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[THE USE OF EVOLUTION IN EVOLUTIONARY PSYCHOLOGY]

Evolutionary Psychology is a new research field that studies behaviour. In their efforts they try to explain human behaviour and social organization different methods and theories are used. But not all these methods and theories are accepted by scientists. Problems can be identified in the use of these methods and in the formulation of theories. This results in a discussion that questions the validity of the explanations and hypotheses formulated by Evolutionary Psychology

Content

Introduction

Aim thesis

Today, when scientists study emotions in an evolutionary perspective they talk about 'evolutionary psychology'. But this 'new' research field seems to emphasize more on human nature in behaviour and social organization. And a lot of different approaches are used. This thesis tries to find an answer to the question whether or not evolutionary psychology is a significantly different research field then the one studied by Wundt and Darwin and the scientists that followed. Or can we say that evolutionary psychology is nothing more than the logical successor of the theories described above?

In addressing these questions, the structure of this thesis will be chronological. So after Wundt and Darwin, different approaches that followed from these theories will be described. In the following chapter, the development of research on behavioural traits will be discussed. This includes the animal psychology of Romanes, the classical ethology of Lorenz and Tinbergen, Loeb's behaviourism, animal psychology of De Haan and the sociobiology by Wilson, Morris and others. This chapter concludes with some criticism these approaches received in their time by, for example, Gould.

The third chapter focuses on the new approach of evolutionary psychology. It tries to explain the goals and aims and describe the general theories the scientists work with. When this is made clear, focus will shift to criticism that this research field receives. This will mainly be done with the help of four papers that criticize evolutionary psychology.

The final chapter first focuses on what could be the link between sociobiology and evolutionary psychology, namely the Adaptationist Program. Finally, evolutionary psychology will be compared with sociobiology to see if we can name evolutionary psychology a new research field or if it's sociobiology in a new form.

Chapter 1 Founders of the study of instincts and behaviour

Research on the brain is hot these days. Just think about the attention books receive that focus on our brain and whether or not we decide for ourselves. In the Netherlands examples such as "*Wij zijn ons brein*" by Dick Swaab and "*De vrije wil bestaat niet*" by Victor Lamme can be given. But research on conscious and unconscious actions are not new. A long line of scientists tried to tackle the problem of the origin of our (un)conscious actions. Two of them can be seen as founders of the modern research done on consciousness, Darwin and Wundt.

1.1 Darwin and the expression of emotions

In the introduction of his book *On the Expression of Emotions in Man and Animal*, Charles Darwin gives an excellent overview of work done by other researchers on emotions and their expressions. What sets Darwin apart from these researchers in the rest of his book is his evolutionary approach. Instead of just describing an expression, Darwin tries to find an origin for the emotions that are expressed. With this, Darwin tries to show a continuity between animals and humans[1]. He mainly does this, in the same way as he did in *The Origin*, by observations of man and animals. From these observations, Darwin concluded that three principles of the origin of expressions can be found[2]:

1) The principle of serviceable associated habits
2) The principle of antithesis
3) The principle of actions as a result of the structure of the nervous system.

According to Darwin, most serviceable associated habits are reflexes that originate from an action subjected to will. Through repetition of that same state of mind, by the force of habitation the action will be repeated even when there is little use for it. He elaborates on this and gives an example of sneezing and coughing.

"*From the foregoing remarks it seems probable that some actions which were at first performed consciously, have become through habit and association converted into reflex actions, and are now so firmly fixed and inherited, that they are performed, even when not of the least use, as often as the same causes arise, which originally excited them in us through the volition. In such cases the sensory nerve-cells excite the motor cells, without first communicating with those cells on which our consciousness and volition depend. It is probable that sneezing and coughing were originally acquired by the habit of expelling, as violently as possible, any irritating particle from the sensitive air-passages. As far as time is concerned, there has been more than enough for these habits to have become innate or converted into reflex actions; for they are common to most or all of the higher quadrupeds, and must therefore have been first acquired at a very remote period.*"[3]

Although only the last principle refers directly to the nervous system, Darwin did state that for the learned actions a certain physical change in the nervous system is also needed for all the first principle in order to be hereditary, as we can see in the previous passage. These reflexes are then inherited over many generations, as with the example of sneezing and coughing. Darwin thought it well possible that over these multiple generations small variations in reflexes are present. This, in analogy with other body structures and instincts, is subjected to the process of Natural Selection. So only the reflexes that benefited the organism in some way are them preserved. A reflex that was originally for one specific purpose could change to fit another purpose because of different needs of that organism. All these reflexes occur purely unconsciously and are even less effective when the will is controlling the process.[4]

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[1] Thierry, 2010 pp.
[2] Darwin, 1872 p.
[3] *Ibid* p.39-40
[4] *Ibid* p.

The second principle holds that when the mind is in opposite states the actions and movements are also of opposite nature. Darwin tried to explain the communication among animals of the same species with this principle but acknowledges that this remains speculative[5] (Darwin 1872). It remains unclear how much impact the principle of antithesis has on the origin of certain expressions and gestures[6]. But Darwin did not doubt that some forms of communication had originated through antithesis:

"*If indeed they are serviceable to man or to any other animal, in aid of inarticulate cries or language, they will likewise be voluntarily employed, and the habit will thus be strengthened. But whether or not of service as a means of communication, the tendency to perform opposite movements under opposite sensations or emotions would, if we may judge by analogy, become hereditary through long practice; and there cannot be a doubt that several expressive movements due to the principle of antithesis are inherited*."[7]

The final principle Darwin describes is when actions or movements are the result of the nervous system without the interference of the will. He tried to illustrate that with the help of the trembling of muscles when a person is sick, dropping in body temperature etc. According to Darwin, trembling has no specific function that originated through the will of a person. Trembling can therefore only be explained as an action that originates in the unconsciousness[8]. As an explanation for this, Darwin refers to Herbert Spencer when stating that an existing quantity of free nerve energy has to trigger a reaction somewhere. This free coming energy forces the cerebral-spinal system to respond with movements. According to Spencer, the free coming nerve energy tries to follow the most habitual routes. When this is not sufficient, less habitual routes will be taken. This results in facial and respiratory muscle movement because these muscles are most used[9] (Spencer 1863). Darwin adds that these habitual routes are the result of regular past impulses, either from conscious or unconscious actions[10].

Darwin concludes his explanation of his three principles with the notion that many expressive movements can be explained with the help of these three principles. But he does add that it is often impossible to account some form of weight to one of the principles described. This contributes to the remaining inexplicability of the theory of expression[11].

On the matter of conscious or unconscious influence the explanation remains vague. In the first principle, Darwin clearly contributes a form of will to the process in order for an action to become a reflex. In his explanation of the second and third principle Darwin focuses more on the unconscious influences on the habituation of certain movements. But in his conclusions he does incorporate the possibility that consciousness is present in all principles:

"*It is, however, possible that even strictly involuntary actions, such as the erection of the hair, may have been affected by the mysterious power of the will.*

Some expressive movements may have arisen spontaneously in association with certain states of the mind, and afterwards been inherited. But I know of no evidence rendering this view probable."[12]

One could say that Darwin believes that every expression is either a direct result of consciousness or the result of the unconscious reaction to an impulse. But according to the quotation above, Darwin himself found the latter less probable than the former. The origin of an expression therefore has to be the result of a conscious action. Only the conscious mind can ascribe a certain

[5] Darwin, 1872 p.
[6] Thierry, 2010 pp.
[7] Darwin, 1872 p. 65
[8] *Ibid* p.
[9] Spencer, 1863
[10] Darwin, 1872 p.
[11] *Ibid* p.
[12] *Ibid* p.355

function to an expression, such as language. And only after the expression is consciously used and becomes habitual can the expressions become hereditary[13].
Although Darwin never discusses the origin and evolution of behaviour in his work, many researchers on behaviour see him and the important founder of the study of behaviour. Lorenz wrote in the preface of a later edition of *Expression of Emotions* that "*Ethology, which can be succinctly defined as the biology of behaviour, has a special right to claim Charles Darwin as its patron saint. It is more immediately dependent of the selectionistic approach than any other biological science.*"[14]

1.2 Wundt and the foundation of experimental psychology

Wilhelm Wundt, a German physiologist, can be seen as the other important founder of the modern experimental psychology[15]. His work was mostly influenced by his research done as an assistant of Helmholtz, Müller and Du Bois-Reymond. The main focus of his research in those days was on the construction of the visual image and the role of the brain in constructing this image. According to Wundt the image was constructed out of the perception of two different images coming from both eyes. He stressed that both images are of vital importance for an individual to measure depth. Wundt also focussed his research on touch. Wundt had observed patients who partially lost their sensibility and could not locate the place on their skin that was touched. They felt the touch, but they could give the location of the touch. Wundt concluded from his observations that in order to locate the touch, two different stimuli are needed for the right perception, the same way as the image from the eyes is constructed. From both the experiment of the visual image and the experiment on touch perception, Wundt concluded that both the sensation of touch and the perception of image was mediated by a so called mental process[16]. Helmholtz argued that both visual and touch perception are the result of conscious processes. Wundt disputed this by stating that the perception lies in the nervous system. It therefore didn't need higher-level intelligence or consciousness. The perception of both the visual image and the touch sensibility was an unconscious process computed in the brain. So Wundt claimed that a true form of unconscious thought was needed, where Helmholtz did not[17].

In order to defend his conclusions, Wundt tried to develop a theory that would consist of the genesis, development and functioning of the sensory perceptions. This theory tried to embed the basic principles of the brain functions in such a way as Darwin did for the evolutionary theory of the genesis of species. This theory was first described in *Vorlesungen über die Menschen- und Thierseele* (Lectures on Human and Animal Psychology, 1863)[18]*. Today the idea of unconscious cognitive processes is common. But in the time of the publication of *Vorlesungen* Wundt received a lot of hostile reviews. When we look back on his work now we could say that his theory became the first form of an evolutionary psychology approach[19].

In *Vorlesungen* Wundt developed his evolutionary psychology. In this theory he incorporated a developmental model of the mind and brain where feelings and emotions played a central role. In this theory Wundt discussed a progressive line of emotions from simple feelings to complex emotions and tried to explain with this that emotions are indeed unconscious processes of the mental state as he had previously done with *Beiträge*[20]. In order to explain the psychic characteristics of the nervous system, which are important for Wundt's theory, he applied Darwin's evolutionary theory. With this he also tried to strengthen the validity of his theory of emotions[21]. Wundt did so by implying the two 'laws' of Darwin, conservation by inheritance and change through reaction to

[13] Darwin, 1872 p.
[14] Thierry, 2010 pp.
[15] Wassmann, 2009
[16] Wundt, 1862
[17] Wassmann, 2009
[18] Wundt, 1990. The second edition of *Vorlesungen* is used here
[19] Wassmann, 2009
[20] Wundt, 1862
[21] Wundt, 1990

random external circumstances, to his own work. According to Wundt "*the two laws that ground the principle of progress in development in the physical realm – the law of changeability and the law of inheritance of individual features - can still be demonstrated to operate in the realm of the psyche, if in a limited way*"[22]. According to Wundt, emotions represented the principle of conservation and intelligence represented the principle of change. He explained this by his observation that among family members the differences in emotions is smaller than the difference in intelligence. Therefore, emotion was inherited and intelligence acquired.

The theory came to be from his argument about vision. From this he argued that emotions and feelings play an important role in the development of cognitive functions in the perception of senses. The theory held that *"at all times, emotions and desires accompany our sensation and our imagination; at times they tie in with cognition, at times they precede cognition; they influence our thinking and they are influenced by thought; it is them that decide our actions and that give the direction to our entire mental life, and they generate its singularity"*. He followed by stating that emotions are an essential part of rational thought. Wundt claimed that "*the emotion does not let us recognize the truth but it prepares the way of cognition. It is the pilot that guides our mind. It summons the mind to penetrate with clear concepts the field that it can only sense."*[23]

But let's examine the evolutionary aspect of Wundt's theory of emotion more clearly. In *Vorlesungen*, Wundt focussed on the connection between facial expressive movements and emotions and stated that this connection was innate and the result of evolution over multiple generations. According to Wundt, the facial expressions sour, sweet and bitter represent the three main forms of physiognomy. They are reflexive movements and are therefore useful to a individual. He used the facial expressions of newborns to explain that the three forms are inherited. Sour and bitter expressions can be seen when a newborn cries and the sucking movements linked to sweet are present even before the baby starts breastfeeding[24]. Therefore facial expressions must be innate. Wundt claimed that with the help of the theory of Natural Selection he had solved the problem of the facial expressions of emotion and their development as far as it could be solved at that time. Because the movements of facial expressions are imbedded in the nervous system that has been developed over generations, the next generation will immediately be able to show these complex expressions. Although Wundt uses the theory of Natural Selection as an important foundation with the principles of inheritance and changeability, the latter is explained by Wundt with a more Lamarckistic principle. This is shown in the following thought experiment presented by Wundt in *Vorlesungen*:

"Let us imagine an organism with the simplest of nervous systems that consists of one cell or of a couple of cells with the corresponding nerve fibers. Already in this organism some accidental stimulation of particular nerve fibers could direct the further development into a certain direction. In this organism reflex movements that were prompted by sensory stimuli would happen at first 'quite irregularly'. Soon, however, some of the sensory nerve fibers would develop more strongly, either because they were stimulated more often by external stimuli because of their location, or because of other influences. In consequence the fibers of movement that were connected to those sensory nerve fibers would, in turn, develop more strongly as well. In this way an isolated reflex mechanism would develop, which was then passed on to the next generation and therefore the next generation would be able to use it right away."[25]

From these reflex movements, emotions could be formed:

"The first trace of consciousness must have developed out of the interaction between these movements and the environment. What the unconscious process of inference had formed now entered, as a result, the emerging consciousness. First developed sensory emotions, then also more complex emotions. The emotions had a regulatory impact on the actions and hence developed those

[22] *Ibid* p.355
[23] *Ibid*
[24] *ibid*
[25] *Ibid* p.357

more complex, composite, and goal directed but still unconscious movements that we call instinctive actions. As together with the development of consciousness developed also conscious judgement and cognition, the latter generated at the same time conscious and willed actions. Both, conscious and unconscious acts now interacted strongly with the physical organization of the organism."[26]
The first step in this development of emotions was to overcome pain, which lead to the development of specific traits which in turn leads to a direction in the development[27]. Wundt used the theory of evolution to his own theory of emotions. But also the founder of the theory of evolution had an interest in emotions and their development.

So both Darwin and Wundt saw emotions and instincts as the result of an evolutionary process. Wundt thought that the origin of these emotions, in the form of reflexes, are unconscious and come to be because of stimulation in the environment. Only after the first unconscious reflexes, consciousness could form into an emotion. Darwin, on the other hand, saw reflexes as a result of conscious processes. Because of the serviceability and the habituation can the movements become unconscious. So instead of Wundt's vision that unconscious processes leads to consciousness, Darwin saw conscious as what made unconscious processes possible.

