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The 'human behavior-complex' and the compulsion of communication: Key factors of human evolution

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A common agreement among the various sciences undertaking the task of the reconstruction of the major events of human evolution is that a strange new branch of apes appeared six or seven million years ago which through several intermediate species led to the modern *Homo Sapiens* (Mithen 1996). Quite a number of hypotheses have been born to explain the emergence of the *Homo* line. But a common weakness of these is the arbitrary selection of one major characteristic of humans, for example language or tool usage, as the only necessary and sufficient base of the evolution of all the human traits. No attempt has been made to analyze all of the important human traits as a behavior-system, which distinguishes us from animals and is responsible for the human phenomena. A modest attempt is presented here.

The human behavior complex

If we look at the major biological behavior characteristics of the modern *Homo Sapiens* living in group societies and compare these to the traits of our closest animal relatives then, besides the similarities, interesting differences are found. Species-specific behavioral traits of humans can be sorted into three main groups. First is the group of social behavior patterns, second is the group of various mechanisms of behavior-synchronization and the third one is the activities of construction.

These three groups of traits are not isolated. There are many human behavior patterns in which single traits influence and complement each other and act in an integrated framework. Therefore it is better to call them the 'human behavior-complex'. In the following list I present the components of the

complex without detailed discussion and next I deal with the possible evolutionary emergence of the complex.

Social traits connected to group life:

Social attraction, existence of closed and dense groups

Decreased and regulated internal aggression of the groups

Xenophobia

Food-sharing

Complementary type of cooperation

Multifunctionality of sexual life

Group loyalty

Group individuality

Behavior mechanisms for synchronization of group activities

Empathy: synchronization of emotions

Hypnability: governed behavior synchronization

Rhythm, singing and dancing: emotional and behavior synchronization

Imitation

Education, teaching and discipline

Rule-following

Constructive abilities:

Abstraction

Tool usage and tool making

Mimics

Language usage

The role of group density

The major challenge for the evolutionary theory is how could we explain the emergence of the species specific human behavioral traits by the various models of natural selection and is it possible to render a special sequence to the appearance of the various traits?

The first group of the behavior-complex formed around group life and refers to a particular common aspect of the various traits that is the link to group density. After the separation from the apes, members of the *Homo* lines were able and compelled to tolerate the continuous close presence of the other group members. This trait is only weakly present in our closest relative, the chimps, which live in small fission-fusion type groups but spend a considerable part of their time alone or together with their young (McGrew 1992). It would be difficult to guess the exact time of the significant increase of group density but it had to happen, probably already in the *habilines* and it increased more in the *erectines* and later in the *sapiens*. If, because of any reason, group density had increased then the necessary appearance of the other components of the human behavior complex could be inferred on the basis of ethological considerations.

The size of the bands of the group societies during the early phase of cultural evolution is estimated to be 30-50 (Dunbar 1996). These groups can be characterized by intensive face to face social relations. Members of these groups intimately know each other. They have direct, personal experiences about the personality and behavior of the fellow members in different situations. It is also known that the primary groups were settled at least for part of the year. Settlement and high group density are rendered under several behavioral conditions and they have important consequences.

The first and most important condition is that high group density can be formed if and only if the intra-group aggression is lowered considerably because high level of aggression disperse the group. Our *Homo* ancestors had to tolerate the physical closeness and they had to eliminate most of the sources of conflicts that lead to aggression. The most important ones are the aggression connected to food distribution and sex.

In difference from his relatives man is willing to share his food. Of course, ape mothers also share their food with their young and food sharing occurs sometimes between male and female dyads but the human type of frequent food sharing, involving not only relatives is a species-specific biological trait.

Our species, similarly to the most developed social carnivores, is able to acquire and share food in common cooperative actions. Food sharing could be compelled by the rarity of food near the settlement of larger groups. If larger

group must be provided for, division of labor is necessary and not everybody must equally contribute to food gathering or hunting.

