The evolution of human nature

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0. Prologue

This book is loaded with facts.

Abstract

This book is about the evolution of human nature, but ‘human nature’ is a special concept that cannot be defined. ‘Human nature’ refers to hereditary psychological and behavioral properties that distinguish humans from chimpanzees and bonobos.
In this book, I try to restrict myself to statements that can be tested by logic or observations. Scientific progress is only possible if incorrect statements can be quickly recognized and eliminated. I will discuss causes and effects of behavior as far as possible free from scientific, religious or ideological prejudices.
My starting point is: when a scientist formulates a claim, he or she has to substantiate that claim. So: demonstrate that a property is hereditary. Demonstrate that a property is acquired. Then nature/-nurture issues suddenly disappear.

1. Introduction

"Human nature is a very paradoxical term." (Faris 1925)

Abstract

This book is about man: about power, love and sex, violence, sacrifice and faithfulness, and about kinship, friendship and treason. I am looking for causal explanations of how natural selection has shaped behavior in these fields.
In this book, I investigate continuities and discontinuities between humans and other animals. Especially our closest relatives are relevant, the chimpanzee and the bonobo. I intend to present solid empirical scientific knowledge. I intend to present facts and conclusions free from ideological, religious and scientific prejudices.
In biological evolution, new variants emerge as a result of the elimination of less suited variants. Some authors regard this as ‘progress’, but it is impossible to define progress in biological evolution without anthropocentric boasting.
Scientific progress is only possible if incorrect statements can be quickly recognized and eliminated. Quick elimination of incorrect statements is only possible if these statements are clear enough, such that they can be tested critically by logic or observation. My aim is rigorous empiricism in simple, testable statements.

2.1. The evolution of Hominids. With a critical discussion on pedigrees

"Our classifications will come to be, as far as they can be so made, genealogies."
(Darwin 1859, p. 486)

Abstract

Usually pedigrees are used to depict the descent of living organisms. Some pedigrees only have ramifications and other pedigrees have ramifications and fusions.

1. Only ramifications but not fusions are possible in the evolution of individuals after speciation, and in the evolution of genes without recombination. This applies to alleles of the mitochondrial DNA (mtDNA), and to alleles of the non-recombining part of the Y chromosome (NRY-DNA). Then pedigrees are transparent.
2. Fusions and ramifications are possible in the evolution within a species with sexual reproduction, in the evolution of genes with recombination, and in the evolution of languages. Then pedigrees become an entangled mess.

This will be applied to the evolution of the ancestors of man from 5 Mya (*Million years ago*) till 100 kya (*thousand years ago*): *Ardipithecus, Australopithecus* and *Homo*. In these groups, fossil remains are traditionally named as if they are different species. But no one knows whether reproduction barriers were present, that is whether these were discrete species. Evolution is gradual, but these fossils have been given names that suggest discontinuity.
Up to 95% - 98% of the DNA of Modern Man (*Homo sapiens*) has a common origin: 100 kya in Africa. But other Hominids have contributed to the DNA of *Homo sapiens*: *Homo erectus* in Africa, and Neanderthals and Denisovans in Eurasia.

2.2. DNA data about the evolution and dispersal of Modern Man Evolving and admixing of mankind

All humans are products of admixture of various peoples.

Abstract

In this chapter, the overall peopling of the earth is described.
A scientifically based, testable pedigree of genes or haplogroups can be constructed, if no recombination occurs in these alleles or haplogroups. This applies to alleles of the mitochondrial DNA (mtDNA), and to alleles of the non-recombining part of the Y chromosome (NRY-DNA). This enabled the deduction of testable descent for the first time in history, but only for the separate male and female lineages. When one tries to combine the mtDNA and the NRY-DNA pedigrees to one pedigree of mankind, an entangled mess results. Unfortunately, humans can easily think in terms of peoples, languages, regions and cultures, but not in terms of alleles and haplogroups.
Data from investigations of mtDNA and NRY-DNA demonstrate that from the remote past until present day, people have mixed on a large scale. This is shown in this chapter, in some detail for Taiwan/-Indonesia/New-Guinea/Oceania/Madagascar, for Amerika and for Europe.
It is impossible to draw testable, scientifically based limits between groups of humans. An attempt to classify mankind into 'races' on a scientific basis must fail. Since there are and were constantly sexual contacts between people, any pedigree of people becomes a mess.
However, it is part of human nature that humans classify themselves and others in groups based on kinship, descent and appearance.[1] Traditionally this is called a classification of races. That is how humans classify themselves and other people, but without scientific basis. That is often the start of discrimination.

[1] Humans seem to have an ineradicable urge to classify themselves and others in groups. This urge is part of human nature. A consequence is discrimination and nepotism; a society can only be civilized if discrimination and nepotism is sufficiently repressed.

2.3. The prosperity of nations.
Long-term changes in height, brain size, early development and IQ

People in Northwest Europe who were born after 1970/1980,
have in adulthood now attained the maximum average height,
and the maximum average IQ for their genetic potential.