[26] Wundt, 1990 p.357
[27] Wassmann, 2009

Chapter 2 Research on the evolution of behavioural traits

2.1 Romanes on animal psychology

Can we understand the mind of an animal in the same way as we try to understand the mind of man? What causes their actions and what about the perception of pain? According to Romanes all these questions cannot be answered by experimental psychology. The mind of animals can only be understood through observation; "*In the science of psychology nearly all the considerable advances which have been made, have been made, not by experiment, but by observing mental phenomena and reasoning from these phenomena deductively.*"[28]. Romanes was not satisfied with the meaning of the word 'mind'[29]. Romanes described two different meanings for the word mind, one that contemplated in our own selves and one that we ascribe to other beings. "*For if I contemplate my own mind, I have an immediate cognizance of a certain flow of thoughts and feelings, which are the most ultimate things – and, indeed, the only things – of which I am cognizant. But if I contemplate Mind in other persons or organisms, I can have no such immediate cognizance of their thoughts and feelings from the activities of the persons or organisms which appear to manifest them. Thus it is that by Mind we may mean either that which is subjective or that which is objective*"[30]. With respect to the difference between man and animal, Romanes said that through analogy we are capable of attributing mind to the actions of another man. In animals the same is possible to the extent that actions are analogous to ours. All knowledge of mental activities of organisms other than ourselves are based upon the interpretation of 'bodily activities' and this interpretation is based upon our own mental activities[31]. But the only way to ascribe consciousness to actions is by analyzing whether or not choices are influenced by previous experiences, which is the process of learning. So the learning process became the criterion for consciousness according to the vision of Romanes in. This criterion did not satisfy Romanes completely. Some animals can still posses consciousness without influences from past experiences, but he could see no other possibility to test consciousness in actions[32].

In his approach to the development of the mental state of man and animals, Romanes can be seen as a follower of the dualistic approach of Descartes. Consciousness as Romanes describes it has replaced the 'soul' or 'spirit'. This means that the evolution of the mind could have taken a completely different route than the evolution of the body. And this is what Romanes believed. In this he saw evolution as anthropocentric meaning that evolution, in this case mental evolution, progresses orderly towards the human mind. For this description he didn't hesitate to use the words 'lower' and 'higher' in ascribing anthropomorphic mental characters to animals[33]. In *Mental Evolution in Animals* he explains this evolution of the mental states (figure 1) and devoted a large part of the book to this. According to Romanes this diagram is not so much as a schematic illustration of one persons imagination but more a summary of the facts that science has come to know until now[34]. The figure represents a branched tree, which is more or less anthropomorphic in terms of the approach of the animal mind. In addition to this the tree is anthropocentric, with man as the end product of mental evolution[35]. In his chapter on consciousness, Romanes ascribes a certain amount of consciousness to particular animal groups, with man as the ultimate goal. He starts with the Coelenterata (Cnidaria) as the animals with the lowest form of consciousness and works towards man[36]. Romanes distanced himself from a pure Darwinian approach where in natural selection

[28] Romanes, 1883
[29] Boakes, 1984
[30] Romanes, 1883
[31] *Ibid*
[32] Boakes, 1984
[33] *Ibid*
[34] Romanes, 1883
[35] Boakes, 1984
[36] Romanes, 1883

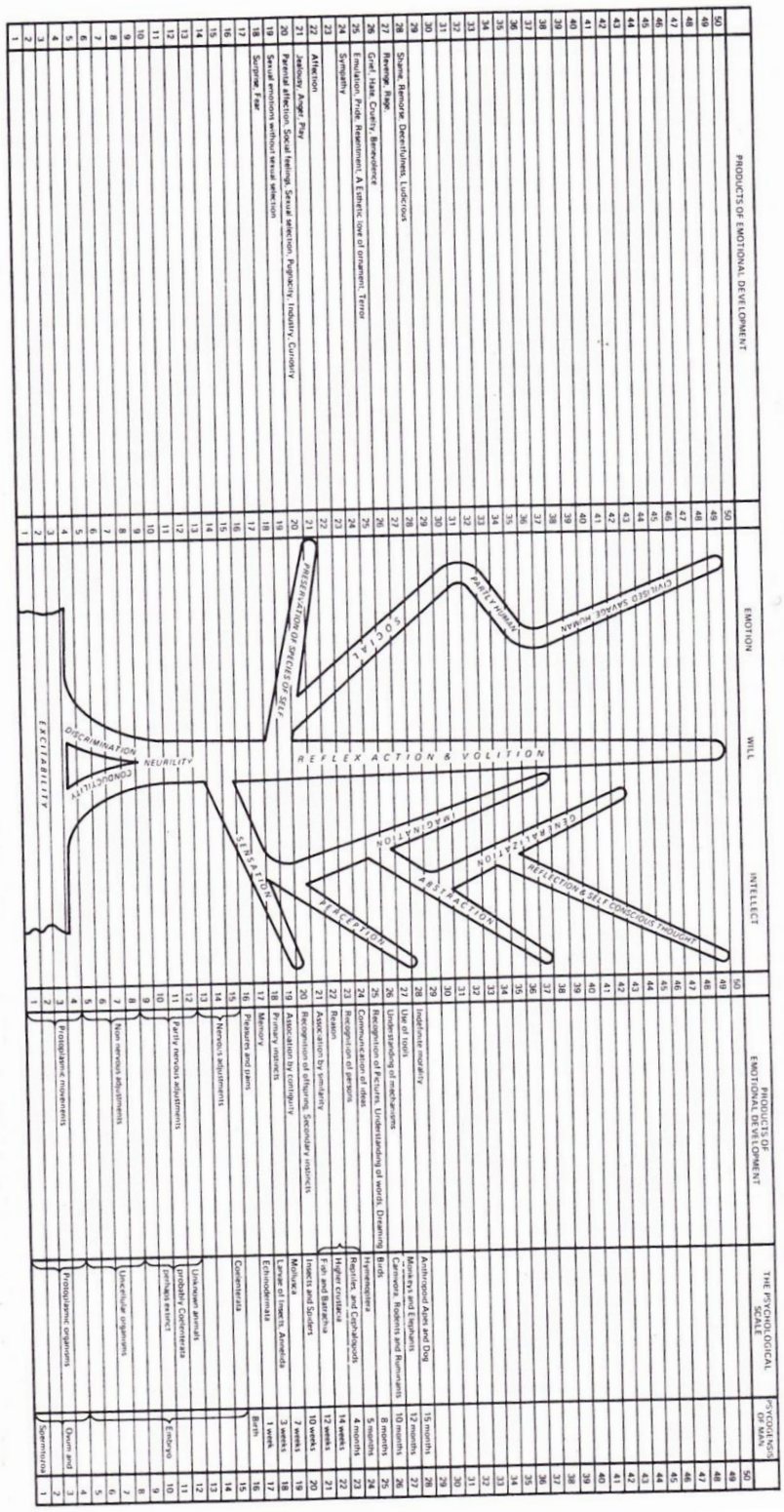

Figure1. Tree of mental evolution by Romanes. Accompanying scales illustrate the relative intelligence of different species and stages of mental development in humans (From Boakes, 1984)

chance plays an important role. Romanes makes no suggestions that in the evolution of mental processes chance could have played an important role also. He emphasized that every action was accompanied by a conscious intent. In the evolutionary process an orderly progression was present with man as the end product. It appears that the influence of Darwin on the developmental subject is less that the influence Romanes received from Spencer. Especially on the origin of the nervous system, Romanes followed Spencer's *Principles of Psychology*[37]. But on other subjects as instincts and the origin of reasoning, Romanes clearly differed from Spencer.

Spencer had described instinct as a compound reflex, a series of simple reflexes. Therefore, every behaviour is automatically triggered by the environment and the internal state of the animal plays no role in the behaviour. Romanes saw this definition as incomplete. It could not account for the complexity of instinctive behaviour. One very important element was missing that Romanes incorporated in his own definition; ´instinct is reflex action into which there is imparted the element of consciousness'[38]. Perception of input now becomes a vital part of the instinct. A reaction to a specific change in temperature or a noise are reflexes. But when a link is made between a specific distance or direction and an object it is called an instinct because of the perception, or consciousness, that is needed for this link.

[37] Boakes, 1984
[38] Romanes, 1883

As Darwin and Spencer before him, Romanes was interested in the origin of instinctive behaviour. Spencer saw instincts as habits that over the course of generation became more and more hereditary. Darwin on the other hand emphasized against this Lamarckian approach and argued that natural selection acted on behaviour that found its origin in chance. He illustrated this in behavioural patterns in asexual animals such as ants[39]. In the position Romanes adopted we can see the influence of both Darwin and Spencer. Romanes believed that natural selection and acquired characteristics should be treated equally in respect to the origin of instinctive behaviour. This is illustrated by the use of figure 2. The left side of the tree illustrates the evolutionary development of the primary instincts. Natural Selection acts on basic reflexes to produce complex habits that require no intelligence, so more complex reflexes. These reflexes are fixed and cannot be modified by the individuals experiences. This side represents the Darwinian thoughts in Romanes. The right side shows the evolution of the secondary instincts. This evolution consists of a Lamarckian element; through repetition of learned behaviour, an intelligent action becomes an automatic habit and over time becomes hereditary. In contrast to the primary instincts, the secondary instincts can be modified by experiences which can result in what Romanes calls 'intelligent variations'[40]. This last part clearly represents the influence of Spencer on Romanes, as described above.

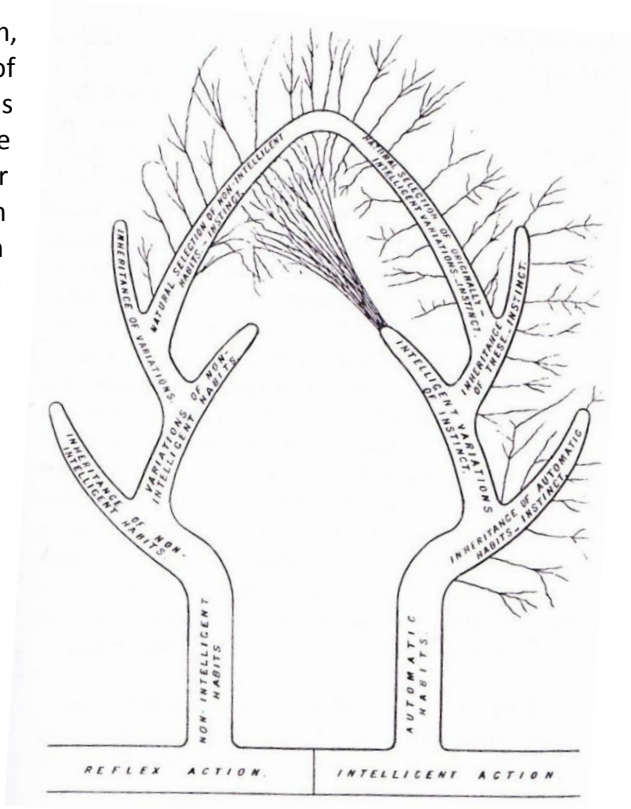

Figure2. Romanes tree diagram of dual origin of instincts (From Boakes, 1984)

By the end of the 19th century, the Lamarckian principle was largely discredited. Wallace had presented a new view where Natural Selection alone could explain everything except for human evolution. New behavioural scientists, especially from the United States, rejected the ideas of Romanes not only on his Lamarckian aspects, but also his dualistic approach and his idea on perception. They mostly returned to Spencer's theory of linear development; from reflex to instinct with reasoning as the end product.

2.2 Three new perspectives on the behavioural traits

2.2.1 Konrad Lorenz and Nikolaas Tinbergen and the rise of Ethology

Konrad Lorenz is one of the main founders of ethology as a new biological discipline. His approach to study behaviour differed strongly from the concepts of his predecessors. This is most prominently shown in his strong dichotomy between innate and the learned behaviour. This means that instincts are inherited behaviour patterns which cannot be modified or become more flexible due to experience or learning. According to Brigandt, Lorenz position is due to four commitments which Lorenz used in his approach of behaviour[41]. First, Lorenz focussed more on innate behaviour than he

[39] Boakes, 1984
[40] Boakes, 1984
[41] Brigandt, 2005

did on learned behaviour. Second, behaviour should be explained physiologically rather than psychologically. Third, his comparative and taxonomic approach of behaviour. Finally, Lorenz used ideas of embryology to explain the development of instincts. These four aspects will be further elaborated.

In the beginning of the 20th century, the theory of reflex chains gained support among different physiologists such as Pavlov, Loeb and Sherrington[42]. According to this theory, instincts are complex sequences of reflexes. Herbert Spencer had described instincts in a similar way a few decades earlier. Animal psychologists on the other hand rejected this theory because it failed to account for spontaneity of behaviour. Animals could act spontaneously even when no stimuli is present as the physiologists put it[43]. One of the main critiques by the physiologists towards the psychologists was the need for consciousness. These mental states make up for the motivation, spontaneity and the goals of behaviour[44]. Lorenz adopted the view of the physiologists rather that the ideas of the psychologists. According to Lorenz behaviour had to be studied in small components and instinct is only a small part of the larger sequence. Consciousness is something that Lorenz could not break down in a smaller component. Furthermore consciousness could not be observed. In addition, he claimed that he didn't need consciousness to explain a behaviour pattern and therefore doubted that, for example, birds are conscious of the purpose of their behaviour when building a nest. Consciousness was excluded by Lorenz in his theory of instincts.

Lorenz took a completely different stand on several subject than others who studied behaviour before and during his time. It was not new to distinguish innate from learned behaviour. Instincts were well recognized as a part of behaviour, but the main focus was on learned behaviour and intelligence. Lorenz took a new stand in claiming that innate rather than learned behaviour is the core of behaviour[45]. Intelligence can only become important when the role of instinctive behaviour decreases. This can happen when in a behavioural sequence new features are the result of learning. Instinctive behaviour is broken up in components and new learned components are added. As a result, innate behaviour can be lost over time and replaced with learned behaviour. But according to Lorenz this is not needed for evolution of instincts. He was convinced that instinctive behaviour patterns are so adaptive that introduction of learned components makes the behaviour pattern less able to adapt. In all this it becomes clear that Lorenz saw innate behaviour as far more important than learned behaviour in describing behaviour patterns.

His second commitment supports his first claim. Learned behaviour is a process of the mind. Instincts, or innate behaviour, are the results of stimuli and can be better understood physiologically. This is exactly what Lorenz held. The core of behaviour can be best understood by explaining behaviour in a physiological approach. Motivation and other mental states are not relevant in his approach[46]. Many psychologists stressed the importance of the goal-directedness for explaining and understanding behaviour. Lorenz however, did not share this view. The goal-directedness of behaviour is not an explanation for behaviour, but should itself be explained with causal factors[47]. This is supported by the adaptation of describing behaviour as stimulus-response. The stimulus triggered a response directly so no form of consciousness is required between the contact of the animal with the world[48].

The chain reflex theory, discussed briefly above, could count Lorenz as one of its followers because it used physiological explanations only. A mental analysis was not needed. But he later abandoned the chain reflex theory. Not because of the physiological explanations but because of the origin of the stimulus. The original theory described external factors as the drivers of the chain of

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[42] *Ibid*
[43] *Ibid*
[44] *Ibid*
[45] *Ibid*
[46] *Ibid*
[47] Brigandt, 2005
[48] Eileen, 1998

reflexes. Lorenz suggested that the stimulus for this reflex chain can well be the result of internal factors, more specifically neurological factors[49]. According to his view nervous energy builds up if a instinctive behaviour pattern is not triggered for some while. This energy can lead to behaviour where the animal searches for a release stimulus or to vacuum activities. The explanation of these vacuum activities aided Lorenz in his claim that behaviour can be triggered without a specific purpose. Vacuum activities are behaviour patterns which are conducted outside of the normal circumstances, for example nest building when it is not mating time. So only the physiological explanations could serve Lorenz in well understanding behaviour[50].