Cooperation or some other form of common group activity can be observed among the highly social species. But in these cases the cooperation is mostly genetically determined and learning only modifies the patterns of inborn cooperative tendencies. Animal cooperation is always a parallel activity, that is, all individuals want to perform the same basic action, but if they are together they can tolerate the contribution of each other and perform tasks according to their positions in the given situation. Human cooperation is always complementary type (Reynolds 1993). This means that the task is decomposed hierarchically to smaller parts, roles, plans and alternatives are prepared before the action and the members of the group assign these to each other. Therefore human activity serves a predetermined common goal. Another condition of the formation of high-density groups is the decrease of the sexual rivalry among males because if it remains high then the frequent conflicts break up the group and makes the division of labor impossible. This problem has been solved by the decrease of the polygamous tendencies of our relatives and with the emergence of monogamy and pair bonding.

Human groups are characterized by an entirely new property: loyalty. Relations of animals to their groups are characterized by their relations to individual group members. According to our knowledge animal minds are not able to recognize their groups as an entity independently from their members. The ability of the human mind to make abstractions made this possible. Human groups appear as autonomous abstract entities, independent social constructions to their members (Csányi 1989a). Human groups are individual entities, their languages, customs, traditions distinguish them.

The basis of the second group of the new characters, which exist also only in man, is quite a few mechanisms serving the synchronization of the activity of group members. Such is the ability to imitate. That property of man that he is willing to copy behavior patterns observed without any reward or a goal which very seldom occurs in its pure form in the animal kingdom. In most of the cases imitation is not conscious. Usually, copying is not exact, but concerns some parts of a complex behavior form or just taking a few characteristic elements from it. Imitation exists in all human cultures.

Susceptibility to hypnosis also belongs to this group, enabling control of one another by means of a close emotional bond and, according to recent findings, this is not a unidirectional communicational channel but a bilateral one. Studying both the hypnotists and the subjects, Bányai (1985) found that sudden deepening of hypnosis occurred after a number of phenomena, which was called comprehensive interactional synchrony (CIS). CIS appeared either in overt movements (like joint movements of the limbs when the subject performed motor suggestions) and postures (e.g. posture mirroring) or in some covert processes (like breathing and myographic activity). These movements were involuntary and out of awareness. The most important aspect of this study is that the 'control' is not a one way process directed from the hypnotist to the subject, but there is a mutual interaction in which both the hypnotist and subject participate by concerting their cognitive and emotional experiences (Bányai 1992). The question also could arise whether there is an adaptive value of the special human trait of hypnotic susceptibility and if there is then what is its basis. In my opinion, hypnotic susceptibility might have evolved as a mechanism for concerting actions of cooperating individuals. It has been a tool to synchronize brain models by non-linguistic means for hominid groups and in that way promote cooperation for a given complex task.

Well-founded hypotheses exist which suggest the appearance of biological communication mechanisms enabling the synchronization and planning of group actions well before the advent of language. An example is mimetics, the enhanced ability of the human face to communicate (Hjortsjö 1969, Ekman 1973), comprising some 250-300 different possible messages and exceeding the communication ability of animals by about a factor of 10. In addition, an extension is the ability of humans to judge intention and emotional state of conspecifics based on the sub-linguistic characteristics of human vocalization like intonation, melody and rhythm of speech (Eibl-Eibesfeldt 1989). Another such mechanism peculiar to humans is the empathetic ability, which enables man to sense the motivational state of his mates.

Out of these forms of emotional communication grows the making of rhythmic noises, chanting and primitive music, rhythmic movements, dances and rites. All these help closely synchronize the emotional and mental states of individuals in the group, facilitating the emergence of a unified will and its

coherent execution. They fulfill the role of a primitive form of language, denoting and differentiating objects and concepts, as well as synchronizing actions and defining individual roles.

A very important mechanism for synchronization of group behavior is the rule-following behavior of man. Our species is attracted by group norms, verbal or written rules at every level of social existence. At the simplest level rule following is a behavior tool for minimizing conflicts. To achieve such effect we do not need formulated rules. Rule following is closely connected to the rank order of the group. The ethological ability of man to form and keep a rank order is transformed to a new organizational level by rule following. Positions in human groups correspond to personal physical power only in the most primitive ones. Groups, which have culture and language, have behavior rules to define higher positions. A leader of a group or tribe usually does not have to fight physically for his position because the ideas connected to leadership embody rules, which control acquiring, and maintenance of the various positions.

