

Joseph Jordania:
Essays on Evolution of Music, Future of Education,
Human Morphology and Behavior

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Essay One

This is an excerpt from the Chapter 3 of the book *Who Asked the First Question? The Origins of Choral Singing, Intelligence, Language and Speech*, 2006, Tbilisi State University Press

On Questions, or Interrogo Ergo Cogito

Let me ask a few very simple and very straight questions about the ability of asking questions that I am going to discuss in the following few pages:

Why do we ask questions?

What evolutionary advantage could the ability of asking questions have given to human individuals?

What evolutionary advantage could the ability of asking questions have given to human groups?

Who asked the first question?

Is asking questions a uniquely human ability or do we share this ability with a few other species, at least with the African apes?

Where did the phenomenon of questioning come from – are there any evolutionary prerequisites for questioning behavior?

Who could answer the first question when it was asked?

Is the question one of the higher functions of syntactic structures?

Is there a genetic component for questioning behavior?

Do we learn to ask questions? And if “yes,” how do we learn to ask questions?

These and a few other topics are discussed on the following pages. So let us proceed.

Why do we ask questions?

This is one of the easy questions to answer, and I was wondering whether I need to discuss this question at all, but then decided that we need to recall to ourselves how important questioning behavior is in our lives. We ask questions for lots of different social and scholarly purposes, generally to find out something that we do not know and we think others might know. Of course, we may sometimes ask questions to check whether others know the answer, but mostly we ask questions when we want to gain

some knowledge about totally different things, such as the social plans of our teenage children for the coming weekend, the result of the soccer game that finished in the early morning hours, or the name of the first composer to use polytonality. According to the information requested in our questions, we may ask members of our family, call our friend, go to the Wikipedia. Throughout our life we ask questions. We ask our first questions even before we can articulate what we want to ask, we start every scientific query formulating questions to which we want to find answers, we support everyday communications asking questions, we have huge libraries and a staggering amount of available information because people were constantly asking different questions and were looking for the answers. Sometimes a question raised in the 16th century was answered in the 20th century; and some of the oldest questions have not been answered yet; we even have a talent to answer questions with other questions (I remember a clever “Jewish” joke: “Tell me, please, why you Jews always answer questions with questions?” – “So, do you think this is bad?”).

I hope everyone would agree that it is impossible to imagine human society, human intelligence and language without our ability to ask questions. **Without our ability to ask questions our brain would be a closed system, limited by the knowledge of our immediate experience.**

What evolutionary advantage could the ability of asking questions have given to humans?

If the reader can imagine two individuals, one of whom is able to ask questions, and another one who for some reason does not have this ability, the intellectual and social advantages of the “questioning” individual will be obvious. A questioning individual can solve problems more easily, can easily access and use the knowledge of other members of society, and can better manipulate people and information to her/his own advantage. Even without asking questions of other members, just being able to formulate questions in her/his own mind would help tremendously in finding the right strategies to achieve different short-range and long-range goals. Human reasoning must have started with the emergence of the ability to ask questions.

Readers might object that this comparison is artificial, because there are no humans who cannot ask questions. First of all, there are some rare cases when for some reason humans are not able to ask questions (and we will discuss such cases soon), but most importantly, let us not forget that we are not discussing our contemporary society only. We are trying to discuss the evolution of language and the mental abilities of our distant ancestors. So the question about two individuals, one of whom is able to ask questions and the other who is unable to ask questions, must be understood in the context of hominid and human evolution: what advantage would the first “questioning

hominid” have when the ability of asking questions emerged at some point in human or hominid prehistory? The advantages seem to me so obvious and so important that I think it would be fitting to declare that **with the emergence of questioning behavior the evolution of our mental abilities made a crucial turn towards human intelligence.**

Maybe the most important consequence for each “questioning” individual is that the emergence of the question phenomenon turned the hominid brain into an **open, self-developing system**. We self-develop cognitively by asking questions and looking for the answers. A child develops by asking an array of questions, and the “runaway brain” evolution (Wills, 1993) begins with questions -- both in phylogeny and ontogeny.

What evolutionary advantage could the ability of asking questions have given to human groups?

Although we have just discussed the advantages that the new ability to ask questions would give to the first human, the true winner of the new ability of asking questions must have been the whole group, the first human society. This advantage must have been particularly obvious when the whole group had the mental ability to ask questions.