To study behaviour in different species in different taxonomic groups was not new in the time of Lorenz. Comparative psychologists also compared behaviour in the different taxa. But Lorenz did more that just dealing with different groups. According to Lorenz instinctive behaviours are like morphological characters which can be identified in different species. Both instincts and morphological characters are inherited and are evolutionarily conservative so they could serve Lorenz as taxonomic characters and help classify biological taxa. His approach was well embedded in both theory and research. Lorenz observed behaviour from a comparative and taxonomic point of view[51].

Lorenz never was really interested in studying the development of behaviour. He focussed more on the phylogeny and the evolutionary adaptation of behaviour and instincts. But when needed Lorenz used the theories of experimental morphology and embryology. To Lorenz instincts are like morphological characters as described above. He extended this analogy between instinct and organs by stating that instincts mature and are not modified in ontogeny because of experience[52]. Instincts develop in the early stages of ontogeny, same as the organs. Changes in instinct can therefore be explained in the same way changes in organs can be explained.

In all his ways of describing Lorenz appears to be a mechanist. Behaviour can only be explained when reduced to the reflex pathway and the stimulus is known. Especially in his early years, Lorenz appears to be committed to a reductionistic approach on behaviour[53]. But this is only partly correct. Although Lorenz, especially in his early years, tried to reduce behaviour into reflex pathways his focus remained on the organism as a whole. Lorenz observed animals in their relatively natural habitat and acknowledged the importance of behaviour in that environment. So even with reducing the components of behaviour into smaller subsets, the role of behaviour for the organism remained Lorenz' main focus.

The strong tendency of Lorenz to explain behaviour in causal factors is something that a Dutch researcher appreciated. Nikolaas Tinbergen can be seen as the second major founder of ethology as a biological discipline. According to Tinbergen, ethology should be considered as 'the biological study of behaviour'[54]. Tinbergen originally reacted to the trend of psychologists who studied behaviour of animals in captivity and under controlled experiments. In trying to become a respected science, it had skipped the descriptive phase Tinbergen found so important for a natural science. He wanted to bring this descriptive phase back to the study of behaviour in the field of ethology[55]. These description can be best labelled as 'generic description' because they describe how behaviour generally occurs in any number of species under a specific set of conditions[56]. In his book on the aims and methods of ethology Tinbergen names Huxley and what are the major problems of biology

[49] Brigandt, 2005
[50] *Ibid*
[51] *Ibid*
[52] *Ibid*
[53] Kalikow, 1975
[54] Tinbergen, 1963
[55] *Ibid*
[56] Eileen, 1998

according to Huxley: causation, survival value and evolution. These problems arise in every field of biology. Tinbergen adds ontogeny to the three. When ethology really wants to become a biological research field, it has to address these problems.

On the matter of causation, Tinbergen referred back to Lorenz and his ideas. Remember that Lorenz described behaviour as something animals possess just as they possess other characteristics. This makes causal analysis possible without subjectivity and teleology[57]. Another important issue Lorenz addressed is that of the internal influence on behaviour. Other than psychologists and reflex-physiologists in that time, Tinbergen stated that the influence of the external world is considerably less than we think now[58]. He ascribes this to the new research field neurophysiology. This field explained behaviour through neurological pathways without the influence of the external world. This could help ethology in describing behaviour, as Tinbergen sees it[59].

When studying behaviour as organs it becomes easier to study the survival value of certain behaviour[60]. This is because of the relationships that are being studied. In a 'normal' cause-effect study, the causes are sought with the effect being known. In the study on survival value the role of the effect on this value is sought. Instead of looking for a cause that has already passed, the study of survival value looks to what the effect can make happen in the future[61]. But Tinbergen acknowledges that survival can only be observed by death. One can only see whether an individual survives if others die. For practical reasons ethologists have to start with behaviour. From there they can try to describe the consequences for survival. But ethology is the field to study survival value of behaviour and Tinbergen named some important methods when addressing this subject[62]:

1. One has to better know a species to notice more aspects that can have a certain survival value.
2. Hunches about survival must, where possible, be strengthened by experiments.
3. Experimentally demonstrating survival value involved a lot of steps. Many of these steps have to improve because most evidence now comes from controlled environments instead of natural contexts.

But as Tinbergen rightly states "*it remains true, however, that the ultimate test of survival value is survival itself, survival in the natural environment*"[63].

Tinbergen naturally addresses the problem of ontogeny because he introduced it himself. He focuses on the phenomenon of changes in behaviour. But he stresses that it is not so much a change of behaviour during development but a change of behaviour *machinery* during development. The problem when describing these changes is how can we control them? First, one has to distinguish between internal and external factors. The external factors are easily detectable and controllable. But by controlling the external influences in such a way that they don't influence the ontogeny, one can see if internal factors change the behaviour machinery. But this can only be said with certainty when internal influences are demonstrated. And this can only be done by interfering with the internal events during ontogeny. As for the change in behaviour during an animal's life, Tinbergen states that ontogeny continues as a process after the period of growth. It also contains maturity. The causation of behavioural change therefore can also be studied as a part of ontogeny; "*the distinction is partly one of the timescale involved*"[64].

Ethology has come from trends of thought which have been made explicit and became more and more influenced by evolutionary thinking. Ethology therefore, as Tinbergen puts it, is being more and more incorporated as a legitimate research field in biology[65]. Evolutionary studies have two

[57] Tinbergen, 1963
[58] *Ibid*
[59] *Ibid*
[60] *Ibid*
[61] *Ibid*
[62] *Ibid*
[63] *Ibid*
[64] Tinbergen, 1963
[65] *Ibid*

major goals and these can be found in ethology as well. First, one must try to unravel the course of evolution. This is mainly done by comparison of two close-related species. But again conclusions, in this case about homology, can only be drawn with a probability factor. The second goal is discovering the dynamics of evolution. This goals consists of two parts. The first part of this goal is to study the genetic influence on behaviour. Genetics was relatively new during Tinbergen's time but showed a lot of promises. The second part is to study the role of selection on the evolution of behaviour. By understanding this role one could say something about the evolution of behaviour. Earlier described studies of survival value can play an important role in this, because selection has been described there already. But also experiments were one creates an artificial selection pressure and sees what results it brings over generation helps describing this evolution[66]. But again, Tinbergen remains cautious when attributing selection pressure to past environments. But this doesn't mean ethology has to dismiss evolutionary studies as just speculation. One just has to be careful with the conclusion drawn[67].

Tinbergen ends with the statement that "*what does seem to me to matter is the growing awareness of the fundamental unity of the Biology of Behaviour, and the realisation that 'Ethology' is more than 'Physiology of Behaviour', just as 'Biology' is more than 'Physiology'*"[68]. With this Tinbergen refers back to ethology being more than just a descriptive study, although it is important to ethology. With the study on survival value, ontogeny and evolution, ethology tries to explain behaviour as an organ that has evolved over time into what we now see and observe. And all these issues can only be simultaneously addressed in the field[69].

2.2.2 Jacques Loeb on the theory of Tropism

The German physiologist Jacques Loeb developed another theory of behaviour than Lorenz and Tinbergen did. Loeb was mainly influenced by the reductionistic-mechanistic approach as described by his teachers Leopold Goltz, who was a former student of Helmholtz, and Adolph Fick who studied under Carl Ludwig[70]. When studying under Fick, Loeb was introduced to the experimentalism in plant physiology. It was here that Loeb developed his theory of tropism[71]. The study on tropisms grew to be a very popular topic for research, especially in the USA[72].

For Loeb, the starting point in analyzing animal conduct is the symmetry in the body of each animal. The analysis of the origin of the impulse now becomes a simple comparative study[73]. Along the body of each animal are multiple spots which can be stimulated chemically. These spots have the same chemical identity, the same constitution and the same mass[74]. Our eyes are an example of two symmetrical spots. When the retina in both eyes is equally stimulated, equal changes are produced in the brain cells which then send out an equal impulse to the symmetrical muscles of both eyes[75]. It is not hard to understand from this point that when one eye is stimulated more than the other, asymmetrical responses occur. So it is important to understand that the foundation of the theory of tropism is that each animal is a symmetrical machine. This shows Loeb's reductionistic-mechanic beliefs.

Although Loeb was reductionistic in his approach, he doesn't identify himself with the physiologists who study behaviour in isolated reflexes. He acknowledged the importance of the reflexes, but it cannot explain the behaviour of an animal as a whole:

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[66] *Ibid*
[67] *Ibid*
[68] *Ibid*
[69] Richard, 1999
[70] Allen, 1981
[71] *Ibid*
[72] Boakes, 1984
[73] Loeb, 1918
[74] Loeb, 1918
[75] *Ibid*

"*While it may seem justified to construct the reactions of the organism as a whole from the individual reflexes, such an attempt is doomed to failure, since reactions produced in an isolated element cannot be counted upon to occur when the same element is part of the whole, on account of the mutual inhibitions which the different parts of the organism produce upon each other when in organic connection; and it is, therefore, impossible to express the conduct of a whole animal as the algebraic sum of the reflexes of its isolated segments*"[76].

Loeb here explains the difference between reflexes and tropisms, according to him. But he does state that reflexes and tropisms are both purely physico-chemical in character.

These chemical impulses are the result of changes in three tropisms; helio-, geo-, and contact irritability. These three tropisms account for the majority of the animals' behaviour[77]. With these three as the major tropisms, Loeb described his theory as:

"*The explanation of these tropisms depends first on the specific irritability of certain elements of the body surface, and, second, upon the relations of symmetry of the body.... These circumstances force an animal to orient itself towards a source of stimulation in such a way that symmetrical points on the surface of the body are stimulated equally. In this way the animals are led without will of their own towards the source of stimulus or away from it*"[78].

So according to Loeb physic-chemical impulses control the response of animals. This is the result of the relation between the symmetrical spots that receive the impulse, the symmetrical brain point that transmit this impulse to the muscles with than results in a certain reaction. In a way, an animal is than 'forced' to react in a certain manner. This is what Loeb called 'forced movements'[79]. In one of his early experiments Loeb destroyed the left optic lobe of a shark. This resulted in that the shark could no longer swim in a straight line. Instead he swam in circles to the right. As a consequence of the destruction of the left optic lobe, the muscles on the left side of the tail are weakened and cannot produce the same amount of force as the right side of the tail can. The impulses sent from the brain to the tail are now not equal, resulting in a different swimming direction. Loeb concluded from this that "*a lesion in one side of the brain lessens the tension of the muscles on one side of the body; as a consequence the motions of the animal become difficult or impossible in one direction and become easy in the opposite direction*"[80]. With respect to this Loeb described three directions in forced movement: circular motions, backwards movement and forward movement. Which direction the animal is forced into depends on the impulse the animal receives. One does have to realize the difference between a permanent forced movement after brain lesion and as a result of chemical impulses, which are temporary[81].

Reducing organisms to chemical machines as Loeb did describe above has consequences for the perception of instincts and consciousness. All actions of an organism are aimed to make sure that the organism reproduces, feeds and takes care of the offspring[82]. What Loeb calls 'metaphysics' explain these behavioural patterns with 'instincts' and 'will'. But he disagrees strongly with them. An animal has no foresight of the end of his behaviour and still makes sure that the acts preserve the individual or the species[83]. His theory of tropism could help in showing that instincts are nothing more than tropistic reactions. From observations he names the influences of hormones on the sexual behaviour of certain animals as a tropistic reaction of the animal to hormones. Also, the mating behaviour of winged ants at sunset is a result of heliotropic (stimuli from the air) influences. During sunset, whole swarms of ants fly out and mate in the sky. Loeb uses these results of his time to support his theory of tropism[84].

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[76] *Ibid*
[77] Greenspan & Baars, 2005
[78] Loeb, 1900
[79] Loeb, 1918
[80] *Ibid*
[81] *Ibid*
[82] *Ibid*
[83] Loeb, 1904
[84] Loeb, 1918

On consciousness, Loeb distanced himself again from what he called the metaphysics. "*Consciousness is the function of a definite machine which we call the machine of associative memory ... that is capable of reproducing impressions in the same chronological order in which they come to us*"[85]. This process of associative memory is the process of learning. Loeb admits his lack of knowledge on this part. The precise mechanism behind the associative memory remained vague and Loeb suggested that it was located in the cerebral hemispheres, following his former teacher Goltz[86]. But in 1918, he still couldn't explain the origin of the associative memory[87]. Despite this lack of explanation, Loeb didn't distance himself from a previous claim of the understanding of associative memory for the theory of tropism. If an associative memory is present, an animal must be able to be trained to respond and behave in a desired way to certain stimuli[88]. This last claim of Loeb illustrates his ultimate aims for the theory of tropism. By understanding the responses of animals to certain stimuli, Loeb could explain the ethics of man. The source of ethics was, according to his vision, nothing more than the instincts which are the heritable aspects of behaviour[89].

2.2.3 Animal psychology by Bierens de Haan

In the Netherlands another research field on behavioural traits rose. Bierens de Haan was a Dutch neo-Lamarckist who's special interest was in the evolution of instincts. During his days the Lamarckistic principle became the most popular alternative for the evolution by Natural Selection. Although several experiments concluded against Lamarckism, Bierens de Haan tried to counter these conclusions with his own explanations[90]. For example, Bierens de Haan criticized the conclusions Pictet draw in an experiment on the inheritance of acquired characteristics of caterpillars. In his experiment Pictet had artificially reduced the hibernation of the animals and wanted to see the results in future generations. These generations didn't have a reduced hibernation implemented as Lamarck would predict. Hence, Bierens de Haan saw this conclusion as evidence in favour of Lamarckism, based on two aspects. First, much more generations were needed to make a characteristic hereditary than Pictet used and second, the traits has to have a goal in order to become hereditary[91]. Bierens de Haan himself didn't do much experiments on inheritance of acquired characteristics. His contribution remained mostly to a theoretic counter offence on conclusions against Lamarckism.

To prove Lamarckism with morphological traits remained difficult. Bierens de Haan shifted from these morphological traits to psychological traits. According to Bierens de Haan the psychological traits possessed a greater flexibility than the morphological ones[92]. Prove Lamarckism with psychological traits was easier because of the possibility of purposefulness in these traits. It's easier to see the avoidance of a shock as purposeful than a passive neurological change. That the mechanism behind this remained vague is irrelevant to Bierens de Haan. For him it was important to incorporate the purposefulness of nature that explain the process by the slightest details.

In his work on the Lamarckistic character of psychological traits, Bierens de Haan paid special attention to instincts or habits. According to Bierens de Haan these traits evolve in the same way as morphological traits, so with a goal in evolution. Habits, Bierens de Haan explains, are activities that an animal learns based on learning, for example the avoidance of a shock. And these habits cannot become hereditary because they are the expression of instincts[93]. Instincts can never become hereditary from habits for three reasons. First of all, habits come from repeatedly expression of

[85] Loeb, 1904
[86] *Ibid*
[87] Loeb, 1918
[88] Loeb, 1900
[89] Allen, 1981
[90] Roëll, 1989
[91] *Ibid*
[92] *Ibid*
[93] Roëll, 1989

behavioural patterns which had a specific conscious goal. In most animals it's hard to see a conscious so these acts can never become hereditary. Also, some instincts only show once in a lifetime like for example parenting. These instincts are not often or never repeated so habituation is not possible. Second, Bierens de Haan calls upon instincts in worker bees. How can their habits be hereditary when they don't reproduce? Finally Bierens de Haan brings forward convergent evolution as a claim for Lamarckism of instincts. How can the caste-system in bees and termites evolve independently from each other with Darwin's accidental evolution[94]?