Abstract

Body height. In Europe, the USA, Australia and Japan, adult human body height has increased in the last 100 – 200 years by 1 - 2 cm per decade, with short interruptions or declines in periods of war. During this time, not only body height, but also life expectancy has increased. This reflects processes over a period of more than 100 years. Adverse environmental influences on body height, such as malnutrition, diseases and poverty, have declined in the last decades in Northwest Europe, and consequently average height has increased, and environment-induced variance decreased. Central governments have promoted food and health care quality, welfare and a more equal distribution of wealth; this total pattern is called long-term prosperity. The heritability of body height rose to above 0.9. For persons who were born after 1970/1980 in Northwest Europa, the average adult height is no longer increasing. Apparently, in Northwest Europa and the USA, circumstances are so good that most individuals reach the maximum height for their genetic potential.
Brain weight. Together with body height, brain weight has increased in Western countries by about 6 g per decade during the last 150 years.
Development quotient. For about 100 years the development of infants and toddlers has been measured systematically. Motor development, language development and cognitive development are rated and calculated to a development quotient (DQ). In Western countries, the DQ has increased by about 3 points per decade.
Intelligence. Since 1900, psychologists have been measuring the intelligence of children and adults, expressed in the intelligence quotient (IQ). After 50 years use of intelligence tests, it was discovered that the average IQ of people in the USA, Europe and Japan had gradually increased. This is the general pattern in economically developed countries and is called the 'Flynn effect'. Problem solving (fluid intelligence) had increased by 5 IQ points per decade, while crystallized intelligence (related to learning and language) had increased by less than one point per decade. Among all IQ tests, scores on Raven's progressive matrices are least influenced by culture and language. Over the period from 1948 to 2002, Raven's score increased by 28 IQ points. This is a massive increase. Not only the average IQ rose, but the variance also decreased: nowadays there are less people with a low IQ. The Flynn effect is not caused by changes in genetic factors, and psychosocial factors such as schooling have little influence. Just as body height, the Flynn effect is mainly caused by biological historical factors such as better food, better health, more wealth, and a more equal distribution of wealth. For people who were born in Northwest Europa after 1970/1980, the average IQ is no longer increasing . The heritability of IQ rose to 0.8 and more. Apparently, circumstances there are so good that most individuals reach the maximum IQ for their genetic potential.
General. The long-term changes in brain weight, DQ and IQ have the same causes as the long-term changes in body height, namely long-term prosperity. The relative contributions of the various factors still have to determined.

3. Heredity, learning, maturation or intellect?

The effects of heredity, learning, maturation and intellect on behavior can be distinguished experimentally.

Here I intend to investigate the continuities and discontinuities in human and animal behavior, on the basis of published empirical evidence.

3.1. Behavior and genetics: reflexes, instinct and spontaneous behavior

"Nothing in biology makes sense except in the light of evolution." (Dobzhansky 1973)
Nothing in evolution makes sense except in the light of genetics.

Abstract

Properties of living organisms are qualified as 'hereditary' if it is demonstrated that they are at least partly caused by genes. Operational criteria can be used to conclude that a specified property is at least partly hereditary.
People and animals distinguish positive and negative stimuli. The distinction between positive and negative stimuli is so basic that heredity is the only causal explanation that animals and man attach a positive or negative weight to stimuli (= value). Species differ in the valuation of stimuli: for instance, for diurnal animals darkness is a negative stimulus, and for nocturnal animals it is a positive stimulus. Positive and negative stimuli are the starting point for various forms of learning.
The scientific literature offers many examples that simple stimuli elicit simple behavior in newborn animals and man. These are called reflexes. Basic reflexes are hereditary and not a consequence of learning. These are unconditional reflexes. Basic reflexes can be modified by experience in two ways: either the behavior itself can be modified, or the eliciting stimuli. Other stimuli cause more complex behavior, which is characteristic for each species. In various behaviors, complex stimulus-response chains are involved, such as food intake by young animals. These are called instinctive behaviors. In genetic cross experiments between species in fish, birds and primates, various complex behaviors appeared to be at least partly hereditary.

3.2. Learning

"All men by nature desire to know." (Aristotle).

Abstract

Man and animals acquire knowledge, which is called 'learning'. A person or animal learns a connection between concepts when he is exposed to this connection, and when this exposure is the cause of this connection being stored is his brain. Operational criteria can be used to conclude that a person or animal has learned a connection between concepts. Often this implies demonstrating empirically that experience is a cause of behavioral change.
In this chapter various examples are presented of hereditary, specialized learning systems in animals and humans. Such learning systems select what is learned, at which age, and on the basis of which sensory systems. On the basis of hereditary learning systems animals recognize their mother, and identify good food and natural enemies. For these and other learning systems it will be demonstrated empirically that learning and heredity are involved. Such hereditary, specialized learning systems were superior in evolution to systems with a detailed completed template, because specialized learning systems keep functioning properly, when the species involved, its food, its enemies and its environment change.

3.3. Maturation of behavior

Normal development presupposes a normal environment.

Abstract

When certain behavior emerges at a later age, and it is not caused by previous exposure to examples of that behavior (i.e. it is not caused by learning), we conclude that this behavior emerges after 'maturation'.
Several examples of behavior that emerges after maturation are presented here: picking by young chicken, avoidance of heights by mammals, flying and nest building by birds, and vocal imitation by primates and birds. Maturation of behavior is evident during and after puberty, such as sexual behavior and dominance behavior. Some forms of imitation occur just after birth, and other forms occur later.

3.4. Personality traits of man and animals. Behavioral differences between individuals

The most fundamental personality difference in man and animals is bold versus shy, or neophilia versus neophobia.

Abstract

Human personality is usually related to personality differences that are rated by questionnaires. The Big Five is nowadays the golden standard for human personality. The Big Five factors are: extraversion, agreeableness, conscientiousness, neuroticism and openness to experience. The Big Five are hereditary to a moderate degree. Investigators can identify more or less than five personality factors, depending on the aims of the investigator.
Personality differences can also be deduced from behavior. Various systems are available to rate the behavior of infants and toddlers. Attention is paid to effortful control and self-control of children, and whether they are capable of delaying gratification (the marshmallow test). For children and adults, attention is paid to social value orientation, dominance and leadership.
Personality traits are also found in animals. In animals, similarities and differences with the human Big Five are mentioned. A basic dichotomy, found in man and animals, is the distinction between bold and shy. An obvious characteristic of animals is dominance versus submission.