If you imagine two groups of humans or hominids, one asking questions of each other within the group, and the other group members unable to ask questions of each other, the difference will be so obvious and big that it would be correct to speak in the first case about group of humans, and in the second case about hominids, or pre-humans. The ability of asking questions drastically changes the intellectual capacity and behavior of the group.

The evolutionary significance of the ability to ask questions first of all was a revolutionary enhancement of the cognitive ability of a whole group of individuals, by **coordinating** their cognitive abilities. Suddenly the members of the first human society started asking each other questions, more actively sharing information and discussing problems. With the appearance of the ability to ask questions the **hominid communication** of exchanging information turned into a **human dialogical communication**. This new ability to formulate and ask questions created a totally new phenomenon -- **group cognition** and **mental cooperation**. The unique human ability of mental cooperation pushed our ancestors on to a completely new stage of cognitive development, previously unknown to the animal kingdom. Therefore, the importance of the new ability to ask questions was not only an increased cognitive ability of *each* hominid individual, but also a **revolutionary new level of group cognition and mental cooperation**. We can conclude that, with the emergence of the ability of asking

questions, each member of our ancestors' society became smarter, but the combination of these smart individuals, put together as a discussing group, was much bigger than the simple sum of several smart individuals. I suggest that **our ancestors passed a cognitive threshold after they started asking questions.**

With the emergence of the ability to ask questions human language gained the last of three main language functions - declarations, commands, and questions (about these three functions of language see de Laguna, 1963 [1927]). G. Revesz wrote about three functions of language as well: imperative, indicative, and interrogative (Revesz, 1956).

We can look at the entire evolution of the human species and the development of human society and civilization from the point of view of an exchange of information and the means available in a society. We could distinguish several milestones in the evolution of the exchange of human information. The **ability to ask questions** was the first and truly revolutionary change in this chain of technologies to exchange information via direct communication. Human dialogical language, intelligence, mental cooperation and a self-developing brain emerged together with the ability to ask questions. We can even say that all the following revolutionary changes in information exchange were just the technical means of enhancing our ability and desire to exchange information. After this we never stopped inventing different ways of asking each other questions. So we started asking questions using **speech** (do not forget – we started asking questions before the advance of articulated speech!), later – **written language**, handwritten and published **books, telephone, radio, TV** and the **Internet**. Throughout our history as a species we have been asking questions of each other, of other generations, and even of people from different countries and continents we will never know, apart from a small moment of shared human behavior when we asked for the information that we needed and they knew the answer.

So, who asked the First Question?

Here we are, answering the question of questions, posed in the title of the book. It is a pity we will never know the name of the first individual who asked the First Question to mark the turning point in the long process of human evolution, but there is another quite precise way to answer this question:

The first question was asked by the first human being, the first *Homo sapiens*.

It does not matter whether it was a woman or man. What matters is the huge advantage and the instant gratification that the ability of asking questions would give to the first questioning human being. Most likely this was a result of genetic mutation, although the development of the ape and then hominid mental ability was heading

towards this crucial point, so the appearance of the “questioning gene” must have been a relatively smooth transaction. Hominid group-based survival strategy on the ground, everyday noisy co-operational activity, an increased load of communication and more complex social politics within the larger groups was leading towards this revolutionary change in communication and information-sharing. The advantage that the first questioning human gained from this new ability must have been so big that with every new generation the number of questioning humans (transmitted genetically from the first human individual) must have increased like a bushfire.

Was the ability to ask questions initially used in everyday referential communication (which grew from the “vocal grooming” (Aiello and Dunbar, 1993; Dunbar, 1996; Whiten and Byrne 1988) or the “contact calls,” or in ritual singing with possibly a referential text? I have already mentioned (in chapters 1 and 2) the fact well known to ethnomusicologists that responsorial singing is one of the strongest universals in human singing traditions. I propose that **hominid responsorial singing (through the question intonation) together with increasingly complex social interactions in hominid groups were the main factors that prepared the way for the emergence of the human ability to ask questions.** And as soon as the new ability of asking questions emerged with the first human being, it must have been used in both responsorial choral singing (a human soloist asking questions and the hominid choir responding together with the stereotypical answer), and everyday referential communications.

At the end of this small section let me employ good old Latin in a symbolic way.