In finding a mechanism on how habits can become hereditary, Bierens de Haan is inspired by the English writer Samuel Butler. Butler wrote that the process in life are determined by unconscious memories in previous generations. The basis of this memory is the immaterial element that defines the soul of life[95]. Bierens de Haan implemented this concept to his modern view on inheritance. A hereditary trait is the result of unconscious memories. This memory is larger when increasing kinship between individuals. Bierens de Haan could implement Mendel's genetics because it is the task of the genes to pass down these memories to future generation. In this concept he sees genes as the centre of consciousness and perception. Finally, Bierens de Haan can incorporate purposefulness because of his definition of mutations. According to him, mutations are not random but active and intelligent. This shows the goal of evolution as Bierens de Haan sees it. Characteristics, morphological and psychological, accumulate towards a goal. This also helps Bierens de Haan in explaining the absence of consciousness in lower animals because they simply don't need it. Because inheritance is based on unconscious memories, even the simplest organism can change over many generations[96].

Bierens de Haan explains the behavioural traits different from other scientists of his time. His focus is more on the psychological than it is on the morphological or physiological. Also different is his focus on the Lamarckism were for example Loeb and Lorenz used the evolution by Darwin as basis. The impact of Bierens de Haan cannot be compared with the others previously discussed. Bierens de Haan mainly approached his concepts theoretically and conducted little experiments to support his claims. Furthermore, animal psychology never became part of school curricula and Bierens de Haan never received a position in this field at any university[97]. Yet it remains a good illustration of the different approaches of behavioural traits and their origin in the beginning of the 20th century.

2.3 Sociobiology as the new synthesis

2.3.1 Edward O. Wilson

In 1976 Edward O. Wilson published a book that introduced a theory on the explanation of the behaviour of animals. His book *'Sociobiology: the new synthesis*' tried to define the systematic study of the biological foundation of all social behaviour. Two important key principles in this study are population structures and the evolutionary process and social behaviour of the early man[98]. Overall, Wilson incorporated the following goal for sociobiology:

"When the same parameters and quantitative theory are used to analyze both termite colonies and troops of rhesus macaques, we will have a unified science of sociobiology."[99]

This goal shows the ultimate aim of Wilson when introducing Sociobiology with the subtitle '*the new synthesis*'. Some decades prior to the publication of '*Sociobiology*' biology was reformulated under

[94] *Ibid*
[95] *Ibid*
[96] *Ibid*
[97] *Ibid*
[98] Wilson, 1976
[99] *Ibid,* p.4

the evolutionary synthesis. Biology became unified under the study of evolution. What Wilson tried to accomplish was a new synthesis in which biology became unified under the study on social behaviour and aspects of populations. With this synthesis, Wilson wanted to have "*the ability to predict features of social organization from a knowledge of these population parameters combined with information on the behavioral constrains imposed by the genetic constitution of the species*."[100]. A shift in the study of animal behaviour will be the consequence. Whereas ethology together with comparative psychology was the central aspect of animal behaviour, Wilson sees no future for this discipline. Ethology will be replaced by sociobiology and behavioral ecology, as will comparative psychology by neurophysiology and sensory physiology.

Since the theory of sociobiology depends on social structures, Wilson identifies a number of parameters that can be measured and incorporated into models for social systems[101].

1. *Group size*: helps determine stochastic models for birth and death rates as well as migrating factors
2. *Demographic distributions*: the age and size of generations shows future distribution in populations
3. *Cohesiveness*: the closeness of group members can be seen as an index for sociality
4. *Amount and pattern of connectedness*: contact with the average group member can be described per unit of time. Increase in this unit per time shows a higher form of sociality
5. *Permeability*: this indicated the contact made with other groups and shows migration rates. Close groups seldom integrate with other groups and rarely accept immigrants
6. *Compartmentalization*: another method to measure complexity in society is by determining to what extent the subgroups operate as discreet units
7. *Differentiation of roles*: specialization of group members shows social evolution
8. *Integration of behavior*: opposite to the differentiation is the integration. How well are different behaviors coordinated?
9. *Information flow*: studying the means of communication.
10. *Fraction of time devoted to social behaviour*: sociality can also be measured by the allocation of individual effort to the affairs of the society, the time spend on the group or on the individual

To analyze these parameters, Wilson suggests that all processes and concepts should be approached dualistic, such as adaptive versus nonadaptive traits[102]. One aspect that Wilson paid attention to reflects the problem that the previously discussed biologist faced, the issue of innate versus learned behaviour. According to Wilson, one of the problems in this debate is the definition of innate behaviour. This concept has been defined in two different ways. First, differences between two individuals or two species are based at least partially on a genetic difference. This genetic basis makes that we can speak of a innate behaviour or an instinct. The second definition tells us that an instinct is a behaviour pattern that either subjected to little modification or differs little throughout the population, or both. That specific traits are pure genetic is unquestioned. But whether or not they are also subjected to environmental influences remains the question. There is no discussion that eye colour is genetic. But if there is a genetic difference between people with blue or brown eyes remains a useful question. This reasoning can be extended to questions on social behaviour. Wilson suggests that experiments can show whether or not for example aggression in two monkey species inhabiting the same area is genetically different[103].

Wilson emphasized the importance of sociobiology throughout his book. He redefines biological concepts to fit the model of sociobiology[104]. He does the same with what a good theory should be. A good theory should is postulation-deductive. First the parameters must be identified so

[100] *Ibid*, p.5
[101] *Ibid*
[102] *Ibid*
[103] Wilson, 1976
[104] *Ibid*

relations between them can be formulated. From this models can be constructed to extent and test the postulates. A good theory should produce easily recognized inequalities, so is should have a quantitative character. The products of the theories should interest scientists to pursue phenomena yet to be explained. And above all, Wilson states, a good theory should be testable, hypotheses should be open to falsification by experiments and field studies[105].

Social evolution is an important concept in Wilson's sociobiology. And this form of evolution is moved by to broad categories of phenomenon, phylogenic inertia and ecological pressure[106]. The first, phylogenic inertia, determines the direction and the speed of the evolutionary process. The genetic basis of an animal determines to what end the phenotype can respond to certain influences. These influences come mainly from the latter category, namely ecological pressures. This includes food resources, prey/predator abundance, competition etc.

So phylogenic inertia can give an indication on the direction and process of (social) evolution. When a population shows high inertia it implies that the population is resistant to evolutionary change. When sudden changes in ecological pressures occur, the genetic basis is too small to adapt itself to the new conditions. Natural selection will filter out all the individuals. On the other hand when there's a low inertia in a population this adaptation will be more easy to fulfill. Wilson provides an example of the haplodiploid genetic basis in the Hymenoptera and termites with the consequences for evolutionary lines[107]. According to Wilson, it is because of this genetic basis (or bias as he names it in this example) that social structures have evolved. Because sisters are more related with each other that to their daughters they will inevitably contribute to the next generation by helping their sisters instead of their daughters. This results in sterile female castes with a colonial structure and only one fertile female. The genetic basis 'pushes' evolution towards this eusocial structure.

But there's more than just the genetic basis that explains the phylogenic inertia. Another important concept in the success or failure of the evolution of social structures is the existence or absence of so called preadaptations[108]. This adaptation is a structure, physiological process, behavioural pattern etc. which has already functioned in another context and can now be used as a 'steppingstone' in the evolutionary process. It forms a bridge between the individual or population not being adapted and becoming adapted. Wilson provides an example from the study of Stiles[109] which shows the result of these preadaptations. During the breeding season of passerine birds the demand for territorial defense goes up. They respond to this demand by increasing their total energy expenditure. They simply invest more energy because they have some to spare outside the breeding season. Hummingbirds on the other hand don't have this option. Because hovering is a high energy consuming activity, less energy is available for nonsocial activities such as territorial defense. Since the preadaptations of energy conservation isn't present in hummingbirds, they cannot engage in other energy demanding activities when this is demanded by environmental influences[110].

In all, Wilson names four aspects of social behaviour that determine inertia[111]. The first has been discussed above. The other three are less explained by Wilson but are still categories of behaviour that influence inertia:

1. *Genetic variability*
2. *Antisocial factors*. According to Wilson some factors can make populations become more social or decrease the social character of that population. He gives the example of Moose that become less social when food is scarce. Mothers even send young away when they can

[105] *Ibid*
[106] *Ibid*
[107] *Ibid*
[108] *Ibid*
[109] Stiles, 1971
[110] Wilson, 1976
[111] *Ibid*

fend off wolves in order to find enough food for herself. The changes in sexual dimorphism due to sexual selection is also seen as an antisocial factor[112]

3. *Complexity of social behaviour*. The more numerous the different behavioural patterns and their genetic basis, the greater the inertia
4. *Effect of evolution on other traits*. When efficiency of other traits is altered by alterations in the social system, the inertia increases. So if territorial defense demands so much energy that it decreases feeding time, the evolution of territorial defense will be slowed.

These four aspects show what phylogenic inertia consists of according to Wilson. Some are explained more elaborate than others but the basis remains the same. The pallet of genetic and phenotypic attributes show how and why certain social behaviours can evolve. But this is closely linked with the other category of social evolution, the ecological pressure. Some factors contribute more as selective forces in social species than others.

One factor that has resulted in a number of social strategies is the defense against predators. Warning signals and the flocking of bird are easily deduced from this theory. Organized predator defense as a result of social instincts is best shown in insects. The reason for this is altruism. The workers are depended on the queen for reproduction. This results in a group defense which is mainly done by specific soldier ants to protect the entire colony[113]. Another factor is the increase in competitive ability. Attributes that are used in the defense against predators can also be used in the competition among rivals of the same species[114]. The antlers of deer species are also used to battle other males for the females in the herd. Social insects use the same tactics in defense as they do in encounters with other colonies. This territorial fighting in both examples are more or less the same as battles with predators.

Every attribute can be ascribed a certain function in both defense and competition. This reflects one of the key elements in Wilson's perception of adaptation. Every structure, behavioural pattern etc. has evolved with a certain function. I will come back to this later.

The third factor Wilson describes as a part of the ecological pressure is the feeding efficiency. This factor is divided into two forms of social foraging; imitative foraging and cooperative foraging[115]. The first simply states that an individual simply follows the group and eats whatever the group eats. This feeding strategy is the result of one of various learning processes. It can be due to pure imitation, but also forced by social pressure. But where imitative foraging increases the yield of the group, cooperative foraging increases the yield even more[116]. This foraging strategy consists of some, temporarily, form of altruism. Individuals have specific roles to complete their combined goal. Where the first exceeds strategies where groups of individuals just scavenge the area for food because of combined knowledge, it still remains a combination of selfish individuals. Whereas the more altruistic strategy shows a form of higher social behaviour.

In the end, Wilson wants to use all these factors, categories etc. to answer questions about the evolutionary aspect of sociobiology. How did social structures evolve, which traits are selected under which conditions and why. And Wilson wants to answer these questions not on the level of the individual. His main focus is on selection that effects two or more individuals. Selection than acts upon the group and should be called group selection[117]. He envisions a spectrum with pure kin selection on one end and pure interdemic selection on the other end. Which of the two plays a role is determined by the behaviour as well as the number of individuals. The main difference between the two forms of group selection is the relatedness among the individuals. In interdemic selection, no relatedness has to be present. Kin selection on the other hand only exists when individuals are related.

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[112] *Ibid*
[113] *Ibid*
[114] *Ibid*
[115] *Ibid*
[116] *Ibid*
[117] Wilson, 1976

Interdemic selection act upon the metapopulation[118]. This is a cluster of populations belonging to the same species and habitat the same area. Because migration between the small populations can occur, the populations are exposed to constant genetic flow. Strategies that benefit the metapopulation can spread among the smaller populations because of this. Variations who don't remain at the level of the individual. This ensures that only adaptations that benefit the entire metapopulation can become subjected to selection. Although gene flow is present in the metapopulation, not all individuals are related. Migration in and out of the metapopulation presents new genes in the gene pool of the metapopulation. When individuals of a group are related kin selection becomes the driving force. Individuals cooperate and behave altruistic to increase the fitness of the entire group of kin[119]. The fitness of the group is even more important than the fitness of the individual. Kin selection is fueled by altruism. This concept states that an individual helps another individual without receiving any benefits. His costs exceed the benefits. Altruism in related individuals is often explained with inclusive fitness. This form of fitness includes not only the fitness of the individual but also the fitness of its relatives. So when an individual X helps his brother Y raising his fitness, the inclusive fitness of individual X also increases.

Wilson concludes by stating that although the theory is still developing, it has already shown great promise. It has given a new insight in social behaviour and its evolutionary path: "For the moment, perhaps it is enough to establish that a single strong thread does indeed run from the conduct of termite colonies and turkey brotherhoods to the social behaviour of man"[120].

2.3.2 Desmond Morris and the use of sociobiology

As we have seen with Wilson and his description of sociobiology, all adaptations in animals have a function based on present or past ecological pressures. In '*The Naked Ape*' Desmond Morris tries to do the same for humans[121]. He discusses a broad range of social aspects of humans, from sex to feeding strategies. First, Morris explains how a zoologist would look at our species as if he would encounter it for the first time. By comparing our outer characteristics with known animals, we would inevitably come to the conclusion that we belong to the primates. But we do diver to some extent. One important feature of primates that we do not have is body hair. Humans are virtually naked compared to other primates. It is because of this that Morris deals with humans as 'the naked apes'. And throughout the rest of the book Morris sticks to this name, because "*it is a simple, descriptive name based on a simple observation, and it makes no special assumptions. Perhaps it will help us to keep a sense of proportion and maintain our objectivity*"[122].

This reduction in hair could be explained in many different ways, but Morris does stress that every explanation has to take into account that some alteration in ecological pressure had to be present. Without any change in environmental circumstances we wouldn't be the naked ape[123]. By adopting this assumption, Morris follows Wilson's theory of social evolution. The two features for social evolution to happen are, as we have seen in the previous paragraph, phylogenic inertia and ecological pressure. Above, Morris calls upon the latter.

How Morris continues in the rest of his book is reflected in the following passage:

"Only by taking a hard look at the way in which we have originated and then by studying the biological aspects of the way we behave as a species today, can we really acquire a balanced, objective understanding of our extraordinary existence"[124]. It is this origin and the shift in behaviour that Morris uses as the fundament of all his explanations. As we evolved from apes to the naked

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[118] *Ibid*
[119] *Ibid*
[120] *Ibid*
[121] Morris, 1967
[122] *Ibid*, p.15
[123] Morris, 1967
[124] *Ibid*, p.23

apes, we also adopted other social strategies. The growth of our brains fueled our transition from fruit-collecting apes to carnivorous-hunting apes. Also, the naked ape became more territorial. Both alterations forced changes in sexual, parental and social behaviour[125]. As a result, the naked ape is a mixture of both with characteristics of both old and new strategies still present. One example Morris brings forward is the development of monogamy as the primary sexual strategy. Because the young of primates are very depended for several years, a great deal of parental investment is demanded of mainly the females. The shift to more hunting-apes made that the hunting groups became all male because of this parental investment by the females. Monogamous male-female pairs were formed and this solved three problems. First, females remained faithful to their man while he was on the hunt. Second, male sexual rivalries were reduced and this aided the cooperative hunt. All individuals had to play their part during the hunt in order to be successful. And thirdly, the offspring benefited because rearing and training became a group or family task[126]. Note that in his explanation, Morris includes a very strong group selection pressure. Monogamy benefited the group instead of polygamy where one individual competes out another for offspring. Also when Morris later in the chapter deals with the explanation as to why we are naked (p.42-48) features of sociobiology are easily detectible. All explanations stress the importance of the survival value and in all cases the naked ape 'adapted' to the changed ecological pressures.