3.5. Intelligences in animals and men

People are intelligent, but so are animals.
On several tasks, animals outperform humans
on aspects that are evolutionarily advantageous for these animals.

Abstract

In general, intelligence regards (1) learning, i.e. the discovery and remembrance of connections, and (2) the solution of problems. IQ tests measure intelligence in man. The psychologist Howard Gardner (1983, 1993) distinguished various types of intelligences in humans. These are 'intelligences', because this involves not only domain-bound learned content, but also the acquisition of new learned contents, and the flexible, goal-oriented use of these learned contents in new situations. I use the human intelligences of Gardner as a starting point to describe the intelligences of animals.
It is not possible to use IQ tests in animals, but various behavioral tests have been developed in natural situations. Amongst others, this regards technical, naturalistic and social intelligence. Animals are intelligent in various respects: they discover biologically relevant connections, and they use the learned content flexibly in various new situations. Birds, monkeys and apes use various tools, and they make such tools themselves. Birds and primates are skillful in using signals for their own advantage; they even use deceptive signals. On several tasks, animals outperform humans on aspects that are evolutionarily advantageous for these animals.

3.6. Rationality.
Social beings often defeat rational beings in the struggle of life.

In various situations, humans make choices that do not aim at maximum profit.
Fast or kind behavior is often evolutionarily more advantageous than rational behavior.

Abstract

Aristotle stated that man distinguishes himself from animals in that man is capable to deliberation to make rational choices. Man is the ‘Rational Animal’. The basic assumption of various theories in economics was that humans make rational choices. A behavioral choice is considered ‘rational’, if all options are taken into consideration, and the participants aim at maximum profit. This can be settled by logic, mathematics and statistics. But in the last decades, social psychologists and economists have demonstrated that in various situations humans behave systematically irrationally. This regards for instance financial choices, self-knowledge, intuitive choices, and hypothesis testing. According to some psychologists, mankind should be rescued from irrational behavior.
I prefer another approach. Early in evolution, animals made behavioral choices that were good enough to withstand the struggle of life. Animals as well as children make intuitive choices. Even the majority of behavioral choices of adults (including philosophers) are intuitive. An intuitive behavioral choice is considered ‘intelligent’ if the choice is flexible and it promotes survival or reproduction.
In evolution, rational choices became possible when our ancestors had developed rational thinking thanks to large brains and language capacity. The capacity to make rational choices, as defined here, is unique for man. But nevertheless most human behavioral choices are intuitive. People display systematically irrational behavior. This irrational behavior promotes social cohesion and fast decisions. I present hypotheses (or rather just-so-stories) that such irrational behavior might be a result of natural selection.

4. Altruism, cooperation and egoism

Can natural selection cause the emergence of altruistic behavior?

Abstract

Competition between members of the same species in a population is the root of Darwin's theory of evolution by natural selection. In each species more individuals are produced than can survive on the long term. Inevitably, in the competitive struggle there are winners and losers. Natural selection gives a causal explanation for the emergence of egoistic behavior. And natural selection provided a causal explanation for the emergence of altruistic behavior that favors relatives, but in some cases humans and animals also
favor non-related congeners. A fundamental question is whether and how natural selection could cause the emergence of altruistic behavior favoring non-relatives.

4.1. Does natural selection select individuals or genes?

The only consistent, testable, causal evolution models are gene-centric models.

Abstract

Charles Darwin formulated his theory that natural selection selects individuals. The individual that best fits in his environment survives and can reproduce: survival of the fittest. This theory explains the emergence of egoistic behavior, and also altruistic favoring of relatives. Darwin knew that his theory only applied to properties that are transmitted to the next generation, but in his time, no scientifically based genetic theory was available. Population geneticists have formulated a scientific evolution theory; this was called 'Neo-Darwinism'. Neo-Darwinism deals with changes in the frequency of alleles. Of course, natural selection works via individuals, but consistent evolution theories deal with the alleles of these individuals. The fitness of alleles can be operationalized.
Other evolution theories deal with the preservation of families of groups, or they are based upon the preservation of the species, the ecosystem or Mother Earth. But these are not testable scientific theories.
Elegant, simple and testable evolution theories deal with changes in allele frequencies, which is the gene-centric approach. In elegant evolution theories, natural selection selects alleles or genotypes, and not individuals, groups, populations, species, ecosystems or planets.

4.2. Evolution models and division games

In a welfare state and in public goods games,
the number of free-riders might become too large;
selective punishment can reduce the number of free-riders.

Abstract

Various simulation and model studies of human altruistic and egoistic behavior have been conducted. In some games, two players participate; in other games a third player has influence. In public goods games, many players play for a common goal.
In contradiction with the rational choice theory, most players do not aim for a maximum own profit, but they prefer a more fair division. When players notice unfair behavior by others, two options remain: punishing the unfair behavior if possible, or starting to play unfairly themselves.
Most human behavior is not rational according to the rational choice theory. Most people do not aim ruthlessly for their own profit, but rather, they choose intelligently such that all people involved get a fair share, and this keeps relations positive.

4.3. Relations between actors as explanatory principle for behavior. (‘Egoism’ and ‘altruism’ are problematic concepts)

Testable analyses of social behavior are based upon the relations between the actors, and not on egoism or altruism.