“Cogito Ergo Sum” – “I am thinking, therefore I exist” – these famous words are attributed to Rene Descartes (they were initially written in French and only later were translated into Latin). In the light of the evolutionary importance of human questioning behavior I suggest another similar saying, with obvious evolutionarily implications: **“Interrogo Ergo Cogito” – “I ask questions, therefore I think.”** (Jordania, 2005).

Is asking questions a uniquely human ability or do we share this ability with a few other species?

This is the most difficult, controversial, interesting, and possibly the most important “question about questions.” If apes do not ask questions (or in other words: do not have the mental ability to ask questions), we may be able to claim that the ability to ask questions is a mental ability that only humans possess, an ability that gave humans the edge to be a specific member of the animal kingdom. I hope the few following pages might generate a discussion on this subject among experts of primate communication.

The idea of the uniqueness of human language has been seriously challenged during the last few decades. Fascinating results of studies, teaching ASL and other non-vocal forms of languages to the apes (Gardner, Gardner, 1969, 1975; Premack, 1976; Premack, Premack, 1983; Terrace, 1980; Patterson, Linden, 1981; Savage-Rumbaugh, 1986; Rumbaugh et al. 1994), as well as the wonderful body of studies of vervet monkeys' alarm calls (Struhsaker, 1967; Cheney, Seyfarth, 1990) proved that we are much closer to our closest living relatives through our linguistic and cognitive capacities than we could have imagined earlier. Virtually all the design features of human language formulated by scholars half a century ago (Hockett, 1959, Hockett, Archer, 1964) – displacement, duality of patterning, traditional transmission, openness, arbitrariness, productivity, were found in the animal kingdom as well (and some of them not only among the apes). Discussions continue, and the opponents of the continuity theory (the foremost being linguists) often dismiss all the achievements of primates.

Whether apes could ask questions was an important problem in the 1970s and the 1980s. Unfortunately, the ability to ask questions was assessed **only in the context of the primates' ability to form a syntactic structure**. Maybe that's the reason why this discussion was never perceived as a potentially crucial point of difference between the apes' and humans' mental abilities. The 1970s and 1980s was a booming period for language experiments when our non-talking relatives suddenly started communicating with us using sign language and other non-vocal means of communication.

The experiments produced impressive results. Scholars discovered that apes could recognize themselves in the mirror as individuals, they could invent new symbols using the signals they already knew, and according to some authors they not only had some elements of syntax and metalanguage, but were able "to acquire concepts and generate hypotheses and strategies" (Rumbaugh et al. 1994:321). The achievements of the bonobos were particularly impressive. These achievements lead the head of the experiments, Sue Savage-Rumbaugh, to declare: "...apes possess the cognitive capacities for language but lack the proper organ of expression" (Savage-Rumbaugh et al., 1993:109), and "Kanzi's ability to understand human speech suggests that, if apes could produce human-like sounds, they might well invent and utilize a language that would be similar to our own, although probably considerably simpler" (Savage-Rumbaugh et al., 1993:107).

Regarding questions, it has been documented for a few decades already that the vocabulary of the acculturated apes contains question words as well, like "Who", "What", "Where" in Washoe's and Nim's vocabulary (Bronowski & Bellugi, 1980:110; Terrace, 1980:11, 167). So, it seems almost obvious that apes must be able to ask questions.

Nevertheless, according to the accounts of the experiment authors, apes do not ask questions. Wonderful examples of conversations with their human teachers have been recorded and published (Terrace, 1980; Gardner & Gardner, 1975, 1984; Premack, 1976; Rumbaugh, 1977; Rumbaugh & Gill, 1977; Patterson & Linden, 1981). Analysis of their conversations shows that in human-primate conversations **questions are asked by the humans only**. The same can be said about the question words: **apes understand them and give appropriate responses, but amazingly they themselves do not use question words in conversations with their human teachers**.

Describing Nim's ability to be engaged in conversations on many topics, Terrace notes: "...His teachers would ask him questions such as What color?, What name of?, Who?, ... Nim showed his comprehension by making an appropriate response... As his ability to sign improved, Nim began to reply to his teacher's questions with more than one sign" (Terrace, 1980: 166-167). But the ability to ask questions proved to be much more difficult.

Ann and David Premacks designed a potentially promising methodology to teach apes to ask questions in the 1970s: "In principal interrogations can be taught either by removing an element from a familiar situation in the animal's world or by removing the element from a language that maps the animal's world. It is probable that one can induce questions by purposefully removing key elements from a familiar situation. Suppose a chimpanzee received its daily ration of food at a specific time and place, and then one day the food was not there. A chimpanzee trained in the interrogatives might inquire 'Where is my food?' or, in Sarah's case 'My food is ?' Sarah was never put in a situation that might induce such interrogation because for our purposes it was easier to teach Sarah to answer questions" (Premack & Premack, 1991 [1972]:20-21).