It is important to recognize an other connection between rank order and rule following. If animals standing face to face than the dominant one takes its share or fulfils its will. Takes food, female, sleeping place etc. we may call this brutal dominance. When a man follows a rule he is obeying to a depersonalized dominance. We call it as rule dominance. The dominant individual is substituted with a socially accepted rule and the submissive person performs the order embodied in the rule. The source of the command in the various social ideas is frequently personalized by the ancestors, or gods, but for the average man it is convincing if something 'must be done' in a certain way.

Obedience can easily be achieved by just mentioning that rules exist.

Construction and the compulsion of communication

In the third group of the new characters belong such seemingly different ones as language using, tool making and using, and abstract thought. Nevertheless, all of these can be inferred from a special kind of constructive ability, which exist in the animal kingdom only in the most proto forms. This ability is expressed in that man's brain is able to reduce a situation through his senses to its components to analyze it and after the analysis to construct new structures, new wholes. With the help of construction man is able to displace

phenomena in space and time, change relationships, recognize causal relations and designing new ones. Construction ability is appearing in abstract thinking, language using, and making of artifacts, in behavior and even in forming the social structure of the group. With the help of construction man creates linguistic models of his environment and of his group. Operates and analyzes them as well (Csányi 1992a and 1992b). Larger part of rules controlling the activity of human groups exists only in linguistic models; they can be formulated only in them. The humanization of the *Homo* groups can not be separated from the evolution of language.

Tool- and artifact-making are an other expression of the construction ability. Some of the animals are also attracted to objects and primitive forms of tool using are also occurring (Macgrew 1996), but these are rare. Although there is no known human culture without the use of some artifacts. Man attraction to objects is biologically determined (Morris 1963). Anthropological hypotheses suggest a definitive and direct correspondence between tool-making, tool-using and man's use of language (Hewes 1971). Artifacts, language, abstract thoughts and rule systems are parts of an unseparable system. Language as a rule system and form of thoughts describing objects is a good example.

Constructive ability also has a communicative function, its role can be evaluated only if its relation to animal communication is clarified. According to the ethological definition 'communication is an action of an animal which changes the probability distribution of the behavior pattern of a conspecific in a way that is adaptive for the first or both'. There is no message, sign, understanding or meaning in this definition, which are the concepts one thinks of when communication is considered. Unfortunately these concepts originated from the highly developed human communication forms, language in the first place and they are only metaphors as components of explanatory models in ethology.

If we say a courting peacock gives a love message to its hen by its courting, this is not true at all. It is only a reference to a similar behavior, which we know well in the case of ourselves. Courting behavior is a physiological phenomena which can be activated by every hen in the mating season and we call it "courting" just because we also have a behavior similar in function.

Animal communication, because it is called such, is a group of controlling mechanisms which allows the recognition of individuals, controls aggression and sex, it helps to maintain contact and avoid predators etc. All of these functions are provided without conscious intention.

True communication appeared in man with sender and receiver, message and meaning. It appears as the transfer of a conceptual construction from one to an other mind. The primary force helping the emergence of this new property could be the density increase of the early Homo groups. Living together in continuous face to face situations, they needed not only regulatory mechanisms concerning aggression and sex or signaling danger but tools for receiving information about the intentions, and even about the fine details of the mental states of their group mates. This urge, which can be called 'compulsion to communicate', helped to concert the actions of individuals in the interests of the whole group.

True communication occurs only if intentionality, and in the case of man this is so, is clearly contributing. That is the wish of the sender to influence the mental state of the receiver and the receiver intention to listen to the sender. Intentional communication has not started with man of course. Its primitive occasions can be found among animals. When chimps stretch their hands to the direction of a provider or to a dominant one, they are requesting. Here the joint attention and recognition of the intention are already appearing. Behavior patterns gain true communicative functions if they appear in the representation or models of the environment of the brain as components. This relationship is recognized in the concept of correspondence (Csányi and Kampis 1988). If a component of the brain's model of the sender, a signal, transferred into the model of the brain of the receiver without changing its function then the correspondence between the two models is 100%. If the signal influences the receiver model only as an environmental event and the receiver's brain makes a representation of it and gives it a new function in its own model then there is no any correspondence between the two models. Between 0% and 100% any value of the correspondence can occur. Therefore, we can estimate the measure of correspondence. For example: ants in a dangerous situation release a danger signaling pheromone. This act also influences their own internal state and start to initiate various escape or fighting