Abstract

For evolutionary theories on social behavior, the relationships between the actors are a superior explanatory principle than altruism or egoism. Men and animals advantage others with whom they have a positive relationship, and disadvantage others with whom they have a negative relationship. Such relationships can be kinship, dominance, alliances, friendships and membership of a group, and sex relations, trade, competition and enemies.
It is possible to analyze the interactions between individuals with known relations: does an animal or a person advantage or disadvantage another or itself by a particular action? Then the problematic concept of ‘altruism’ is no longer needed in the further analyses.

5.1. Social and sexual behavior, mainly in primates

Human men and women easily fall in love, and easily become jealous;
a predictable outcome is relative monogamy with secret adultery.

Abstract

In primates a close connection is found between social and sexual behavior. This determines the structure of societies. Most primates live in one-male harems or in promiscuous communes. In these societies, males and females live in a dominance hierarchy. Other primate species live in monogamous couples or solitarily. In chimpanzees, we find three patterns of reproduction: polygyny (one male claims several females), promiscuity, and temporary pair bonding. The actual patterns depend on the circumstances and the individuals involved, but in general, the alpha-male chimpanzee begets the most children.
The three chimpanzee patterns also occur in humans, but in man, monogamy (temporary pair bonding) is the most frequent pattern. This is substantiated by anthropological, biological and psychological findings. Actually, in various cultures, 60 – 90% of the adult men and women live in husband-wife relations (monogamy), although polygyny is allowed
in many cultures, and adultery is fairly frequent. If a society has as many men as women – who can fall in love or become jealous - monogamy is the probable outcome. If there are more women than men, polygyny by powerful or rich men is in the interest of men and women.

5.2. Inbreeding, outbreeding and incest in animals and humans.

In all peoples, rules have been made about who is allowed to marry whom.
Some of these rules promote inbreeding, and others counteract inbreeding,
and again others are medically irrelevant.

Abstract

For reproduction, individuals who are not too closely related and not too far, are the best sex partners. Far related individuals might be members of another species, and then the offspring is often less fertile. With close relations the disadvantages of inbreeding sometimes follow. Adverse consequences of inbreeding are excess mortality, hereditary diseases, less vitality and less fertility. These adverse consequences are found in animals and humans. But inbreeding has not always adverse consequences. Quantitative data are presented about the consequences of inbreeding.
Inbreeding avoidance is found in men and animals. In many animal species, inbreeding is less frequent, either because adolescent males of females leave their birth group, or because individuals instinctively mate less with individuals with whom they are raised. This instinctive inbreeding avoidance is called the Westermarck effect. The Westermarck effect is also evident in genetic sexual attraction. i.e. the strong sexual attraction between close relatives who are separated early and reunited as adults.
In all societies, various rules have been made about who is allowed to marry whom. These marriage rules are called ‘incest taboos’, but that is the wrong term. Some marriage rules promote inbreeding, and others counteract inbreeding. Some of these rules are disadvantageous for the offspring, some rules pose medically irrelevant limitations, and some rules cause irrational needless suffering.

5.3. Deep biological and cultural roots of Love

Is Love mainly connected to transcendental, overwhelming goodness, or to selfish genes?

Abstract

This chapter starts by making a list of the various meanings of ‘love’. For each variant, I formulate who the actor is, and who or what the object is. For each combination, I investigate the relevant behaviors, and whether this variant is also found in animals The possible connection with sexual behavior is discussed.
The conclusions are as follows.

1. The activities of all living organisms are such that the probability for survival and reproduction increase. This is a direct product of natural selection. The so-called ‘love for life’ is almost as old as life, so about 3.95 Gya (giga years ago, billion years ago).
2. Early in evolution, organisms approached stimuli that increase the probability for survival of reproduction, and they avoided stimuli that reduce the probability for survival of reproduction. This probably started 2.5 Gya. This is the very beginning of the assignment of ‘value’ to stimuli.
3. About 2 Gya, organisms started to reproduce sexually. Within some species, variants differentiated with few, large reproductive cells (= female individuals), and other individuals with many, small reproductive cells (= male individuals). Initially, the small reproductive cells (pollen or sperm) were spread randomly, but later some female organisms were inseminated internally. Internal insemination presupposes that organisms differentiated congeners from non-congeners. This was the start of ‘love for their own species’ and ‘love for the other sex’.
4. Knowledge is the coupling of concepts; that is learning. Animals learn. Therefore, I think that basic ‘love for knowledge’ is at least as old as animals, so at least 700 Mya (mega years ago, million years ago).
5. Individuals of several species animals have a territory. This is the start of ‘love for the homeland’, or patriotism, which started about 680 Mya.
6. In all mammals, maternal care is necessary for the survival of newborn offspring. Therefore, I conclude that in the lineage of man, maternal love is at least as old as mammals, so 220 Mya.
7. According to the theory of kin selection, selectively favoring relatives is evolutionarily advantageous. This is the beginning of love for kin; I speculate some 100 Mya.
8. Living in groups presupposes positive behavior towards members in the same group. This is the beginning of friendship, alliances and dominance relations. In the primate lineage, group living started about 52 Mya.
9. In many group-living species, either young-adult males or young-adult females migrate to other groups. That is only effective if the other groups absorb newcomers. This is the beginning of tolerance of strangers, or even hospitability for strangers. In the primate lineage, this was about 20 Mya.
10. Individuals of some species live in monogamous couples. This involves infatuation and jealousy. For humans this started 1.8 – 0.4 Mya. But for gibbons and many birds, romantic monogamous love is much older, 10 and 65 Mya respectively.
11. Later, humans developed many cultural variants of preferences: for body decoration, gods, carvings, paintings, music, pets, hospitality, peace and science.