More than a decade later after writing these promising words of how to teach apes to ask questions, Premacks wrote: "Though she [Sarah] understood the question, she did not herself ask any questions -- unlike the child who asks interminable questions, such as What that? Who making noise? When Daddy come home? Me go Granny's house? Where puppy? Sarah never delayed the departure of her trainer after her lessons by asking where the trainer was going, when she was returning, or anything else" (Premack & Premack, 1983:29). Amazingly, Sarah would sometimes "steal" the words from the trainers, and then she would happily **repeat the questions asked by trainers to her and then repeat her own answer**. And still, she never herself asked trainers any questions.

Earlier Washoe also failed to formulate and ask questions, though that was one of the aims of the Gardners' project (Gardner & Gardner, 1969, 1975; Bronowski & Bellugi, 1984:110; McNeill, 1980:152-153). Despite all their achievements, Kanzi and

Panbanisha do not seem to possess the ability to ask questions as well. At least, Sue Savage-Rumbaugh and her co-authors never seem to have claimed this so far (Savage-Rumbaugh, 1986; Savage-Rumbaugh and Levin, 1994; Savage-Rumbaugh et al., 1993, 1998, 2001).

The only case when it was claimed that an ape asked a question that I am aware of was connected to the chimpanzee Lana. Lana was a chimpanzee that participated in Duane Rumbaugh's experiments in the 1970s. "When the machine [food-giving machine] was broken and food could not be loaded, Lana was able to ask: '?You move food into room?'" (Savage-Rumbaugh & Levin, 1994:143-144) Even if this is the case of an ape asking a question, it would be strange to consider the possibility that apes would ask a question of a machine (who cannot give them an answer) and would never ask any questions of their human trainers, who can interact and give them answers. Given the natural curiosity of the apes, it would be natural to expect that if apes know how to ask questions, they would be asking plenty of questions.

So, according to our current knowledge, despite all their cognitive achievements, apes do not ask questions. They are apparently very good in replying to human questions, and they do understand quite complex requests and questions, but fail to ask questions. In cases when they begin a conversation, their utterances are either statements ("Bird there"), or orders/requests ("Play me", "Tickle me", "Me more eat", etc). There seems to be something very important in this fascinating fact, something connected with the evolutionary distinction between the cognitive capacities of apes and humans.

Accordingly, I would suggest that it is not the recognition of ourselves as individuals that makes us humans (we know that apes, at least chimpanzees and orangutans, are as good as humans at recognizing themselves in the mirror). It is, rather, **recognition of other members of the society as individuals with equal cognitive abilities and the employment of their cognitive abilities as a source of information (asking questions), that makes us human, and our language -- human language.**

There is a subtle connection between the ability to ask questions and the "theory of mind." Reference to the cognition of another individual as a **source of information** should be considered one of the highest forms of the "Theory of Mind (TOM)" (or TOM. Premack & Dasser, 1991; Cheney & Seyfarth, 1991; Povinelli, 1993; see also Mead, 1934). According to the available information, apes lack this ability: "The chimpanzee has passed tests suggesting that it attributes states of minds to the other one. These states, however, are either motivational..., or perceptual... Decisive evidence for the attribution of informational states is still lacking (Premack & Dasser, 1991:265).

The fascinating fact about the TOM and questioning behavior is that children learn the mystery of asking questions long before they show the development of TOM.

This is fascinating, as apes are able to acquire at least some elements of TOM, which appears around the age of four in children's development (Astington & Gopnik, 1991:12), but at the same time apes seem unable to learn how to ask questions, which appears in children's development in the form of correctly pronounced question intonation before a child even turns one (Crystal, 1987:241, 143). Questioning behavior seems to be more species-specific to humans than the development of TOM.

Do apes ask questions in their natural environment?

Studies of monkeys and particularly apes in their natural environment give us important information. It is well known that apes (and monkeys) are skilful extractors of information from the adult members of the group who do not donate the information (King, 1994:143). Other animals (dogs, for example) can also easily elicit information by observing (or even sniffing) humans or animals. The question is whether animals possess **special communication signals to inquire about the informational state of another individual** (the essence of question phenomenon).

