Campbell (1960, p. 381) would say that variation in evolution is 'blind'. Therefore, the experience of *ex post* success or failure becomes important. Campbell says that "a consistent selection process" is a necessary condition for evolution. 'Experience' in an evolutionary setting can only mean the *testing* in the natural environment of some variants. In short, while individual experience is based on a learning rule, racial experience is not; while the former is 'inductive', the latter is 'conjectural' and 'selection-based'. For that reason, I call Hayek's individual experience a kind of '*inductive experience*' and his racial experience a kind of '*selective experience*'.

³³ Strictly speaking, the connections are '*deduced*' from the learning rule *cum* the co-occurrence of stimuli. I merely mean that the connections are based on a process of *generalization*, be it rule-guided generalization.

In the case of individual experience, the co-occurrence of impulses precedes the formation of a connection. However, in the case of racial experience, the 'conjecture' of a connection precedes the occurrence of *any* impulses. For instance, if the connection between 'brightly colored animal' and 'poison' is innate, such an animal will never have experienced, not even in a pre-sensory manner, the simultaneous occurrence of bright colors and poison before the connection was present – nor will one of the ancestors ever have had such an experience.

This might suggest that racial experience is *a fortiori* also a kind of 'pre-sensory' experience. However, in a later paper, Hayek (1978, p. 42) draws the reader's attention to "the limited extent in which it can be said that these action patterns³⁴ are built up by 'experience'". It seems to Hayek "that the organism first develops new potentialities for actions and that only afterwards does experience select and confirm those which are useful as adaptations to typical characteristics of its environment". The conjectural or mutational formation of the new connection precedes the experience of the race. This experience is thus 'post-connectional' and 'selective'. Moreover, since selection will occur after the organism has reacted to certain stimuli according to the conjectured connections, it would be more correct to call racial experience '*post-sensory*': experience *after* sensation (see Figure 1).³⁵

Another important difference between racial and individual experience is the manner in which they are related to reality, to the external world. In the case of individual experience, stimuli in the external world are represented by impulses in the nervous system. Individual experience is *mediated* experience. In contrast, experience of the race is the real, *immediate* experience *with* hard reality, unmediated through impulses or sensations, rather than an experience *of* your own subjective reality.³⁶

[FIGURE 1]

³⁴ Remember that synaptic connections are essentially behavioral dispositions.

³⁵ Therefore, I agree with De Vecchi's (2003: 158-59) statement that the later Hayek "goes beyond the concept of 'pre-sensory experience,' present in *The Sensory Order*", but I *disagree* with his claim that the later Hayek now "assumes a position that is closer to the anti-empiricism of the gestalt school ... and ... manages to attenuate the impression of an unresolved tension between empiricism and anti-empiricism that he had created in *The Sensory Order*".

³⁶ Heinemann (1941, p. 562, 570) uses the handy expressions 'immediate' and 'mediated experience', first, to translate the concepts of 'autopsia' (your own experience) and 'historia' (reports about the experience of others) central to the Empiricist school in medicine, and, second, to describe 'experience as action' and 'experience as result' (cf. *supra*), but I use the terms in a somewhat different sense. What I call 'mediated' is what Donald Campbell would call 'vicarious' (e.g. Campbell, 1997, p. 12).

CONCLUSION

Very much like Campbell and Popper, Hayek should be read as an empiricist going beyond traditional empiricism, sensationalism and positivism: *with Hume beyond Hume*. Rather than summarizing the whole argument from 'sense experience' to 'pre-sensory experience', and from 'individual experience' as 'inductive experience' to 'racial experience' as 'selective experience', I want to end, first, by taking Campbell's evolutionary epistemology beyond Hayek and, second, by suggesting some possible lines of research. Hayek's broad empiricism holds that knowledge is based on experience in the wider sense in which it includes individual sense experience, individual pre-sensory experience and racial experience. However, from an evolutionary epistemological point of view, this empiricism is perhaps *too broad*.

Evolutionary epistemologists focus on the *growth* of knowledge and thus the source of *increases* in knowledge. The "Basic Selectionist Dogma" of Campbell's "1960 model" (Campbell, 1997, p. 8) states that "A blind-variation-and-selective-retention process is fundamental to all inductive achievements, to all genuine increases in knowledge, to all increases in fit of system to environment" (Campbell, 1960, p. 380). The reason for this radical selectionism is that "real gains must have been the products of explorations going beyond the limits of foresight or prescience, and in this sense blind", since "if such expansions had represented only wise anticipations, they would have been exploiting full or partial knowledge already achieved" (p. 380-381). This basically means that 'selective experience' is the source of *all* (increases in) knowledge. Hence, 'evolutionary empiricism', though also 'post-positivist', would be much stricter than Hayek's broad empiricism.