6.1. Is man mainly violent or mainly peaceful? Or is this the wrong question?

Ideological biases hinder an impartial view on human nature.

Abstract

In the authoritarian experiments by Stanley Milgram and Philip Zimbardo, normal students behaved cruelly towards other students. Also in war, normal soldiers undertake cruel massacres. On the other hand, in many experiments in social psychology, most people behave positively. This positive view is in agreement with the situation in Western countries with a central democratic government, with relatively little violence, and relatively more cooperation. It depends mainly on the situation whether people behave in a friendly or asocial manner.
In behavioral genetic investigations into friendliness and aggression, usually a considerable influence of hereditary is found, and a small influence of growing up in a common environment. While we have seen above a large influence of the environment, in behavioral genetic experiments, the influence of growing up in a common environment is small. This seems to be a paradox. Does the environment really have a large or a small influence?
A dual answer to this question is:

- The actual **situation** mainly influences the actual **behavior**.
- **Genes** mainly influence **properties** (such as personality) of people or animals.

Further it has been demonstrated that human personality has at most a moderate influence on behavior.
A practical question is: if you want to improve society, what is most effective: trying to improve people, or trying to improve the situation? Attempts to improve people are rarely successful, since 'decent' people misbehave in war and in various experiments. It is more effective to improve the situation. This is not wishful dreaming, but is has already been practiced. By improving wealth, justice and equality, Western governments have, reduced murder and manslaughter by a factor 20 to 1000 compared to previous societies and to small-scale non-Western societies.

6.2. Group violence and deadly violence in primates, including man

Among mammals, man is the only species that wages war.

Abstract

The deadly violence of male chimpanzees against adult members of their species is compared with the deadly human violence. Groups of adult chimpanzee males of a single community regularly perform patrols into the territory of neighboring communities. On such patrols, they regularly kill solitary males of other communities. They have tactics with few risks for the attackers who have a numerical upper hand. When several adult males of a community have been killed, their community disintegrates, and the females and children migrate to other communities. After the elimination of a community, the perpetrators acquire territory with extra food, and they acquire extra females. These murders are useful to spread the alleles of the perpetrators. Chimpanzees avoid lethal fights between groups.
Border patrols in chimpanzees most resemble the spontaneous, unarmed excessive violence of groups of Western men against solitary men (so-called 'senseless violence'). Besides violence against solitary men, non-Western peoples undertake ritual battles and deadly raids. Not only in chimpanzees, but also in man, communities are eliminated by deadly raids. Unique for man is war: large-scaled deadly violence between groups. Language, culture and self-sacrifice (i.e. civilization) are indispensable for war.
It is not scientifically fruitful to try to 'explain' the violent behavior of chimpanzees and humans in terms of motivations and intentions. An empirical, testable, causal explanation of behavior describes (1) in which situations the behavior occurs, (2) the contributions of heredity, development, learning and intelligence, (3) the consequences of the behavior, and (4) whether the behavior contributes to the propagation of the alleles of the perpetrators. According to these criteria, the violent behaviors of chimpanzees and man are by and large causally explained.

6.3. The Loyalty Hypothesis. Why does Wise Man (*Homo sapiens)* stick to group opinions?

People prefer to be illogical or ignorant than traitors.

Abstract

Here, I propose the Loyalty Hypothesis. This hypothesis states that humans are above all loyal to their group opinions, and that the logic of the opinions, and their agreements with the facts are subservient to group loyalty. Survival of prehistoric and historic groups depended on whether their own group was sufficiently large, coherent and brave enough to win the competition with neighboring groups. In the presence of external threats, group members (mainly men) must be prepared to take personal risks to defend the group.
Group coherence goes together with unanimity about crucial opinions that connect the group. Those are mainly opinions about blood relationship (descent and 'race'), and religious or political opinions. According to the Loyalty Hypothesis, many cognitive biases emerged during the evolution of man. Due to these biases, groups became more coherent, and could win wars against other groups.

7.1. Signals and meaning

The origin of signals in evolution was the origin of 'meaning'.

Abstract

I use the word 'signal' exclusively for states or events of living organism, or of parts of living organisms, or of products of living organisms. These states or events are called 'signals' if the following criteria are fulfilled:

- a sender has been identified,
- a receiver has been identified,
- the states or events have a more or less predictable effect on the receiver,
- the effects on the receiver are (at least initially) evolutionary advantageous for the sender and receiver (co-evolution between the production of the signals, and the reactions on them).

So signals are a product of natural selection. Everywhere in living nature, organisms send signals and communicate. Some signals remain inside the body, like action potentials of neurons, and the release of hormones. Other signals have effects outside the organism, like the colors and flavors of flowers, the appearance of animals, and signaling behavior of animals. Signals have causes and effects. Signals are caused by genes and/or by external stimuli. Signals refer to their **causes**. That is: signals have meaning. I use the word 'meaning' exclusively for the cause of signals (or what signals represent). Signals have **effects** which are more or less predictable. Natural selection has produced signals, because the predictable consequences of signals were evolutionarily advantageous, initially for both the sender and for the receiver of the signal.
Signaling and also meaning evolved early in the history of living organisms. Signals were present (and meaning was present) long before humans and human language existed.
This chapter is a general discussion on signals. Human sentences are signals. So this discussion is relevant for the meaning of words and sentences.