The example of the development of monogamy continues with discussing why males still have polygamist tendencies. This is illustrative for almost all other explanations Morris give as to why we behave in certain ways. Our shift from polygamy as seen in other primates to monogamy which is unique for primates was due to intelligence[127]. Learned behaviour that aided the group was selected but missed a genetic basis. It became the common strategy but it remained learned behaviour instead of innate behaviour. As Morris puts it "*it has happened too quickly and has been forced to depend upon intelligence and the application of learned restraint rather than on biological modifications based on natural selection*"[128]. This is why we still encounter polygamy in our society according to Morris. Monogamy is something that we learned and now considered 'normal' but it isn't in our nature.

Another subject that Morris focuses on is the nature of aggression and fighting in the naked ape. The only way we can understand this is by looking at our descent and link with other animals. According to Morris, animals fight for two reasons; to show their dominance in the social hierarchy or for the rights of a territory[129]. Which of the two applies is depended on which species is or are involved. When we look at primates, the first of the two reasons applies. They have a more nomadic life system with little inter-group conflict. But when the naked ape switched it life system towards the carnivorous-hunting system it became more territorial[130]. Though the hierarchical system wasn't abandoned completely. The hunting is a cooperative activity. Within the hunting groups, a hierarchy remained albeit in a milder form with a top leader but no tyrant[131]. This applies also to the defense of the territory and of the families. Tools became a part of our defensive and hunting activities. Chimpanzees are known to use branches to hit object when in semi-captivity. But there was no evidence of the use of tools by chimpanzees in the wild[132]. Morris imagines that this is how the naked ape started out himself. Tools only for defense and hunting, but this changed over time. Tools became part of the repertoire when dealing with intra-specific conflicts; "*once the weapons were there, they became available for dealing with any emergency, regardless of the context*"[133]. And this intra-specific conflict has been become more present than inter-specific conflict when we deal with

[125] *Ibid*
[126] *Ibid*
[127] *Ibid*
[128] *Ibid*, p.50
[129] *Ibid*
[130] Morris, 1967
[131] *Ibid*
[132] *Ibid*
[133] *Ibid*, p.174

the naked ape. Morris stresses than in the animal kingdom intra-specific conflict rarely results in death. When the opponent has been defeated to the extent that he/she is no longer a threat, the fighting is over. But this is no longer the case with the naked ape. According to Morris, because our intra-specific fighting has become long distance fighting we cannot see to what extent the opponent has been defeated. This results then in a "*wholesale slaughter on a scale unheard of in any other species*"[134]. Another important aspect of our nature that plays a part in this intra-specific fighting is our cooperative nature:

"*The strong urge towards mutual assistance to which it gave rise has become susceptible to powerful arousal in intra-specific aggressive context. Loyalty on the hunt has become loyalty in fighting, and war was born. Ironically, it is the evolution of a deep-seated urge to help our fellows that has been the main cause of all the major horrors of war. It is this that has driven us on and given us our lethal gangs, mobs, hordes and armies. Without it they would lack cohesion and aggression would once again become 'personalized'*"[135].

Support of our comrades has become more important than dominance over the enemies. And Morris then tries to focus on the possible solutions to our imminent problem. The only biological solution to this problem is massive decrease of the population. And this can be achieved best by anti-conception or abortion. To quote Morris, this is "*the best solution for ensuring world peace*"[136].

What Morris does in this last example is an important feature in his argument in '*The Naked Ape*'. Only when we know and understand our biological features and urges we stand a better chance of survival[137]. We must use our intelligence to coop with our biological nature and use it in a modern day perspective. "*If we do not, then our suppressed biological urges will build up and up until the dam bursts and the whole of our elaborate existence is swept away in the flood*"[138]. Biological knowledge, Morris concludes, is vital if we want to avoid our own extinction.

[134] *Ibid*, p.175
[135] *Ibid*, p.175
[136] *Ibid*, p.178
[137] *Ibid*
[138] *Ibid*, p.241

Chapter 3 Evolutionary Psychology, a new research field

In the previous chapter the shift from describing behaviour in ethology towards explaining and testing behaviour in sociobiology has been shown. With this shift, sociobiologists hoped to push psychology towards phenomena that were yet unknown or misunderstood. The goal was to explain contemporary (human) behaviour based on adaptive evolution[139]. But this aim received a lot of criticism from a new movement that focused on studying and explaining behaviour, Evolutionary Psychology. This new movement claimed that the aim of explaining contemporary human behaviour as a direct results of adaptive evolution was misguided[140]. The environment we live in today differs so much from the environment in which humans evolved that the two cannot be compared. The focus should be placed on which behaviour would have been selected in ancient environments. Our modern behaviour can then be explained as an output of those behavioural mechanisms evolved[141]. And so a new direction in explaining behaviour was born, Evolutionary Psychology

3.1 Aims of Evolutionary Psychology

Within the field of psychology, a metatheory remains absent. Sub-disciplines such as cognitive, social, personality and developmental psychology act isolated from each other[142]. One theoretical paradigm that could unify the sub-disciplines is evolutionary psychology[143].

In psychology behaviour is based on a mechanism in the human mind. When applied to evolution, psychologist speak of an evolved psychological mechanism. This mechanism consists of a set on processes inside an organism that[144]:

1. Exists in the form that it does because it solved a specific problem of individual survival or reproduction recurrently over human evolutionary history
2. Takes only certain classes of information or input, where input can either be external or internal, can be actively extracted from the environment, and specifies to the particular adaptive problem the organism is facing
3. Transforms that information into output through a procedure in which output regulates physiological activity, provides information to other psychological mechanisms, or produces manifest action and solves a particular adaptive problem.

The goal for evolutionary psychology follows from the description of these mechanisms. All behaviour is based on psychological mechanisms. The goal is then to discover human psychological mechanisms and the evolutionary path of these mechanisms[145]. These have evolved when our ancestors were faced with a problem that decreased the fitness of the species or population. This form of problem is in evolutionary psychology an adaptive problem (see point 1 above). As a result of natural selection, the favourable traits will persist in future generations.

In order to identify and understand these evolutionary psychological mechanisms one must know the functions. Which problems were solved with specific mechanisms. To analyze the hypothesis that are based on these problems two heuristics are generally used, the modularity heuristic and the design heuristic[146]. The modularity heuristic states that a distinct dedicated process underlies each hypothesized, evolved psychological capacity. When there's a good reason to assume the selection of a psychological capacity, evolutionary psychologists should also assume that to underlie this capacity a specific process has evolved. So each evolved capacity is based upon a

[139] Griffiths, 2006
[140] Symons, 1992
[141] Griffiths, 2006
[142] Buss, 1995 / Kenrick, 2001
[143] Kenrick, 2001
[144] Buss, 1995
[145] *Ibid*
[146] Machery, forthcoming

specific process. The second heuristic, the design heuristic, suggests that the process described in the modularity heuristic is well-designed to fulfill his function based on the problem faced. From this heuristic hypotheses can be formed about what design would be suited to support a relevant function. The latter of the two has been criticized to some extent. I'll come back on this criticism later in this chapter.

In evolutionary psychology one can distinguish three levels on which hypotheses are formed[147] (see figure 3.1). First, a psychological hypothesis is formed. This hypothesis consists of predictions about the nature of a psychological trait (level 2). Based on this hypothesis predictions are made about the results found in experimental and non-experimental studies (level 1). So far evolutionary psychology doesn't differ much from 'normal' psychology. But the third level is what sets evolutionary psychology apart. Here they form hypotheses about the origins of the psychological trait that is being researched. In this final level is becomes clear that evolutionary psychologists see the psychological traits as adaptations to past problems. Instead of just describing a trait or mechanism, like for example cognitive psychologists do, evolutionary psychologist describe the trait or mechanism and link this to the origin.

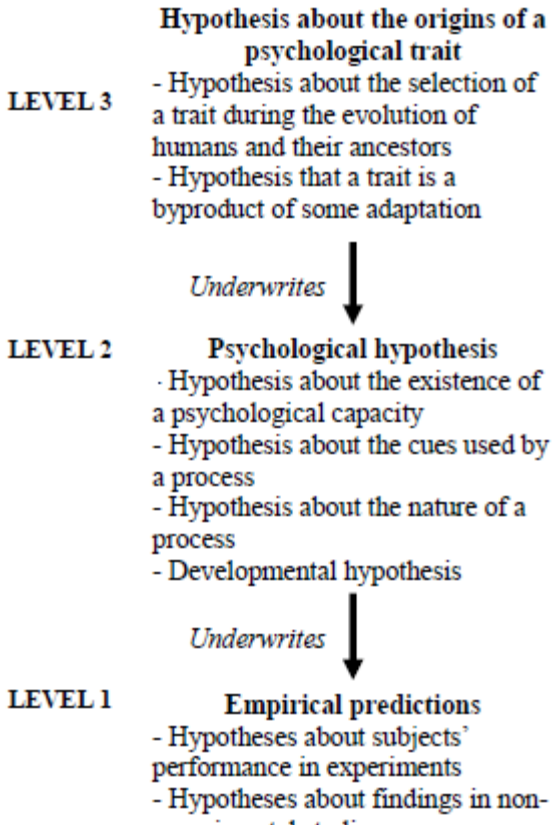

Figure 3.1. Structure of theories in Evolutionary Psychology (From Machery, forthcoming

In some way one can see evolutionary psychology as a return to the aims of classical ethology (see chapter 2.2.1 Lorenz). Although the studied subjects are somewhat different (not completely, Lorenz also had his perspective on human behaviour), the basic principles are the same. Both presume that behavioural traits are the result of ancient, evolved mechanisms which act in a new environment. Both stress the importance of evolutionary perspective. Instead of merely describing a trait, one has to consider its origin in order to understand the function.

3.2 Important theories in evolutionary psychology

3.2.1 The massive Modularity Thesis

According to the massive modularity thesis the mind is made up of almost explicitly special-purpose cognitive mechanisms. The comparison is often made with a Swiss army knife and its many blades, hence the alternative name 'Swiss army knife model'. Because the mind is a collection of separate models that each perform a different function, they act relatively isolated from each other[148]. These modules, which are basically the cognitive mechanisms discussed in the previous section, are 'designed' by natural selection to meet specific situations. Hence, evolutionary psychologists stress that it is not just some functions are modular but all of the functions are modular. To support this theory, evolutionary psychologists have presented several arguments[149]:

[147] Conway & Scheller, 2002
[148] Garvey, 2007
[149] *Ibid*

- Information is not always transferred from one module to another. Optical illusions can deceive us for this reason. We may know something must be wrong in an illusion but our eyes don't see it (the eyes deceive us). Evolutionary psychologists argue that no such problem presented itself during the Stone Age therefore no specific module evolved
- Adaptations are the result of solutions to specific problems in specific contexts. It is an advantage to have different mechanisms for different problems. This makes the response to a problem more or less automatic. When one has to decide which option is the best, it generally takes more time. This would have posed a problem in hostile environments according to evolutionary psychologists

Especially the last supports the claim of evolutionary psychologists as to why mechanisms are multiple modules instead of domain general mechanisms. Specific modules can be 'fine-tuned' to specific adaptive problems whereas domain general mechanisms cannot or at least to lesser extent[150].

3.2.2 The Monomorphic Mind Thesis

Other evolutionary psychologists argue more strongly for the monomorphic mind thesis[151]. According to this theory the differences in cognitive adaptations of individuals or groups are not genetically based. The psychological difference are (almost) always the result of differences in the environment. The developmental program is the same but different aspects are triggered. This claim is mostly based on the following argument;

"*Complex adaptations necessarily require many genes to regulate their development, and sexual recombination makes it combinatorially improbable that all the necessary genes for a complex adaptation would be together at once in the same individual, if genes coding for complex adaptations varied substantially between individuals. Selection, interacting with sexual recombination, enforces a powerful tendency towards unity in the genetic architecture underlying complex functional design at the population level and usually the species level as well*"[152].

In short the monomorphic mind thesis predicts that when under the same environmental conditions, individuals show little difference in their cognition.

3.3 The reliability of results, a criticism on evolutionary psychology

3.3.1. Confirmation in evolutionary psychology, can it be falsified?

In section 3.2.1 about the aims of evolutionary psychology I discussed the methods by which hypotheses are formulated. These hypotheses are later tested for their validation and whether or not scientific theories can be formulated from these hypotheses. But also the process of hypothesizing can be taken a closer look at.

When evolutionary psychologists try to hypothesize the origin of human psychological traits they rely on forward-looking heuristic. A past adaptive problem is identified and based on this problem it is argued that humans should posses a trait that would solve this problem. This trait may already be known or it may not and it has a known function or it has not. But according to the hypothesis it should be there. Machery[153] brings forward three point of notice when applying the forward-looking heuristic on evolutionary psychology. First of all, it is agreed by evolutionary psychologists that a forward-looking heuristic is useful but not necessary for discovering psychological traits. This is because not all psychological traits are considered adaptive[154].

[150] Griffiths, 2006
[151] *Ibid*
[152] Tooby & Cosmides, 1990, p.393
[153] Machery, forthcoming
[154] e.g. Kurzban *et al.*, 2001

Furthermore, this heuristic often results in several competing hypotheses about a psychological trait all based on the same adaptive problem. And finally another method is also used by evolutionary psychologists. In backward-looking heuristic an identified psychological trait is used to find the selection pressures responsible for the selection of that specific trait. Hence, caution is necessary when using this heuristic. One has to make sure that is doesn't become a hypothesis of 'fit the facts'.

When these hypotheses need to be tested, evolutionary psychologists normally use four different methods. The first method is the use of middle-range evolutionary theories. These theories identify different selection pressures that are assumed to have borne on the evolution of several taxa[155]. Two problems arise when using this method on psychological traits[156]. One is that these theories might not apply to humans and that these middle-level theories are design unspecific. They are applicable to numerous of taxa so say little about species specific traits. The second method used by evolutionary psychologists is the comparison of humans to other species. By doing this they hope to identify specific characteristics that were faced with an adaptive problem and have been selected. This also brings forward some difficult points. Often very different phylogenetic taxa are used for comparison. More stressing is the use of only a single taxon very distant from humans is order to identify specific characteristics that faced adaptive problems[157]. Third, evolutionary psychology relies on hunter-gatherer studies to identify past adaptive problems. The use of this method will be discussed in more detail in section 3.2.4. The final method used by evolutionary psychologists is the use of paleoanthropological knowledge about the evolution of humans. This knowledge is far from complete and all too often this makes the use of this method unreliable[158]. Just think about different theories on when and how *Homo sapiens* has migrated out of Africa.

Another heuristic used in evolutionary psychology to identify psychological traits is the design heuristic. This heuristic assumes that each evolved psychological trait is based upon a single process. This process is designed to fulfill its function[159]. One would then consider the possible designs that would fit specific functions. But even if one could find past adaptive problems, this method would still be insufficient to state anything about the nature of the selected mechanisms[160]. This claim is supported by four arguments[161]. First, one should realize that adaptations are never created in a new generation. They are modifications of existing traits that give an individual an advantage. An infinite number of varieties can exist and none of them can be explained or predicted based on the selection pressure that caused the evolution of that trait. Second, claims about the selection of processes are empty without knowledge of the phylogeny of the species. An adaptive problem such as territorial defense was faced by a number of species but different strategies evolved in different species.. Evolutionary biology has shown that different strategies have evolved when faced with the same adaptive problem. Third, following the first two, even when an adaptive problem is identified it remains unclear which psychological trait has solved this problem. It remains a matter of 'fit the facts'. Fourth, even when an adaptive problem has an optimal solution this doesn't imply that this solution has evolved. Natural selection is known to select for satisfying solutions, not optimal solutions.