behavior components depending on the concentration of the pheromone. The effect of the released pheromone is the same on the nearby conspecifics; it induces the same escape or fighting patterns. The correspondence between the brain's models of two ants is 100%. In case of inherited signals, the mechanism is usually similar. This type of communication was called type I communication. In an other example, a master teaches his dog to obey to the signal 'sit". In this case, the correspondence between the models of the dog and man is low. For the man "to sit" is an abstract concept, which originally has a very weak connection with this particular dog if only that it is an animal, which can also sit. For the dog, the sit vocalization at first is a nonsense but during the training, it learned that it has to sit because of the reward or punishment. His brain constructed a new model version of the environment in which the vocalization 'sit' as the key for reward joins to the representation of its master and with its own sitting behavior. If appropriate keys are given, animals merely perform the learned instructions. At the beginning of the training, the level of correspondence was 0 and somewhat increased during it and its exact measure is difficult to determine. Communication of such form was called type II communication. Among animals, both are available.

The process in which a component of a communicative system acquires a new function is the same as the process of interpretation in the theory of human communication. It is also clear what is the message, an other frequently used concept in this framework. The message is the function of the signal in the brain's model of the sender. But the model making of the brain is a very complex dynamic process therefore it is possible that a particular component may have more than one functions. The function depends on the part of the model in which the function is performed. This is the context of the message, which influences the interpretation.

The song of a male tit is very attractive for a female and it is the introductory part of the courtship but the same song is repulsive for a male competitor and is connected to aggression and territoriality. For a predator the tit song also attractive because it signals a prey. It could be entirely neutral as a background noise without any information value for an other uninterested species.

From the concept of correspondence it is obvious that true

communication could be based only on learning processes because the environmental model of the animal brain can be changed only by learned components.

To go back to our ancestors, for them, the evolution of communication principally is the continuous increase of correspondence among them. Therefore any mechanism, which is available for an ape organism to increase its correspondence, is also suitable as a tool for true communication and these also started to change for better communication.

Such mechanisms are well known. The human face is able to communicate 150-200 different messages, more precisely to express this number of different internal states (Wilson 1975). This is an outstanding ability among the higher animals because they can use only 10-40 behavior patterns of the whole body for such purpose. The human face is able to express emotional states: joy, surprise, fear, sorrow, shame, distaste etc. (Ekman and Friesen 1975). The tone, pitch, intonation also carry emotional information; fear, wonder, anxiety, irony, erotica, resignation could be inferred from them (Sedlacek and Synchrona 1963).

Expression of emotions seems to be rather universal even if certain forms are suppressed in certain cultures. Concerning the social function of the expression of emotions it is possible that they serve to signal the motivation behind them. Expression of an emotion could be a very important predictor for the action of the sender in the next moment. Therefore contribution in common actions or the refusal of it could be important information of the emotional communication (Fridlund 1994). These fine expressive acts only have a function in the case of a species in which the individuals are constantly monitoring the mind states of their conspecifics. The human race is such a species. A large part of our everyday activity concerns the observations of the others or being in the center of attention. For humans it is extremely important to know what the others are thinking, planning, and dreaming.

Communication with the whole body

Besides expressing emotions, using our motor system to communicate, that is using mimetics might be the most important tool for early communication

(Donald 1991). This ability of us is based on imitation, but in the appropriate context mimics can communicate rather complex thoughts. According to Donald, the brain of apes uses an 'episodic' kind of representation and their brains are unable to 're-represent' information free of modality and context. Everything is bound to the direct experiences. He thinks even the *habilines* could not do better in the *Homo* lineage. But the more complex tools, bigger brains and larger groups of the *erectines* suggest that a new brain mechanism emerged which was able to make secondary representations and mimetics. Donald calls the culture of erectines 'mimetics cultures'.