7.2. Vocalizations in humans and animals. The origin of human language

"Language is a biological trait that radically changed the performance of one species and the appearance of the planet." (Nowak and Komarova 2001, p. 288)

Abstract

Monkeys and apes communicate with all kinds of sounds, and they react adequately to these signals. When apes have grown up with speaking humans, they can react appropriately to spoken, grammatically complex sentences. But they cannot themselves form complex sentences according to grammatical principles – not by sound, and not by symbol language.
From the contact sounds of apes, human language arose. In the evolution of man, the language- and speech-forming organs (including the brain) increased in *Homo habilis* and *Homo erectus* between 1.8 and 0.4 Mya. Thereafter, complex, well-thought-out messages could be transmitted by well-articulated speech. The most elegant scientific assumption is that this was a normal process of natural selection.
Human toddlers acquire human language in predictable successive phases. In separated phases, toddlers produce sounds, spoken words and spoken sentences. These phases are the product of various specialized development, learning, imitation and intelligent brain systems. These systems are to a large extent hereditary. Together they are the *language acquisition device* (LAD).

7.3. Magic sentences. Some illogical sentences are particularly effective

The best sentences are weird.

Abstract

In poetry, religion and love, sentences are particularly effective if there is something logically wrong with them. The best sentences are weird. Such sentences are illogical and thereby not testable. I call these 'magic sentences', because they have more impact than was expected from the meaning of the words and grammar – like magic spells. Most people appreciate such magic sentences. This is additional evidence for human preference for irrationality. Intelligent opponents can be bluffed away by magic sentences, since there is no rational response to magic sentences. In scientific discussions, it is important to identify 'magic sentences' and not to waste time trying to formulate rational reactions to such sentences.

8.1. The origin of religion.
1. The biological substructure

As the probability of a preferred, uncontrollable outcome becomes larger, animals and human become more easily superstitious.

Abstract

When children grow up in an environment without belief in ghosts or gods, there is little chance they will start to believe in ghosts or gods themselves. However, people easily start to believe in supernatural powers if others in their social environment do so. This is known as 'religiosity'. Religiosity consists of two elements: on the one hand mystical experience, and on the other hand devotion and obedience to 'higher powers'. This is characteristic for Eastern and Western spirituality, respectively. Religiosity is to a small to moderate degree heritable.
An appreciation for the mystical is closely connected to religion but also with other aspects of social life. Magic, mystical or humoristic language is relevant in human social life. The appreciation of special illogical sentences is probably a genetic acquirement – after development of language – that contributed to smooth group living, love, sense of humor, and inspiration for poems.

8.2. The origin of religion.
2. The social cultural superstructure: the Mighty-Ancestor Hypothesis

The Ghost theory *by Herbert Spencer (1876) to explain the origin of religion has unjustly fallen into oblivion.*

Abstract

How is it possible that, long ago, our far ancestors living in small communities started to believe in a life after death? I guess because they saw and heard their deceased beloved relatives in dreams, and sometimes in daily life. Gradually, our far ancestors developed the idea that ancestor ghosts not only existed, but could also provide advice and help, and that they rewarded good behavior, and punished bad behavior. Our far ancestors tried to appease the gods by good behavior, prayer, sacrifices and magic. The legends and myths about the ancestors became more and more fantastic; especially far ancestors were attributed more and more supernatural power.
The existence of a tribe could be jeopardized by a neighboring tribe. Leaders used their ancient 'powerful' ancestors to gain more authority themselves, to promote coherence within their tribe, and to recruit allies. The ancestors of the leaders gradually gained the status of gods. Nowadays, gods are the overvalued ghosts of the ancestors of leaders. This is an old theory by Herbert Spencer (1876), an agnostic, who repudiated traditional religion; his theory has unjustly fallen into oblivion. Belief in mighty ancestors contributed to group coherence, the acquisition of allies, and the winning of wars. This is called the Mighty-Ancestor Hypothesis for the origin and preservation of religion.
Several historical kings claimed that they were descended from the gods. This is the natural counterpart of the Mighty-Ancestor Hypothesis.

8.3. Man and other animals

Also animals have abstract intelligence.

Abstract

According to theologians and philosophers the large difference between man and animals is that man has a soul, self-consciousness and a free will. These are untestable claims, so I will not deal with them.
A general claim is that man distinguishes himself from animals by Reason. In general, humans are more intelligent than animals, but on some tasks, some animals perform better than humans.
The large difference between humans on the one hand, and chimpanzees and bonobos on the other hand is language, which emerged in two phases.

1. **Brain and language.** The brain weight of the ancestors of man increased by a factor 3 between 1.8 and 0.4 Mya. Then, our ancestors had developed enough understanding to produce grammatically complex sentences. Moreover, all speech organs had developed.
2. **Culture.** In chimpanzees and bonobos, cultural transmission of learned content is present. But only by grammatical language, complex, detailed messages could be transmitted since 0.4 Mya. Language enables analysis, reasoning and deliberation. Over generations, humans have accumulated knowledge and technical abilities. Quantitative differences are present between man and chimpanzee in communication systems, social learning and culture. But these quantitative differences have become so large that they now seem to be qualitative differences between chimpanzees and men, in behavior and way of life.

9. Conclusion

Writing a book is insightful.

What did I (= the writer) learn writing this book?

At the age of 14 years, I wanted to understand what type of creature man was. I did not write this book to express my thoughts, but to develop them. Now that I am 70 years, the book is as it is now.