Using the design heuristic might very well lead to wrong hypotheses about the nature of psychological traits. It doesn't have to, but it could. It could reduce the number of possible hypotheses by identifying which psychological traits are necessary for specific adaptive problems and therefore excluding other possibilities. But with this heuristic it remains impossible to state definite hypotheses about psychological traits and their evolution. Because one might be correct but could very well be incorrect no distinction can be made between the two. All hypotheses formulated from

[155] Buss, 1995
[156] *Ibid*
[157] Machery, forthcoming
[158] *Ibid*
[159] *Ibid*
[160] Griffiths, 1996
[161] Machery, forthcoming

the use of this design heuristic should be used with caution. It is better to consider the possibility that the hypotheses is wrong than assuming it shows the evolution of a psychological trait.

Evolutionary psychologists support their hypotheses with mostly three types of evidence[162]; design, cross-cultural data and developmental data. The first, design, states that the adaptation to a specific function of a trait can be found in its design. Traits are design in such a way that they support the species to increase the fitness in a past environment. Two main critiques follow the design argument. The first can be found in evolutionary biology as well and can be used here as well. In the next chapter this argument will be discussed to much greater detail. The second critique is on the to what extent should design be evidence for adaptation. Psychological traits are not exclusively the results of evolved traits under adaptive selection pressures. Learning mechanisms might also be accounted for some of the psychological traits. Cross-cultural data is often used to show whether or not psychological adaptations are present in many different cultures. Learning aspects as well as physical and social environmental influences are mostly left out. Again, wrong conclusions can be extracted from this data. Also developmental data can be used to much as a dichotomy. It remains hard until today to pinpoint whether a psychological trait is either nature or nurture. So a fear of snakes in young children could be an adaption. But parental of other social influences could increase of decrease this fear. Who is to say that the way snakes are portrayed in children's cartoons don't play an important role in this?

Because of the designing character of many evolutionary psychology hypotheses, the falsification of these hypotheses becomes an issue. To be considered a true scientific theory, the theory has to be able to be falsified. The lack of pure empirical evidence about the evolutionary character of psychological traits enhances this. Alternative hypotheses can be brought forward and are not easy to counter. I don't question whether or not psychological traits are subjected to natural selection. If physiological processes and morphological characters are subjected to natural selection, psychological traits are likely to be as well. But as mentioned above, the identification of adaptive problems and the possible solution pose a problem. Without proper empirical evidence to support a hypothesis it becomes a 'just-so story' that defends itself to others relying on a more likelihood than on actual evidence. It isn't just the evidence that makes hypotheses in evolutionary psychology vague. The adoption of the evolutionary aspects from biology isn't without it flaws.

3.3.2. The misinterpretation of biological concepts

In the previous chapter we described the goal of evolutionary psychology as 'to discover human psychological mechanisms and the evolutionary path of these mechanisms'[163]. But by invoking on the theory of Natural Selection the goal of evolutionary psychology should be formulated as explaining psychological processes as biological adaptations.

An example of a concept that is used differently in both fields is fitness. In biology the concept of fitness is used in different ways[164]. First of all, in population genetics fitness is reproductive success. This means that it can be measured by the number of descendents of an individual in a particular environment. Fitness here is not always maximized, to suffice is enough. On the other hand fitness is used to describe features of individuals in an environment. It shows how well an individual 'fits', or is designed to live in the environment. In both uses of fitness the term is not considered a fixed pattern of evolution. In evolutionary psychology fitness becomes a fixed concept of maximizing reproduction. As a result "*natural selection, on a succinct, simplistic reading of evolutionary biology, maximizes reproductive success (fitness in the first sense* (population genetics)*) by improving design (fitness in the second sense) through the elimination of inappropriate design features. This results in the adaption of organisms to the environment. The related analysis of*

[162] Machery, forthcoming
[163] Buss, 1995
[164] De Jong & Van der Steen, 1998

features in biology is known as adaptionism"[165]. The matter of adaptionism in biology and its role in evolutionary psychology will be the subject in the next chapter.

In their search for adaptive psychological traits evolutionary psychologists frequently speak about functions. But in psychology and biology function has a different meaning. In psychology, function has a more causal meaning which restricts itself to the system. In biology functional questions are more 'why' question, referring to the function of a trait or organ in a particular environment. Furthermore, in biology function can be analyzed in two different ways[166]. First in a etiological (causal-historical) way. This means that a trait had some survival-enhancing role in a past environment and is still present for that reason. The second is the propensity (forward-looking) way in which the function of a character reflects increased survival in certain environments. In the latter, the trait still has a function in the present day and in the etiological way its survival increasing functions lies in the past. Evolutionary psychology relies on the etiological approach of function. A trait has been selected in the environment because it could adapt to past selection pressures. But in practice evolutionary psychologists often mix the two approaches when dealing with functionality of psychological traits (the use and problems of the forward-looking heuristic have been discussed in 3.2.1. by Machery). Looren de Jong and Van der Steen stress that the two approaches should be distinguished carefully and that this is not the case in evolutionary psychology[167].

In evolutionary biology, the genetic explanations are of vital importance. More importantly the genetic variation in populations. In classical terms variation is the result of constant mutation, recombination and genetic drift. It is the material natural selection selects on. Cosmides and Tooby[168] argue in line with this classical view that all humans have the same 'modules' (see 3.1.2. on the modularity theory) which are the end product of selection in the Pleistocene. Variation in these modules is not adaptive in itself. Only because of selection are the adaptive variant selected and non-adaptive variants excluded. They will still be present but don't play an adaptive role. This view is not supported by evolutionary biologists. Variation can be maintained by natural selection and population genetics stress the importance of variation to understand differences within and between populations[169]. Also, variation could very well have an adaptive function. Variance in face structure for example helps recognition in social animals[170].

The greatest critique from (evolutionary) biologists is on the adaptionistic character of evolutionary psychology. This will be discussed in chapter 4.

3.3.3. Moral claims of evolutionary psychology

The implications of evolutionary psychology exceed mere psychological and biological claims. With the re-introduction of emotions and intuitions to an evolutionary perspective it has opened the door for ethical implications as well[171]. The boundary between reason and emotions during decision making processes has been questioned because of this. To what extent are our decisions based on reason and not subconsciously on our emotions? Also, the ethical questions have become subjected to empirical tests by evolutionary psychologists. And finally is brought a new perspective on philosophical questions like what makes us want to be good[172]? But are evolutionary psychologists able to hold their ground in the ethical debates? It would appear that this is not the case. As Pava states: "*Evolutionary psychologists with their continued pledge on neutrality lack a moral vocabulary with which to participate in ethical dialogues. In its attempt to look at ethics from a completely*

[165] De Jong & Van der Steen, 1998
[166] *Ibid*
[167] *Ibid*
[168] Cosmides & Tooby, 1994
[169] De Jong & Van der Steen, 1998
[170] *Ibid*
[171] Pava, 2009
[172] *Ibid*

objective point of view, it tries to step outside of the ethical world altogether"[173]. Instead of participating in the debate they claim to 'discover' the truth about the principles of ethics and morality. By thinking that in this debate science can have the final word, evolutionary psychologists 'misconceive the phenomenon of ethics in the first place'[174]. Only when evolutionary psychology will understand its place in the ethical debate it can contribute to the discussion and understanding of ethical principles[175].

3.3.4. The Pleistocene as adaptive environment

In section 3.1 I've discussed the aims and methods of evolutionary psychology. All are based on the presumption that the psychological traits evolved as a consequence of past adaptive problems. Recent history cannot produce any significant changes in the human genome and human mind. Although Tooby and Cosmides refer to this period as "*statistical composite of adaptation-relevant properties of the ancestral environments encountered by members of ancestral populations*"[176], most evolutionary psychologists place this period in the Pleistocene, some 100.000 to 600.000 years ago. So what developed during the Pleistocene is fixed and insufficient time has elapsed to bring about any other evolutionary adaptive psychological traits. It is because of this assumption that according to evolutionary psychologists we behave in correspondence to our 'ancestral minds'. We simply didn't had the time to adapt to contemporary influences. This is why we have a natural fear of snakes but not a natural fear of guns as evolutionary psychologists put it[177].

But this presumption isn't as straightforward as evolutionary psychologists would have it. Evidence has shown that human societies took multiple forms in early stages of the development of *Homo sapiens*[178] which would automatically provide different adaptive problems. But let's say that selection pressures were to be homogenous in past environments and our ancestors adapted to the problems in the Pleistocene. These problems differ significantly from contemporary problems. According to the reasoning of evolutionary psychologists (and biologists for that matter) when the environment changes, so do the selection pressures. Evolutionary psychologists believe that these changes in selection pressure will push the population to adaptations to the new faced problems. Enough evidence is provided that the environment has changed for humans since the Pleistocene and selection pressures would undoubtedly have changed too[179]. Evolution and adaption in just a few generations has been shown in all sorts of animals so why could humans adapt since the Pleistocene?

If our psychological traits evolve just like our physiological and morphological traits than evidence of evolution in the latter two would suggest that evolution in psychological traits would also have taken place. For example, Laland, Odling-Smee and Feldman have shown that because of the domestication of cattle and the dairying activities since this domestication created a selection pressure that resulted in lactose tolerance[180]. Another example: Homozygous null mutations of abnormal spindly-like microencephaly (ASPM) causes a condition were the brain size is reduced significantly. Phylogenetic analysis of ASPM has shown a strong positive selection in the primate lineage leading up to *Homo sapiens*. This would suggest that ASPM has contributed to the evolution of the human brain. Evidence has shown that a genetic variant of ASPM arose 5.800 years ago and pushed by a positive selection pressure to high frequencies. According to statistical test it is unlikely that this is the result of genetic recombination or genetic drift. In this case natural selection has to be the driving factor[181]. These results suggest that adaptive evolution has continued after the

[173] Pava, 2009 pp.399
[174] Pava, 2009
[175] Suggested reading Pava (2009) *The Exaggerated Moral Claims of Evolutionary Psychologists*
[176] Tooby & Cosmides, 1990
[177] Swami, 2007
[178] Morwood, 2004
[179] Swami, 2007
[180] Laland *et al.*, 2000
[181] Mekel-Bobrov *et al.*, 2005

Pleistocene in anatomically modern humans. Taken together with the lactose tolerance example, both suggest that evolution in the last 10.000 years is very well possible. Swami is right when concluding "*there is no reason to believe that we are 'trapped in the Stone-Age minds'*"[182].

3.4 Conclusion

Evolutionary psychology has been criticized from different angles such as philosophy of biology, philosophy of psychology, psychology and biology. The formulation of hypotheses has proven to be problematic when applying the forward-looking heuristic, especially when this heuristic becomes mixed up with an etiological approach of functionality. Also supporting evidence brought forward by evolutionary psychologists has proven to be insufficient to convince psychologists, biologists and philosophers. Design as an evidence still appears to 'fitting the facts' to past adaptive problems. Other empirical evidence about the evolutionary character of psychological traits remains incomplete. This makes it hard for evolutionary psychology to meet with the demands that a scientific theory should be falsifiable. Otherwise the hypotheses will look more like 'just-so stories' than like scientific hypotheses. The general underlying assumption of evolutionary psychology that our psychological traits evolved due to adaptive problems in the Pleistocene appears to be hard to hold. As Conway and Schaller state: "*If the assumptions are of questionable veracity, then the entire theoretical structure is likely to be judged implausible*"[183].

[182] Swami, 2007 pp.126
[183] Conway & Schaller, 2002 pp.158

Chapter 4 Evolutionary Psychology, the new sociobiology?

4.1 The adaptationism program

A central perspective that can be identified within evolutionary psychology is the feature of adaptationism. As we will see later in this chapter evolutionary psychology isn't the first to build research on this perspective. But what is meant exactly with adaptationism?

Adaptationism assumes that every trait is the results of an adaptation in an environment. These adaptations can only be the result of natural selection. Other processes like drift cannot create adaptations on themselves. So research based upon adaptationism tries to identify functions to explain the adaptations. If the function can be identified so can the selection pressures that are linked to the evolution of that specific trait[184]. Godfrey-Smith has identified three kinds of adaptationism[185]:

1. Empirical adaptationism; here natural selection is the driving force with only few constraints. By just looking at the influence of natural selection one can predict the outcome of an evolutionary process.
2. Explanatory adaptationism; biology should focus on the relation between an organisms design and the adaptedness of that organism with its environment. Also here is natural selection considered the only possible force to answer these questions
3. Methodological adaptationism; the methods of analyzing adaptations is to see them as an organizing concept for evolutionary research

Lewens elaborates on these categories and identifies sub-categories[186]. Also, instead of explanatory adaptationism Lewens speaks of disciplinary adaptationism but they look much alike. All six sub-categories help construct hypotheses about the evolutionary process of adaptation.

Empirical adaptationism can be divided into three forms; pan-selectionism, good-designism and gradualism. The first, pan-selectionism, assumes that natural selection alone is responsible for the adaptations we see today. So it presupposes that the phenotype that gives the highest fitness goes to fixation. That is, of the phenotypes that are available for natural selection to act upon. The factors that affect the phenotypes available are irrelevant to pan-selectionism. The good-designism builds upon pan-selectionism. Because populations are free from constraints when natural selection is involved, they are able to 'improve' adaptations and become 'well-designed' traits to fit the environment. The last form of empirical adaptationism, gradualism, claims that all the adaptations in nature should be explained in terms of natural selection. Because adaptationists assume that small fitness-increasing features are unlikely to occur in a way that in can influence evolution, natural selection is the only explanation for adaptations.

Godfrey-Smiths' third form of adaptationism, the methodological adaptationism, is according to Lewens based on two heuristics that differ in strength. The first heuristic states that only when hypotheses are formulated adaptionistic, that all traits are adaptations, we can recognize the adaptations. According to Lewens this is a weak heuristic[187]. If adaptations are selected for their function they can be discovered when one assumes that traits are neutral to selection. When some traits show an increase in selection relative to other it becomes proof of a fitness advantage over other traits. The stronger heuristic suggests that we should approach traits as the best design under the circumstances in which evolution took place. Although it may look as terrible design even in those environments it evolved, it would probably still be the best possibility. Otherwise the phenotype would have gone to fixation.

[184] Williams, 1966
[185] Godfrey-Smith, 2001
[186] Lewens, 2008
[187] *Ibid*

The disciplinary adaptationism by Lewens (the explanatory discipline of Godfrey-Smith) tells the adaptationists what would be worth investigating[188]. What research questions are interesting to focus on? The claim here is simple. All questions in evolutionary biology should have an adaptationistic approach if it wants to be worthy of investigating. Lewens brings forward another aspect of adaptationism, the epistemological optimism. This view tells us that the evidence that supports the hypotheses about the functions and evolutionary path of the traits is enough to exclude alternative hypotheses[189].
In this short overview one can identify aspects that can also be found in the heuristic of evolutionary psychology and sociobiology. These and the critiques they received will be discussed to length in the next sections of this chapter.