According to Fossey, gorillas have a special "question bark", which indicates very mild alarm or curiosity (Fossey, 1972; Marler, 1976:241). Mostly devoid of communication context, the "question bark" cannot really be considered as questioning behavior. It is rather a sign of curiosity. Chimpanzee vocalizations are much more important for our discussion. J. Goodall describes special **inquiring pant-hoots**, which "...tends to rise in pitch toward the end of the series and is almost always followed by a pause during which the caller listens intently and (if at a lookout position) scans the surrounding countryside. A chimpanzee who hears another pant-hoot often responds by calling (usually with pant-hoots, sometimes also with *waa-barks* and even screams); thus the individual who initiates this question-and-answer exchange will learn both the identity and the whereabouts of those who reply" (Goodall, 1986:134).

Could this be considered questioning? In a certain sense it may seem so, as the caller who initiates this "conversation" apparently needs to hear the voices of its own kind to identify them and learn their whereabouts. In this context the rising of the pitch toward the end of the series seems particularly important, as it obviously resembles human question intonation (also rising at the end and requiring an answer). But a closer look suggests that inquiring pant-hoots might be in fact **statements** (not questions), and their function is to maintain audio contact within the group:

(1) The reply to the inquiring pant-hoots usually is the same series of inquiring pant-hoots, with rising intonation at the end. This kind of response seems difficult to accept as an "answer to a question." It seems more plausible to suggest that

an inquiring pant-hoot is a kind of statement (“Here I am!” or “Here we are!” or even “Hey!”), rather than inquiring or questioning (“Who is there?” or “Is anybody there?”);

(2) The same type of rising-at-the-end pant-hoots are also used by chimpanzees spontaneously, without any need of information and without expecting a response (see Goodall, 1986:134-135, section *spontaneous pant-hoots*). This also suggests that inquiring pant-hoots are in fact statements, not questions;

(3) Most importantly, enculturated chimpanzees do not use interrogatives in laboratories where they are successfully taught complex forms of communication. Although in laboratories they demonstrate incredible cognitive abilities, much beyond the level of their free-ranging relatives, and although they are familiar with interrogative sentences, still **they do seem to ask questions**. It seems very unlikely that chimpanzees lose the ability to ask questions in captivity.

Questioning-like behavior has been suggested in other primates. David Symmes and Maxeen Biben suggest three criteria to establish the presence of a **conversation** among animals: (1) turn taking, (2) directionality of change in acoustic structure, and (3) bidirectionality of information transfer (Todt et al., 1988: vii; Symmes & Biben, 1988: 123-32). According to the research of Symmes and Biben, squirrel monkeys’ vocal exchange can be characterized as conversations. Regarding the ability of squirrel monkeys to ask questions, Symmes and Biben suggested, “animals are seeking information by questioning and receiving information from answers” (Symmes & Biben 1988:131). I understand it is not easy to be sure **what** the squirrel monkey are “talking” about, or whether they really ask each other questions, but it seems unlikely to me that squirrel monkeys can ask questions when more cognitively developed apes do not seem to possess this ability. Bateson and Trevarthan coined a special term “proto-conversation” for the early forms of communicative interaction (Bateson, 1975; Trevarthan, 1979)

Therefore, the foregoing evidence suggests that:

- Our closest living relatives understand human questions and can respond accordingly on a level of a human child roughly about 2.5 years old (Savage-Rumbaugh, 1994);
- Chimpanzees in the wild have vocalization that has elements of questioning behavior (enquiry about the whereabouts of other members of the group, and most importantly – the human-like terminal rising question intonation);
- According to published results, apes were not able to learn how to ask questions in the experiments, despite their widely known curiosity.

• The **reason for this inability could be the genetic limitations of the apes' brain**. These limitations do not allow for the mental ability from which apes would learn questioning, or to inquire about the informational state of other individuals.

And finally, we should not forget that the experiments of teaching apes human language are still in progress.

Are there any evolutionary prerequisites for the questioning behavior?

Yes, there are at least two of them. First of all, an evolutionary prerequisite of the question phenomenon is **curiosity**. It is safe to declare that a question without curiosity cannot exist, although curiosity without a question is widespread among higher animals. Everyone who has ever had pets would agree that curiosity is a natural part of animal behavior (about the role of play and curiosity among animals see Lorenz, 1971). Although curiosity and the ability to ask questions are closely related, there is a big difference between these two phenomena as well.