We can add to these that before mimetics appeared human specific forms of social attraction and group bonding must have preceded because only these evoked compulsion to communicate. For mimetics a conscious self-induced representation in the brain is necessary which is not linguistic yet but intentional, communicative in nature. Joining representation and communication is the essence of this new trait. A mimic tries to imitate a characteristic feature of the imitated animal or group mate in order to communicate. He makes a new representation in the brain, whose sole function is communication. Mimics could embody many actions and modalities: voice, tone, face expressions (this is the function of emotional expressions), movements of the eyes, movement of hands and feet and the positions of the whole body. The mimic communicates not only a concrete object or person or an event but also a story. The story is not a signal which one can understand, and then choose to ignore it or not. The story is occurring in time, someone does something to somebody. The units of the story have meaning only in relation to the whole event. The story must be interpreted and we have to be involved in it with our emotions and empathy. Mimetics play is very important even nowadays; it is the source of the arts.

During mimetics the played and perceived act is not the same with the one it represents therefore it is necessary to separate reality and symbols in the interpretation. This separation is the first step to abstraction. A mimetic act can be enjoyed and played again several times. During the repetitions the component actions can be simplified, they might become communicative signals, parts of rituals or everyday communication. Parts, which broke the heart perhaps, transferred to an other play and remain in the memory of the

group as symbols of important events; death, birth, grief or joy. These properties of mimetic skill can lead to high differentiation among the groups. The mimetic symbols can evolve separately in each group. Mimetic cultures start to isolate themselves in this way which further enhances the effects of group selection. With mimetic skill, a communication system emerges which has an almost infinite component pool and its usage needs a construction ability to create the complex stories from the components. Nevertheless there is no syntax in it unless we regard the dramaturgy of the stories as such. For mimetics the personal construction is necessary but to be understood the interpretation of the whole group is also needed. The mime can be understood only within the framework of the collective group model made by the continuous mimetic acts. Only those parts of emotions, ideas can be communicated which are overlapping with group mates. Other group members could join to the mime play and roles can be formed in this way. They may play the events of the last lucky hunting for their enjoyment and a common communicative act created the rite and theater of course, all of which based upon the common model and understanding.

There is a very important phenomenon, which emerged during the evolution of mimetic communication: doubling the association networks in the brain, which gain further importance in the usage of spoken language.

Representations can be divided into two large categories in the brain of the carrier of a mimetic culture. In the first category all of the primary or personal representation is sorted including those, which are secondary representations for personal use only. These are the same by and large as those used by an ape. But the carrier of a mimetic culture possesses representations, which appeared during group communications. Those memories when he understood something from somebody's mime or his own mime was understood by the group. These representations must be separated also because they are repeated frequently during communication otherwise if anybody starts to think to communicate something he has to look at this category first for finding out the easiest way to communicate his thoughts. In this we can see the starting of the separation of the domains of the personal and the cultural in human life.

Most probably the personal domain was the larger in the mimetic cultures and the domain of the common understanding considerably less for a long time.

From this two domains of representations the common will be called 'global' and the personal will be called 'local'. The transfer between the two domains is not simple. Someone may think of communicating something, which is known only by himself. This primary knowledge can be represented very richly but when transferred to the global domain by mime its richness disappears, but those parts, which were transferred, are multiplied.

The separation of the global domain from the local concerns the problem of meaning. If someone says 'understood' what does it mean in the epoch of mimetics? At first it is clear the meaning emerged when representations were created in the global domain. Someone just perform a mimetic act and a bystander tries to figure out what it is about and when succeeds, gets the representation a meaning.

Because stories are communicated during mimetics, meaning is the sum of actions, which can be performed or imagined on the base of the global domain.

Global representations of a well-developed mimetic culture embody the sum of the meaningful actions. Those, which cannot be classified as such, simply have no meaning. Groups will be highly different according to the actions available in the global representations. Such variability is the strong base of group selection. The set of the global representation is not closed. If correspondence could increase, it will increase the pool of actions. Individuals with their own local representations could contribute to the growing of the global ones if they try to communicate. The urge to communicate in this way also has a selective potential in human evolution.

It is important to remark that both global and local representations can be regarded as an associative network in the brain because the meaningful components have connections with each other. The larger the network the more easy it is to increase it and create new meaning in it. The network of the meaningful representations is a group construction, which is a continuously growing open system.