		Chapter
1.	Facts are holy.	This life
2.	Not-testable statements hinder scientific progress.	This book
3.	The causal explanation of behavior is one of the goals of this book.	This book
4.	Heredity is relevant in human behavior.	This book
5.	The phobia for genetics of some psychologists and some anthropologists will disappear.	This book
6.	Limiting yourself to solvable problems prevents wasting time on problems that are endless from the outset.	1.
7.	After the separation of the lineage to *Homo sapiens* from other Hominids, other Hominids still contributed to the DNA of *Homo sapiens*.	2.1.
8.	All humans are products of admixture of various peoples.	2.2.
9.	People in Northwest Europe and North America who were born after 1970/1980, have in adulthood attained the maximum average height, and the maximum average IQ for their genetic potential.	2.3.
10.	Nothing in evolution makes sense except in the light of genetics.	3.1.
11.	"All men by nature desire to know." (Aristotle).	3.2.
12.	Humans and animals learn all sorts of connections, but selected and restricted by hereditary, specialized learning systems.	3.2.
13.	Normal development presupposes a normal environment.	3.3.
14.	The most basic personality traits of humans and animals are 'bold' or 'shy'.	3.4.
15.	Intelligent behavior can only be distinguished from instinctive behavior by experimental interventions.	3.5.
16.	People are intelligent but so are animals. In several tasks, some animals outperform human, on aspects that are evolutionarily advantageous for these animals.	3.5.
17.	The magical number seven is three.	3.5.
18.	In various situations, humans make choices that do not aim at maximum profit. Fast or kind behavior is often evolutionarily more advantageous than rational behavior.	3.6.
19.	The only consistent, testable, causal evolution models are gene-centric models.	4.1.
20.	In a welfare state and in public goods games, the number of free-riders might become too large; selective punishment can reduce free-riding behavior.	4.2.
21.	Testable analyses of social behavior are based upon the relations between the actors, and upon the effects of their actions, and not on egoism or altruism.	4.3.
22.	Human males and females easily fall in love, and easily become jealous; a predictable outcome is relative monogamy with secret adultery.	5,1.
23.	In chimpanzees and bonobos, males have a sexual preference for older females.	5.1.
24.	In humans, men have a sexual preference for young women.	5.1.
25.	The best partners for sexual reproduction are related, but not too close, and not too far.	5.2.
26.	Love is almost as old as life.	5.3.
27.	Ideological biases hinder an impartial view of human nature.	6.1.
28.	In favorable circumstances, most people behave kindly.	6.1.
29.	In various species, adult males or females kill infants or children that are not their own offspring. This behavior is evolutionarily advantageous for the perpetrator.	6.2.
30.	In humans and chimpanzees, small male groups periodically from time to time, but according to a fixed pattern, severely molest or kill isolated males from other communities. The attackers are rarely wounded.	6.2.

31.	In humans, again and again, large groups of armed men apply deadly violence to other large armed and unarmed groups: these are wars and massacres.	6.2.
32.	People prefer to be illogical or ignorant than traitors.	6.3.
33.	Previously, psychologists and anthropologists were taught that human nature is formed only by the environment (education and culture) and not by genetics.	6.3.
34.	Signals have emerged in evolution, because the coupling of causes and effects of these signals were evolutionarily advantageous for the sender and receiver. With the origin of signals, 'meaning' emerged in evolution for the first time.	7.1.
35.	The brain and special organs for spoken language evolved between 1.8 and 0.4 Mya.	7.2.
36.	Language is the major behavioral difference between man and apes.	3.5.,7.2.
37.	Children acquire language. That is a combination of heredity, learning, imitation, maturation, intelligence and creativity.	7.2.
38.	The best sentences are weird.	7.3.
39.	As the probability of a preferred, uncontrollable outcome becomes larger, animals and humans become more easily superstitious.	8.1.
40.	The *Ghost theory* by Herbert Spencer (1876) to explain the origin of religion has unjustly fallen into oblivion.	8.2.
41.	Gods are the overvalued ghosts of the ancestors of leaders.	8.2.
42.	Due to religion, leaders became better able to dominate their people.	8.2.
43.	Also animals have abstract intelligence.	8.3.
44.	By the strict separation of formal and empirical sciences, some obstinate problems can be really solved.	10.1.
45.	Detecting causal connections was so important in evolution that much superstitious behavior emerged.	10.2.
46.	Some problems that for good reasons seemed insolvable, have nevertheless been solved.	10.2.
47.	Some obstinate problems can be solved by real thinking.	6.1., 10.2.
48.	Causes and effects can only be discussed in testable terms in the world of things.	10.2.
49.	Whether and how neural processes can cause mental processes is called 'The Hard Problem', The Hard problem is insolvable, since there are no natural laws about mental events.	10.3.
50.	Causes of behavior differ fundamentally from reasons for behavior.	10.3.
51.	Not a single claim of *a priori* knowledge of man or other animals withstands criticism.	10.4.
52.	Animals have become closer to humans now that it has been demonstrated that many animals display intelligent behavior.	This book
53.	Humans have become closer to animals, now that is has been demonstrated that several properties of humans are partly hereditary.	This book
54.	You should never present more than 3 one-liners.	3.5.

10.1. Formal and empirical sciences – and daily life

By the strict separation of formal and empirical sciences,
some obstinate problems can be really solved.