4.2 Criticism on the Adaptationist program

4.2.1 A focus on sociobiology

Adaptationism is a perspective in evolutionary biology that has been criticized from both a biological and philosophical perspective. This charge towards adaptationism can often be traced back to one essay written by Stephan Jay Gould and Richard C. Lewontin; '*The Spandrels of San Marco and the Panglossian Paradigm: A Critique of the Adaptationist Programme*'. In this essay they criticize the assumption that all traits need to be adaptations. They illustrate this with the example of the spandrels of the San Marco Cathedral in Venice. As they state:

> *"The design is so elaborate, harmonious, and purposeful that we are tempted to view it as the starting point of any analysis, as the cause in some sense of the surrounding architecture. But this would invert proper path of analysis. The system begins with an architectural constraint: the necessary four spandrels and their tapering triangular form. They provide a space in which the mosaicists worked; they set the quadripartite symmetry of the dome above …… The spaces arise as a necessary by-product of fan vaulting; their appropriate use is a secondary effect. Anyone who tried to argue that the structure exists because the alternation of rose and portcullis makes so much sense in a Tudor chapel would be inviting the same ridicule that Voltaire heaped on Dr. Pangloss: "Things cannot be other that they are . . . . Everything is made for the best purpose. Our noses were made to carry spectacles, so we have spectacles. Legs were clearly intended for breeches, and we wear them""*[190].

The Panglossian paradigm is derived from Voltaire's Dr Pangloss. In Voltaire's famous book *Candine* Dr Pangloss travels around the world and describes things in the same way as he does above. Everything that happens must have its reason and its function. Otherwise it wouldn't have happened. To some extent adaptationists do the same. All structures and traits in an organism must have an adaptive function. Otherwise natural selection wouldn't have favoured it over other structures or traits.

Gould and Lewontin primarily focus on the style of reasoning done by adaptationists. Generally when one argument about the adaptive value of a trait fails, adaptationists believe that another must exist. We just don't have the knowledge yet to determine which adaptive function it is. As long as the story can be fit in the models of natural selection it passes the criteria of a good hypothesis. Gould and Lewontin argue that this is far too little to be a scientific hypothesis. All possible alternatives should be considered and shown less plausible. For example, Gould[191] has criticized the work of Barash[192] on aggression in mountain blue birds. Gould argues that in providing an explanation, Barash left out the possible alternative hypothesis of learning in mountain blue birds. And he argues that this isn't unique for this study but is often done by adaptationists[193]. Providing explanation becomes more like storytelling. And storytelling in science receives much resistance as we have seen in chapter 3.3.1.

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[188] *Ibid*
[189] *Ibid*
[190] Gould & Lewontin, 1979 pp.582-583
[191] Gould, 1978
[192] Barash, 1976
[193] Gould & Lewontin, 1979 pp.588

Besides the style of reasoning, the methodological approach and the underlying assumption aren't free of controversy themselves. When an organism is studied in an adaptionistic approach the traits are seen as individual traits working without relation to the other. Organisms are 'atomized'. Only when this approach (partially) fails the notion that traits influence each other because of a trade-off in energy is brought into the hypothesis. All traits help the organism to reach the optimal design. And the only method possible is trough natural selection. But adaptationists leave out the organism as a whole under selection. When natural selection acts upon an organism, it acts on the whole of the organism and not on just one trait. Some traits can be explained in this way, but many traits will not be the primary source for natural selection to act upon. Therefore, their evolution will depend on the evolution of other traits. High blood pressure and a strong heart in giraffes cannot be analyzed when these traits are atomized. Only when the evolution of the long neck is taken into the discussion one can provide a plausible explanation. As Gould and Lewontin state:
"*natural selection under the adaptationists program can explain superficial modification of the Bauplan that fit structure to environment: why moles are blind, giraffes have long necks, and ducks webbed feet, for example. But the important steps of evolution, the construction of the Bauplan itself and the transition between Baupläne, must involve some other unknown, and perhaps 'internal' mechanism*"[194].

So the criticism lead by Gould and Lewontin is mainly on the notion of formulating hypotheses and the atomizing of traits in animals. Although sociobiology is the target at which the critique is focused, Gould claims that attacking sociobiology isn't their main goal[195]. The problems that the adaptationist program faces is the main goal, but because sociobiology uses the adaptationist program is becomes a target. In *Sociobiology as an Adaptationist Program*, Lewontin makes a strong case to why sociobiology is part of the adaptationist program[196]. As discussed in chapter 2.3, Sociobiology's analytic concepts are based upon behavior and the use of adaptationist principles. This results in methodological and epistemological problems, especially when dealing with the nature of the human social behavior. According to Lewontin, in order for sociobiology to become a serious science it has to improve several points [197]. These points are all based on the adaptationist program and should be altered. First of all is the atomizing of traits as mentioned above. The critique that Lewontin provides is similar to the critique provided above. But Lewontin adds that this atomizing is also custom to sociobiology and should be considered more carefully. The second point Lewontin brings forward is reification. Natural selection can only act upon real material things. Metaphysical categories such as mental constructs cannot be subjected to natural selection for this reason. Although mental constructs are the result of material organs, selection can still only act on these material organs and not on mental constructs. Lewontin illustrates this with the example of ownership law. Today, possession of property is protected by a law that was unknown a millennium ago. To state that modern law is based on territorial behavior in animals is to state that properties are real objects rather than mental constructs that can evolve under natural selection. Lewontin argues that this reification "*is a cloud hovering over all the sociobiological descriptions of human behavior*"[198]. Thirdly, Lewontin speaks of conflation as a problem. Social animal behavior has been often explained with derived human social concepts. In this process, cultural aspects are lost. When sociobiologists use the same metaphors to explain human behavior with the help of animal behavior they carry an altered meaning. The last problem is the confusion of levels. The focus of sociobiology is on the individual despite their theories of group selection and kin selection. Social human phenomena become nothing more than a cluster of individual acts. This results in a methodological problem in which the behavior of individuals is used to explain group behavior.

[194] Gould & Lewontin, 1979 pp.593
[195] Gould, 1993
[196] Lewontin, 1979
[197] *Ibid*
[198] *Ibid*, pp.8

Besides these problems laid down by Lewontin, another is presented in his article. As is known, genes are the units on which natural selection acts. Population genetics, an important field in the study of evolutionary biology is based on the theorem that genetic variation is important for natural selection. Over time, this variation will decrease as a result of adaptation if adaptation is present. But this genetic variance is ignored by sociobiologists. This is partially because so far it has been impossible to show the genetic fundaments of mental traits. Besides this lack of information about genetic variance and fundaments, the relation between genotype-phenotype and environment is often not clear. Suppose one knows the relation between environment and phenotype. Because the relation between genotype and phenotype is never a clear one-to-one relation is remains almost impossible to state anything about the influence of the environment on the genotype. Add the knowledge about the genetic fundaments of mental traits and it becomes very hard to derive a hypothesis involving these aspects. This results in the lack of scientific testable hypotheses. The adaptationist program is sociobiology results in story telling instead of a true scientific field which provides good hypotheses that are testable.

And what about evolutionary psychology? Can it be stated that this new research field also builds on the adaptationist program? Or did the critique provided by Gould, Lewontin and other after them prevented this?

4.2.2 Is evolutionary psychology also a form of adaptationism?

In order to identify an adaptationist program in Evolutionary Psychology we must again look at the epistemology and methodology of the new research field. In chapter 3.1 the aims of evolutionary psychology have already been discussed so I won't be doing this again here. Four issues are worth the attention to answer the adaptive issue in evolutionary psychology.

First, David Buss has named some processes that are present when psychologists speak of a evolved psychological mechanism. Since behaviour in psychology is based on psychological mechanisms and evolutionary psychologists want to identify the evolutionary path of the mechanism, the first process Buss brings forward is vital to the approach in evolutionary psychology. He states that an behavioural mechanism exists in the form that it does because it solved a specific problem of individual survival or reproduction recurrently over human evolutionary history[199]. In short, each behavioural mechanism is the result of evolution because of adaptive problems in our ancestral past.

Another important aspect that Buss presents is the role of natural selection and sexual recombination. As he states: "*Essentially, all complex mechanisms require dozens, hundreds, or thousands of genes for their development. Sexual recombination, by shuffling genes with each new generation, makes it exceedingly unlikely that complex mechanisms could be maintained if genes coding for complex adaptations varied substantially between individuals . . . . This suggests that individual differences, including heritable individual differences, are unlikely to represent differences in the presence or absence of complex adaptive mechanisms*"[200]. So according to Buss the only mechanism that can be held responsible for the formation of adaptive psychological mechanisms is natural selection.

Third, in the methodology of evolutionary psychology some aspects are noteworthy. The first is the forward-looking heuristic (see 3.3.1). A past adaptive problem is identified and based on this problem it is argued that humans should posses a trait that would solve this problem. This trait may already be known or it may not and it has a known function or it has not. But according to the hypothesis it should be there. As Buss illustrates it "*one might identify a lock (adaptive problem) and then search for a key that might fit it*"[201]. The other heuristic, the backward-looking, works the

[199] Buss, 1995
[200] *Ibid,* pp.11
[201] *Ibid*, pp.12

opposite direction. Here a psychological mechanism is identified and an adaptive problem is tried to be linked to this mechanism. Or to speak as Buss, the key is known but the lock is yet to be found.

Finally, the most popular theory in evolutionary psychology should be looked at. In chapter 3.2 the modularity thesis was presented. In short this thesis states that our mind consists of many different mechanisms that act independently and have their own evolutionary path. Modules are developed to solve specific problems and cannot help solve problems that aren't 'their own'.

When we now look back at these four points, adaptationists premises can be identified in all of them. They will be dealt with in turn. First, the premises that each behavioural mechanism is the direct result of adaptation can hardly be stated not to be adaptationist in origin. Traits cannot exist or come to be without their adaptive function. Second, the role of natural selection. In the adaptationist program only natural selection is considered strong enough to make evolutionary changes. As adaptationists consider evolutionary changes to be adaptations it follows that only natural selection can make adaptations. Genetic drift and sexual recombination cannot account for this. This is not different in evolutionary psychology. Because of a fitness advantage during an adaptive problem, a trait has been selected by natural selection and has become our modern behavioural mechanism. Third, the heuristics. Both heuristics assume that the trait they look for (in forward-looking) or that they use to identify adaptive problems (backward-looking) are the result of adaptations. Again, this methodology can be found in the adaptationist program (see chapter 4.1). The last point, the modularity thesis can be linked to the atomizing of traits in adaptationism. By looking at traits as independently instead of interlinked evolutionary psychology approaches behavioural mechanisms the same way adaptationism does when approaching traits.

From these points, can we therefore state that the criticism presented by Gould and Lewontin in their essay can be transferred to present a criticism towards evolutionary psychology?

Gould is clear on this question. In his essay '*More Things in Heaven and Earth*' he states that "*Evolutionary psychology, as a putative science of human behaviour, itself evolved by "descent with modification" from the 1970s-style sociobiology"*[202]. His claim is based upon three aspects of evolutionary psychology Gould sees as a serious weakness. First, the modularity theory that divides behaviour into different modules (like a Swiss army knife, see chapter 3.2.1). Although evolutionary psychology claims to be the meta theory for psychology, neuropsychology approaches the brain different. Whereas the first speaks of independent modules or behavioural mechanisms, neuropsychology stresses the importance of the function of the brain as a whole organ. This atomizing that is done by evolutionary psychologists can also be found in sociobiology. Second, evolutionary psychology holds that variation in human behaviour is little or absent among individuals or groups. Behavioural mechanisms that evolved from our Pleistocene mind are universal for all human. By adopting this point of view, evolutionary psychologists exclude one of the most important features of Darwin's theory of Natural Selection, namely the presence of variation. This would imply that all of our behaviour is fixed since the Pleistocene and evolution of our behaviour has stopped since. Later differences are cultural based, not evolutionary. Next to genetic variation being a known factor in population genetics it remains hard for evolutionists and anyone who knows Darwin's theory to imagine that Natural Selection has suddenly stopped in the Pleistocene. This universal human behaviour explanation follows a pure adaptationistic program. This leads us to the last point Gould brings forward. Evolutionary psychologists claim that they have altered the adaptationists program into a new form that is better for evolutionary explanations. Instead of adaptations being adaptive today, evolutionary psychologists claim that these adaptations may be out of place in modern time. But they have been advantageous in a present situation and are therefore still present as a behavioural mechanism. Although this makes understanding the explanations of behavioural pattern easier, the assumption that all behavioural patterns are adaptive remains intact. And it is this assumption that Gould opposes.

So based on these three aspects the critique remains relatively the same. But Buss states explicitly that he is not a sociobiologist and that the two differ in some important features. Although

[202] Gould, 2000 p.117

both field are based upon the theory of Natural Selection that includes inclusive fitness as described by Hamilton[203] there is a difference. According to Buss sociobiology sees humans as so called 'fitness-maximizers' with the goal to increase fitness as much as possible as the ultimate goal. Evolutionary psychology on the other hand see the evolved mechanisms not as the result of maximizing fitness but as adaptive solutions. It is the best solution that is presented among all possibilities. So humans are 'adaptation executors' and not 'fitness maximizers'[204]. According to Buss the first term explains human evolution better that the latter because first of all fitness cannot be observed by the individual within his or her lifetime. Only after generations it becomes clear what the influence on fitness has been. And second fitness is something that differs because of age, species, ecological pressures, adaptive domains etc. So no domain-general feature about fitness maximizing can exist. Furthermore, what really is an important difference between sociobiologists and evolutionary psychologists is their main focus. And this can be found in the name. Sociobiologists are mainly biologists and evolutionary psychologists are mainly psychologists. Psychological mechanisms are the main focus and not patterns of social organization as in sociobiology[205].

When we filter out the arguments made by both Gould and Buss we can see that the basis of the critique on sociobiology remains. Buss argues that sociobiology is completely different from evolutionary psychology and should be compared because of their focus on psychology. But this doesn't changes the use of the adaptationist program in evolutionary psychology. This remains intact. The argument made by evolutionary psychologists to avoid this critique is that adaptive mental traits or behaviours aren't adaptive in our modern environment but they were in their adaptive environments. Although this makes hypotheses formulated by evolutionary psychologists more plausible the basic assumptions of the adaptationism in sociobiology remains intact. The criticism on sociobiology isn't transferable to evolutionary psychology in a 1:1 ratio but the core of the argument against sociobiology remains intact. Evolutionary psychology relies on the adaptationist program that has been the same fundamental principle in sociobiology

4.3 The aims of sociobiology and Evolutionary Psychology compared

So the critique isn't much different between sociobiology and evolutionary psychology. In previous sections both their aims and assumptions have been discussed at length. But to sum up and to make the foundation which is criticized more clear they will be discussed briefly here.

As discussed previously sociobiology's ultimate goal is to explain social behaviour in a evolutionary perspective. In doing so it is tried to show a direct line of evolution from the lower animals with social structure to early man. This evolutionary path can then help us understand our actions and behaviour and could also be applied to cultural aspects such as law. Function of traits can be explained from their adaptive social value. Evolutionary psychology on the other hand aims only to explain the evolutionary path of behavioural mechanisms in humans. And because their approach is psychology instead of biology the focus is on the underlying mental mechanisms. Evolutionary psychologists explain the function of traits from their adaptive value in a past adaptive environment. So both sociobiology and evolutionary psychology aim for the evolutionary path of behavioural patterns. The only clear difference is in the traits they study. Whereas sociobiology focuses on social behaviour, evolutionary psychology focuses on the behavioural mechanisms.