Spoken language

After a considerable time mimetic communication has changed to spoken language and this time is estimated anywhere in a long range between fifty thousand and two million years by various scholars. The communicative

function of language is considerably increased compared to mimics. It is not only information exchange concerning emotional states, events already happened but an appropriate medium for exchange of thought representations concerning external environment and internal states, which is able to present past, future, intention, plan, imagination and alternatives of actions in an information system which is open and theoretically infinite. It is suitable for construction. It is appropriate for reconstructing reality, using components of linguistic representation of actions and actors, objects and events of the environment including the group itself, which use it. In this way an abstract, virtual reality emerge in which properties of the components - be it objects, persons or organisms, real or imagined or the relations among them - will be provided by the mind of the user of the language. This is the highest form of the constructive ability of man.

Finally we have to highlight some consequences of the interactions of the above mentioned character groups. The closed and dense group structure, the ability to synchronize and the activity of construction made a closed feedback loop. Constructive activity of a closed group is directed mainly to the group itself. This effect will be multiplied by the mechanisms of synchronization and preserved and stabilized by group loyalty and its related characteristics.

Therefore the group constructs itself!

There are many consequences of this. First is the formation of different rule systems, norms and languages in different groups. In the same way as children extract the rules of linguistic environment (of which the linguists' grammar is only a scientific model) a member of the group culture is able to recognize a rule system from the interactions of his fellow members and he follows it because of the other social characters and in this way also reinforce it. Language, kinship systems, rites but even everyday practices appeared and became fixed in the culture as a result and contribute to the group individuality that was already mentioned (Csányi 1991).

The group as 'superorganism'

If we look at the human behavior complex, the hypothesis that human groups entered into a new level of organization in the early phase of cultural evolution seems to be well founded. Structure and activity of such groups can

be understood if we suppose that a special kind of social fusion occurred which originated a new entity, a group being, a superorganism. Further phases of the cultural evolution occurred by the selection among group beings.

If we examine the components of the human behavior complex that appeared at the end of this early evolutionary process and evaluate them regarding the relation of the individual and the group, five basic changes can be found:

1. The emergence of common, global ideas.

Man accepts, and wishes the identity of his group. Believes the global ideas of his group: in a religion, in a myth, an ideology or a culture expressing an identity without criticism. This change is the appearance of morality.

2. Performing common actions.

The second change is that man is able to perform common actions with his group mates. He is capable of complementary cooperation of high order in the framework of the global representations.

3. Making common constructions

This third change is an organic supplement of the first two: ideas and artifacts are constructed. The global ideas and actions continuously analyzed at local level by personal, emotional and rational tools. The result of this analysis is a continuous feed back to the global level. In this way the individual is the maker and endurer of the social reality of his group.

4. Loyalty appears

The fourth change is that unlike animals, man is loyal to his group and is willing to perform actions, which are not in his personal or genetic interests. He is willing to sacrifice himself for the group.

5. Transformation into superorganism

The first four changes make the fifth possible. Transformation is the appearance of the new entity: the autonomous superorganism.

This fifth change represents the interaction of the components of the human behavior complex, basically a system-organizing ability of humans.

Human beings can easily be organized. They can form an active, goal oriented, responsible group as sect, religion, party, fighter commando, school,

theatre, factory, state because they have a biologically determined system-organizing ability.

People are able to choose a group and if it is chosen they accept its organization, and global ideas and they are willing to cooperate in the interests of the group, sacrificing their own. We can find these characters behind every human organization. Not only behind tribes, states, firms or political organizations but also in the every day life of families, in cases of pair forming and in friendships. Based upon the studies of primitive religions Durkheim (1961) found four organizational principles: common actions, common morality, self-sacrifice and transformation which is the fifth one in this study. His students analyzed friendship, based on one of Durkheim's own as an example (Wallace and Hartley 1988), and found Durkheim's four principles to be valid.

The biologically based human behavior complex provided five principles from which four are the same as Durkheim's four found on cultural bases.

Conclusions

'Human behavior-complex' is the set of characters which are the most important species-specific properties of *Homo sapiens*. These characteristic biological changes appeared during human evolution as a consequence of the compulsion of communication because of the increased group density. Human communication is both the product and initiator of the human evolution. Its origin can successfully be studied only in this double nature.

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