Abstract

For clarity we distinguish:
1. formal sciences, such as mathematics and logics.
2. empirical sciences, as physics, chemistry, biology and empirical psychology.
The differences are that statements are tested differently, and that the state of knowledge is fundamentally different. Statements can be proven true in formal sciences, such that absolute certainty is possible within the system chosen. In empirical sciences, empirical affirmation is the highest attainable, such that only probability statements are possible. In empirical sciences, statements must be logical and consistent, but if prevalent mathematics and logics are insufficient, scientists use other types of mathematics, such as Riemann geometry, or another logic, such as quantum logic. In formal sciences, for instance, 'infinite' is a useful concept, but not in empirical sciences. When formal and empirical sciences are strictly separated, some stubborn philosophical problems suddenly disappear, such as the problem of induction, and various problems around causality.

10.2. Causalities

Detecting causal connections was so important in evolution
that much superstitious behavior emerged.

Abstract

In this chapter, I examine causal statements in various sciences. The variants are perception of causal connections, and causality in philosophy, in physics, in biology, in two variants of psychology, and in statistical models.
The brain works such that it interprets some selected successive events directly and automatically as 'causal' (so-called 'perception of causality'). The brain is evolved to detect causal connections fast. However, artificial intelligence shows that detecting causal connections requires a lot of information processing.
My starting point is a strict separation of formal and empirical sciences. In formal sciences such as mathematics and logics, a cause can be treated as the necessary and sufficient conditions for an event.
In empirical sciences, on the other hand, only probabilistic causal statements are possible. Causal connections must be empirically tested. Since my aim is to present empirically testable statements, I use causal concepts only for the world of things. Causes are states of concrete things, or events between concrete things. And effects are events between concrete things. Abstractions are not actors, and cannot be a cause. In physics, a causal explanation is deducing an event from the initial state of things, and the natural laws.
In biology, however, new concepts are relevant: 'functional' [2] and goal-oriented. A functional structure and functional activity of living organisms is a product of natural selection. Darwin's theory of evolution by natural selection was the first causal explanation for the origin of functionality in living nature. Goal-oriented actions are performed by animals or artificial devices; this is the consequence of feedback systems based upon cause-effect chains. Feedback systems in living nature are the product of natural selection. Norbert Wiener's cybernetics was the first causal explanation of goal-oriented actions of artificial devices.
I have formulated operational criteria to decide whether a state or event can be called 'a cause' in physics, biology and scientific medicine.
For some psychologists, psychology is a science of behavior. In this view, the same rules and limitations apply to psychology as to biology; here cause and effect apply, and testable statements are possible. For other psychologists, psychology is the science of mental life; here reasons, intentions and consciousness apply, while statements cannot be scientifically tested. A distinction must be made between events in the physical world (cause and effect) and mental events (reason and intention). For a clear deliberation, the concepts (and words) 'cause' and 'reason' must be strictly distinguished.
In statistical models, correlations between variables can be measured, but causal connections cannot be deduced from correlations. Causal connections can only be established from empirical investigations or from natural laws.

[2] A broadly accepted technical English translation of the German 'Zweckmässig', or the Dutch 'doelmatig' is not available. I propose the word 'functional', which is related to the biological concept of 'function'. The concept 'functional' is almost identical to either 'working properly' or 'evolutionarily advantageous' (Van Dongen and Van den Bercken 1981).

10.3. Brain and mind. Neural and mental events

Whether and how neural processes can cause mental processes is called the 'Hard Problem'. The Hard Problem is insoluble, since there are no natural laws about mental events.

Abstract

Brains perform myriads of processes, and people can be aware of only a tiny (neglectable) fraction of these processes.

Humans perform complicated actions, and sometimes they can be aware of what they do and why. But in patients with brain damage or other brain diseases, a bizarre relationship is found between what people do and what they experience. The reason people give for their behavior, is not always the real cause – not even when they are honest.
In discussions about brain and consciousness, a distinction must be made between events in the physical world and mental events. Experimental brain science demonstrates that the brain has taken the initiative for an action long before the actor is aware of his initiative for action.
In the discussion about the connection between brain and mind, various points of view are encountered. In this chapter, these viewpoints are briefly discussed. The strong and weak sides of the separate views will be mentioned. It is argued that no scientific causal explanation can be given for the connection between neural and mental events.

10.4. Claims of *a priori* knowledge

Not a single claim of a priori *knowledge of man or other animals withstands criticism.*

Abstract

According to some philosophers, humans are supposed to have knowledge that is not derived from sensory observation or reasoning; that is called *a priori* knowledge.
The starting points and decision rules of logic and mathematics are supposed to be *a priori*, but there are several variants of logic and mathematics. There is no compelling reason to consider one of these variants *a priori*. On the contrary, these systems of thought have been developed by geniuses, Other people can acquire this knowledge with effort.
Knowledge of object permanence, space, time and causality are regarded as *a priori* knowledge. It is hard to test this view empirically, since the laws of nature cannot be switched off. But magicians and mentalists cast doubt about object permanence and causality. That is why I think that also ideas of object permanence and causality are derived from observation.
After a comparison of moral systems of various peoples, it appears that over different cultures practically any moral system can be found, often favoring the rulers. This does not seem to be the expression of *a priori* knowledge of individuals.
Various aspects of behavior of humans or animals are hereditary, for instance:

1. approaching positive stimuli, and avoiding negative stimuli,
2. capacities (sensory, motor and intellectual),
3. stimulus-response connections (reflex or instinctive behavior),
4. behavioral preferences (attitude and personality),
5. hereditary, specialized learning systems,
6. hereditary irrational biases.

A lot is hereditary, but not substantive content; that is not knowledge in its common meaning. In my opinion, not a single claim of *a priori* knowledge of man or other animals withstands criticism. Natural selection has provided animals and man with hereditary learning systems, rather than with hereditary *a priori* content.