Of course, this does not imply that Hayek's pre-sensory experience based on the learning rule is nonsense from Campbell's point of view. The second part of Campbell's Basic Selectionist Dogma says that "The many processes which shortcut a more full blind-variation-and-selective-retention process are in themselves inductive achievements, containing wisdom about the environment achieved originally by blind variation and selective retention" (Campbell, 1960, p. 380). The evolution of Hayek's learning rule itself is an 'inductive achievement', a 'genuine increase in knowledge'. Hayek never reflects much on the fact that the learning rule is *itself* the result of the 'experience of the race' and thus contains knowledge about (the regularity of) the environment. In contrast with the learning rule, the new connections which are the deterministic *result* of the learning rule are *not* (completely) 'genuine increases in knowledge' since the knowledge was already achieved at the moment the learning rule evolved. Hence, the pre-sensory experience of the individual is

still not the most fundamental kind of experience. The 'experience of the race' that the learning rule works is a 'pre-pre-sensory experience'.³⁷

The empiricism/rationalism debate is not only about the *sources* of our beliefs and concepts, but also about the *justification* of our knowledge. It is not only about how people *do* in fact acquire beliefs about the world, but also about how they *ought to* acquire beliefs. Unfortunately, in *The Sensory Order*, Hayek was not particularly interested in the question whether knowledge *ought to* be based on experience. In contrast, Campbell's evolutionary epistemology is clearly normative. While he sides with the skeptics against traditional epistemologists (Campbell, 1997, p. 12) and holds that 'justification' is never complete (p. 13), he does construct a theory of 'justification' on the basis of "Plausible co-selection of belief by referent" (p. 9). According to this theory, a belief – or a behavioral disposition other than a belief (cf. *supra*) – is 'as justified as can be' if it is plausible that the belief has been systematically co-selected by the belief-independent reality to which it refers. For instance, the beliefs we form about objects on the basis of seeing objects are justified if it is plausible that these objects were part of the environment which has selected the eye and the neural system which processes information coming from this eye. Campbell calls this 'competence of reference' selection (p. 10). If there is no such a plausible scenario, or if other co-selectors have probably been more influential, the belief is not justified. Campbell's idea of co-selection by the *belief-independent* reality nicely illustrates that 'selective experience' must be '*immediate*' (cf. *supra*).

Given what has been said, we can redefine 'knowledge' as a *behavioral disposition* which has *competence of reference* because it was systematically *co-selected by its referent*. Campbell's theory is an *externalist* theory of justification because the knower does not necessarily have access to the grounds of justification. Campbell himself relates it to Alvin Goldman's *causal* theory of knowledge (p. 9). Indeed, the referent *causes* the 'belief' to survive. More specifically, Campbell's theory is *reliabilist* because it claims that 'competence of reference' selection processes are *reliable* sources of truth. Hence, Campbell also relates it to Goldman's reliabilist theory of justification.

I believe that Campbell's normative evolutionary epistemology is a welcome complement to Hayek's epistemological ideas.³⁸ Refining Hayek's concept of 'experience'

³⁷ There is another reason why individual learning is no anomaly in the light of Campbell's Basic Selectionist Dogma. The third part of Campbell's Dogma says that "shortcut processes contain in their own operation a blind-variation-and-selective-retention process at some level, substituting for overt locomotor exploration or the life-and-death winnowing of organic evolution" (1997, p. 8). Likewise, individual experience in Hayek's sense has inductive as well as *selective* aspects. I will discuss this elsewhere (Lindemans, 2011).

and specifying the way in which we can call him an 'empiricist' as well as what kind of empiricist he *could* have been are only the first steps, though. In this paper, I have restricted the analysis to Hayek's 'empiricist' *epistemology*, i.e. the theory of how *people in general* (should) acquire knowledge. The next step is to apply this epistemology to two specific classes of individuals which are very important to Hayek: *entrepreneurs* and *scientists*. These are some questions that could be raised: What is the role of 'experience' in Hayek's *market economics*? Do (or should) entrepreneurs acquire knowledge on the basis of experience? What kind of experience? Can we use the concept of 'selective experience' to justify entrepreneurial action? On the other hand, what is the role of 'experience' in Hayek's *philosophy of science*? Do (or should) scientists – psychologists as well as economists – acquire knowledge on the basis of experience? What kind of experience? Can we use the concept of 'selective experience' to justify scientific theories?³⁹ In that sense, I hope that this chapter is only the beginning.

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I would like to thank Leslie Marsh for creating a forum to discuss Hayek's philosophical psychology in its purity, i.e. without necessarily having to link it to his economics or politics: I hope it will inspire the reader as much as it inspired this author. I also want to thank two anonymous referees for combining wise comments with warm encouragement, so that remaining errors are bound to be mine only.

³⁸ Talk about *oughts* and justification might raise the objection that drawing hasty policy conclusions from epistemological considerations would go against the spirit of Hayek's thought. However, the epistemological 'ought' is not a moral or political, let alone legal, 'ought'! Moreover, it might be objected that Hayek (1988, p. 61 ff) criticized the whole *justificationist* program. However, Hayek (or was it the eager editor of his book?) seems to object against *internalist* standards of justification which require that the knower always has *access* to the grounds of justification. It would indeed be un-Hayekian to demand that people always justify their beliefs on the basis of a plausible story of co-selection by the referent. But what Alvin Goldman called 'social epistemology' and Roger Koppl 'institutional epistemics' (Koppl, 2005: 91-92) is very much in the spirit of Hayek.

³⁹ I am finishing up a companion paper which makes at least the bridge to Hayek's 'empiricist' philosophy of science (Lindemans, 2011).

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FIGURES

Figure 1: Inductive and selective experience