Both base their hypotheses on some assumptions that can also be compared and most of them overlap each other. First of all, which has been discussed in the previous section, both rely on the adaptationist program. Behavioural patterns, social of mental, are adaptations to past problems. In fact, evolutionary psychology is quite clear as to when these past problems occurred. Our behavioural patterns adapted to problems our ancestors faced in the Pleistocene, the early stage of

[203] Hamilton, 1964
[204] Buss, 1995 pp.10
[205] Buss, 1995 p.10

the development of *Homo sapiens*. Sociobiology doesn't give a specific era in which our social evolution took place. According to them this form of evolution is constant over different era's.

Another aspect in which sociobiology and evolutionary psychology overlap is the importance they ascribe to natural selection. According to both our entire modern human form is the result of natural selection and every trait, mental or social, has an adaptive value. Why specific traits evolved can be determined by their modern function (backward-looking heuristic) or by identifying the conditions under which a specific traits should have evolved and then look at our modern day 'pallet' (forward-looking heuristic). Both sociobiology and evolutionary psychology make use of these heuristics. But in this heuristic only natural selection has the power to produce new traits. Genetic drift cannot produce new traits and byproducts cannot arise without a function. So everything is adaptive.

Finally, sociobiology and evolutionary psychology agree on the absence of variation, or a reduced variation. Because our ancestors adapted to the environment in the Pleistocene and condition were relatively uniform then our entire human population has these specific adaptations. Variations that are present are the result of cultural influences and not genetic influences. Sociobiology on the other hand relies on group selection as the main method of natural selection. Every organism acts in the best interest of the group. This naturally implies little variation. Social structure should be uniform in the population for group selection theory to even be possible. Other traits that enhance egoism are excluded from the population. Therefore all traits present should enhance group behaviour and other options are excluded.

Chapter 5 Conclusion

5.1. Conformation in evolutionary psychology

In chapter 3 Evolutionary Psychology has been explained according to its theories and tools. Remember that the goal of Evolutionary Psychology is to explain the evolutionary path of mental traits and the behaviour they stand for. Our ancestors faced adaptive problems that were solved by adaptations in our mental states. In doing so, evolutionary psychologists use different 'bodies of knowledge' to support their hypotheses[206]: middle-range evolutionary theories, cross-species comparisons, hunter-gatherer studies and paleoanthropology (briefly discussed in chapter 3.1.1). First, middle-range evolutionary theories consist of specific selection pressures that are assumed to have played a role in the evolution of several taxa, as described by Buss[207]. These theories, such as parental investment and parasite-host evolution, can be well subjected to falsification and are therefore usable in evolutionary studies. Machery brings forward a just response to this claim made by Buss. These theories do provide an insight in the evolution of several taxa, but no proof can be given to support the claim that they apply to human evolution. Therefore it is not sufficient to build hypotheses on these theories. Furthermore, Machery adds, these theories are design unspecific. They are applicable to several taxa and therefore state nothing about the evolution of specific species or specific selection pressures[208].

The second method, cross-species comparison, could be useful but isn't yet[209]. By comparing human evolution with the evolution of other taxa insights can be found about selection pressures. But too often this comparison remains limited to a single species and this species is not rarely phylogenetically distant to humans. When primate evolution is used it often remains based on middle-level theories which gives conclusions a speculative appearance.

Thirdly, hunter-gatherer studies are used to show adaptive problems our ancestors faced. These hunter-gatherer studies mostly are based on anthropological studies of modern day hunter-gatherers such as primitive tribes in the Amazon and the Kalahari desert. From these societies possible adaptive problems are identified that our ancestors faced. But modern day hunter-gatherer societies are hard to compare to the ones our ancestors lived in. Influences from our modern world are likely to have influenced these modern hunter-gatherer societies. They might have been pushed to other environments due to industrialization and destruction of forests. Therefore one cannot assume that these societies face the same adaptive problems our ancestors faced[210]. Anthropological studies can provide an insight, but cannot be transferred directly to our ancestral environment.

Finally, evolutionary psychologists use paleoanthropological knowledge. This includes the evolution of our modern species from the more apelike form we once had. These studies provide good knowledge of the evolutionary path humans travelled, but aren't able to identify adaptive problems or ancestral environments. None the less, such studies have given us knowledge about the lifestyle of different hominoids. The main problem is that this knowledge remains incomplete and insufficient to be used as the foundation about mental evolution.

5.2. Misuse of evolutionary concepts

The lack of sufficient empirical evidence, as discussed above, remains one of the main critiques brought forward by (evolutionary) biologists. Biology, as a natural science, should support a hypothesis with extensive empirical evidence for it to be accepted a plausible hypothesis or even to be considered true. This includes hypotheses about evolution and evolutionary paths. And this is

[206] Machery, forthcoming
[207] Buss, 1995
[208] Machery, forthcoming
[209] *Ibid*
[210] *Ibid*

where the natural science Biology differs from the Evolutionary Psychology. Within Evolutionary Psychology, assumptions are made without the empirical evidence to support it. One of these assumptions is the modularity of the mind. Neuropsychologists also use the term modularity, but the concepts differs from the Evolutionary Psychologist's concept. Gould explains that the concept of modularity in neuropsychology is used *"to stress the complexity of an integrated organ. Evolutionary Psychology uses modularity to atomise behaviour into a priori, subjectively defined and prooly separated items (not known modules empirically demonstrated by neurological study), so that selective value and adaptive significance can be postulated for individual items as the ultra-Darwinian approach requires"*[211]. Also, methods are different which inevitably result in what biologists consider less empirical evidence[212] (see 5.3 Problems with Heuristics). So when Evolutionary Psychologists adopt a paradigm from the natural sciences, they should support it with the same evidence. But because evolution is brought into the psychological paradigm and not the other way around these critiques are presented.

One problem is the interpretation of the theory of Natural Selection by evolutionary psychologists. Holcomb states the following: "*Recall how Darwin described natural selection: If any trait useful to the organism should arise, and if it varies among organisms and is heritable, it will increase the next generation. Natural selection causes evolutionary change in which functional traits spread*[213]". Evolutionary biologists spot the incompleteness of this statement. A useful trait can arise at any time. Whether or not this trait increases fitness determines its presence in the next generation.

5.3. Problems with heuristics

In chapter 3.1.1. about conformation in evolutionary psychology I discussed the forward- and backward looking heuristic. Machery has presented several critiques of these heuristics. These have been described in 3.1.1. Some aspects are noteworthy. In his critique of the forward-looking heuristic Machery states that evolutionary psychologists do not claim that all psychological traits are products of evolution. And that not all psychological traits are adaptations[214]. But when giving a definition of a psychological mechanism, Buss states that each mechanism "*exists in the form that it does because (or other mechanisms that reliably produce it) solved a specific problem of individual survival or reproduction recurrently over human evolutionary history"*[215]. So Buss does claim all psychological mechanisms are adaptations from past adaptive problems. If the statement of Buss is true, it can support the backward-looking heuristic and not the forward-looking heuristic. The adaptation is unknown, the problem is yet to be found.

When the forward-looking heuristic is used, several hypotheses can be formed. It then becomes a matter of which best 'fits the facts'. As a problem he names the 'inference to the best explanation', if a hypothesis best explains the phenomenon that researchers try to explain, it is considered true[216]. Buss has dismissed this claim. According to him 'just-so-stories' are an essential part of science. They bring forward opportunity to empirically test a theory[217]. This will result in the adoption or rejection of these 'best explanations'. But the empirical value of 'just-so-stories' is still subjected to discussion[218].

From this forward-looking heuristic, Evolutionary Psychology identifies two categories of psychological mechanisms. The first consists of psychological mechanisms that still have a function

[211] Gould, 2001 *p.99*
[212] Machery, forthcoming
[213] Holcomb III, 1996 *pp. 533*
[214] Machery, forthcoming
[215] Buss, 1995 pp.6
[216] Holcomb III, 1996
[217] Buss, 1995
[218] Holcomb III, 1996

today. The second consists of those who don't, but did in the time of adaptive problems. This latter category provides us with a problem. In order for the heuristic to be validated, these mechanisms have to be found in modern humans. But these mechanisms that lost their function cannot be found. According to Buss our nature, in which all these mechanisms can be found, requires environmental influence to develop (nurture). Once developed these mechanisms need special input to perform the functions that they are 'designed' to perform[219]. But if a mechanism has lost its function, it will never come to expression according to Buss' reasoning. The right environmental input for development will probably be absent. And even when these mechanisms are able to develop, the right input for activation are most certainly absent. If not, the mechanism still has a function and it automatically belongs in the other category of psychological mechanisms.

With these two categories still in mind, the backward-looking heuristic is only a partially useful method. It cannot be used for the category of mechanisms that lost their function. Only psychological mechanisms that still have their function today can be subjected to this method. But again, it becomes a matter of 'inference to the best explanation'. Because our knowledge of the environment in early human evolution remains incomplete and under construction, it becomes hard to identify these problems. But it is not hard to build a problem around the solution. It could very well be that a psychological mechanism has evolved as a byproduct of another mechanism and now serves a particular function. I will discuss the problem of adaptationism in the next section.

As Buss claims, all psychological mechanisms are adaptations and served to solve a problem in our history. But in their study on racism, Kurzban *et al.* have shown that racism is not an adaptation[220]. On the other hand, his conclusions can be explained to be logically derived from our morality. Racism is universally considered to be morally wrong. If evolutionary psychology were to claim that racism served an adaptive value in evolutionary history it more or less would commit public suicide. It would mean that it is in our nature to discriminate against other races. Our morals tell us that it is not. This leaves room for discussion whether or not such a claim is more politically based than scientifically.

5.4. Adoption of adaptationism

In chapter 4.2.2. it has been discussed that evolutionary psychology builds on the adaptationistic program. Traces of adaptationism can be found in the premise that all psychological mechanisms evolved to solve a specific problem. Furthermore evolutionary psychologists believe that only natural selection is strong enough to create new mechanisms. Changes as a result of genetic recombination and genetic drift are excluded. As Buss claims both genetic recombination and genetic drift "*makes it highly unlikely that complex mechanisms could be maintained*"[221]. But also in the heuristics adaptationistic assumptions are present. For both forward- and backward-looking heuristics to work one has to assume that the products (evolved psychological mechanisms) have solved problems to begin with. Otherwise one could not find the problem (backward-looking) or find the solution (forward-looking).

As in biology, evolutionary psychologists try to explain their traits, the mechanisms, according to their function. And to understand the function of a mechanism one has to know the condition under which it evolved. In other words, which adaptive problem the mechanism solved[222]. Again, without adaptationism as a starting point this question would be difficult, if not impossible, to answer. Gould and Lewontin have challenged these adaptationist assumptions most efficiently in *The Spandrels*[223]. This has been discussed at length in chapter 4.2.1. Their main critique was focused on sociobiology, not evolutionary psychology. But in 4.2.2. I argued that their critique can be transferred

[219] *Ibid*
[220] Kurzban *et al.* 2001
[221] Buss, 1995
[222] *Ibid*
[223] Gould & Lewontin, 1979

to evolutionary psychology. Sociobiology has a different focus than evolutionary psychology does (animal traits vs. human psychology) but the premises under which they search for their answers are the same. Therefore the critique of Gould and Lewontin holds for evolutionary psychology

5.5. Was evolutionary psychology the logical 'next step'?

To answer this question we have to look back at the development of the study on behaviour as presented in chapter 2. If we determine the main focus of each paradigm we can see whether or not a line of 'descent' can be found.

With his book '*Expression of Emotions of Man and Animal*' Darwin provides us with a first form of evolutionary study on the mind. Although Darwin's main focus is on reflex mechanisms, as the result of responses to the environment, it does provide the starting point for studies on the evolutionary path of our mind and the actions resulting from it. The evolutionary aspect of modern evolutionary psychology started with Darwin. No evolutionary psychologist will discuss this. In the studies of Wundt we find a more specialized research field. His research focuses more on the development of emotions and not the reflex mechanisms as Darwin did. According to Wundt, emotions develop in a progressive line. Simple organisms have simple emotions. The more complex a organisms becomes, the more complex the emotions become.

Following Darwin, and in some aspects Spencer, Romanes shifted the focus of the evolution of emotions more to the animal kingdom. But unlike today, Romanes saw Lamarckistic evolution as the driving force behind the development of instincts. These instincts are habits that became hereditary over generations. But another aspects of the theories of Romanes is more noteworthy. Romanes argued that the mind, just like morphological structures, is subjected to evolution. But these evolutionary paths are not linked. The change and adapt independent of one another. In Romanes approach, a dualistic component can be identified. Mind and body should be seen as two independent structures. And although they interact, their development over time should be addressed individually. And this same feature can be identified in evolutionary psychology. Their approach to the evolution of the mind has the same dualistic component as with Romanes.

Lorenz and Tinbergen developed a new approach to behaviour. Instead of focusing on the mind as the origin of behaviour, they looked for causes in the physiology of animals. An aspect formulated by Tinbergen is the importance of survival value, or fitness, of behaviour. But instead of conducting experiments on animals to try and manipulate this, it should, according to Lorenz and Tinbergen, be studied in the natural habitat. And it should be studied as an organ of the organism, physiologically. Only then one can state meaningful hypotheses about the survival value of behaviour. The approach formulated by Lorenz and Tinbergen has been abandoned by evolutionary psychology. Fitness, as discussed above in 5.2 isn't incorporated in the evolutionary psychologists' approach. It is naturally assumed that useful traits increase fitness. Furthermore no studies are done in the natural habitat. This is impossible for evolutionary psychologists since they place the time of evolutionary adaptation in the Pleistocene.

In biology other approaches to behaviour and the mind developed. Noteworthy is Loeb. He approached behaviour in animals as something that can be controlled. Causes of behaviour are found in chemical responses, a reductionistic view on behaviour. Everything then becomes a reflex to a stimulus. Loeb's perspective didn't survive the critique. It is therefore not surprising that no aspects of Loeb can be found in evolutionary psychology. One biological field that did influence evolutionary psychology to some extent is sociobiology, with the works of Wilson and Morris. Both authors do stress the importance of solving adaptive problems in a social context. This has been the subject of chapters 4.2 and 4.3.

So was evolutionary psychology the 'logical next step'? It is difficult to answer this question in retrospective. The question whether or not the theory of Natural Selection was 'there for the taking' or not still remains the subject for many discussions. Was Darwin the one who put the pieces together? And this question should be answered from both the psychology perspective as from the biology perspective.

Evolutionary psychology follows several perspectives long used in biology. Since evolution is such an important feature of evolutionary psychology, it has to follow the line of development of this theory as done in biology. When looking at the researchers presented above, one can identify several aspects in evolutionary psychology. For example, the differentiation between the evolution of the mind and the morphological structures (dualism in Romanes). But the most heavy influence is received from sociobiology. Their adaptationistic perspective, the importance of adaptive problems and the social context can all be found in evolutionary psychology. But not all important concepts are incorporated. Therefore the step taken by evolutionary psychology isn't 'logical' in a forward direction but more a sidestep in a possible new paradigm. This sidestep has 'borrowed' some biological aspects while leaving others behind. As discussed in previous sections, in doing so evolutionary psychology hasn't incorporated the evolutionary paradigm as it is formulated throughout its own development. From a biological perspective this makes evolutionary psychology a research field that is not a science 'in development' but a 'pseudo-science' that hasn't formulated a new paradigm but tried to join two others. The result is not sufficient (yet).

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