If curiosity is a natural desire of higher animals to know more about the world around them, the ability to ask questions is the most powerful strategy of the mind to satisfy curiosity.

I would suggest that the question is “**materialized curiosity**.” Although a question is formulated by an individual, when it is formulated as a communication signal it makes possible an enormous innovation: involvement of all members of the group in settling the problem. So, when “materialized” in a question, curiosity becomes a powerful engine, pushing cognitive development far ahead.

Another crucial element of the future human questioning behavior among animals is **question intonation**. Question intonation is much more limited in the animal kingdom than curiosity, and chimpanzees might be the only species that possess it (outside of genus *Homo*). Although question intonation still does not seem to be used among chimpanzees for inquiries about the informational state of each other's minds, the use of question intonation among chimpanzees as an “open structure” that leads to vocal exchanges must be one of the most powerful evolutionary indications of the later human ability to ask questions. Following Derek Bickerton's popular term, protolanguage, we could call the “inquiring pant-hoots” used by chimpanzees, with the rising intonation, but still not used for inquiring into the information states of each other, **protoquestion**.

Who could answer the first question when it was formulated?

This is a methodologically very important question. We all know that any kind of evolutionary progress, whether that be a result of human invention or of gene

mutation, will make an impact on the individual's survival chances and will be included in evolution, only if the environment provides a basis for the positive use of this new ability at the very moment of the appearance of the new ability.

By the time the genetic mutation brought to life the new revolutionary ability to ask questions, the situation could be volatile: there was possibly only one, the very first human being with the new human ability to ask questions. So, what could she or he do? How to use the new ability? It might seem that without other humans around able to answer the first questions of the first human, this new ability would be to no avail and of no advantage.

The answer to this ostensibly difficult question is very clear and easy: **we can be sure that all members of the hominid groups of our ancestors were able to answer the question of the first human.** I am confident of this because experimental studies of ape mental abilities during the last few decades have provided ample proof that **apes are very good at understanding questions and answering them properly.** Knowing the ability of apes to answer questions, there can be no doubt that our hominid ancestors with bigger brains would be at least as good at answering questions as apes. Therefore, by the time the first human asked the first questions, the situation in hominid groups was very "fertile" for the use of this new ability.

It might sound strange, but for a few million years our ancestors (including apes) were cognitively ready to answer questions, although there was no one around to ask them any questions.

The already existing "protoquestion" ("inquiring pant-hoots" containing the rising intonation) among wild chimpanzees can give us an important clue out discussion. The first human child could well hear examples of vocalizations with the rising questioning intonation from the adult members of her/his social group from the first days of her/his life. We can be sure that the first "real human" questions, inquiring into the information state of other's minds, were also asked with the help of the question intonation only. Even today all human infants of all races and language families start asking their first questions using the questions intonation only.

Is the question one of the higher functions of syntactic structures?

M. Tomasello mentions the ability to ask questions as among other more complicated grammatical structures acquired by children in the later stages of their language development: "...later... [after the age of two] children begin to use a variety of specialized discourse structures that differ in various ways from the prototypical events of interest to 2-year-olds. Children learn to produce the conventional form of such things as questions, passive sentences, and sentences with embedded clauses" (Tomasello, 1996:297). Later he repeats this idea "...the kind of discourse-

communicative functions that arise in linguistic interactions with others are an integral part of the acquisition of the more complex sorts of grammatical competence: question asking, passive sentences, and the like (which may be the exclusive province of human beings)" (ibid, pg. 300).

Putting the ability of asking questions together with other more complex grammatical structures does not seem right. Although children do start creating syntactic structures to ask their first “syntactic questions” after the age of two, they definitely do not start asking questions during the third year of their development. Here are a few facts and considerations about the question intonation and question as a grammatical/syntactic structure:

- Questioning is the grammatical category that can be formulated on the one-word stage of language development, **without the use of syntax**, just with the help of the ancient vocal medium – **pitch**.

- Question intonation can be the **biggest universal of human languages** and communication. All languages of the world without exception, tonal, non-tonal, intonational and accented – use the rising “question intonation” for the “yes-no” questions, very popular in human communication (Bolinger, 1972:314; Cruttenden, 1986:169-174).

- According to Chomsky, the grammatical means of formulating questions are also among the strongest **syntactic universals** of the languages of the world (Chomsky, 1957), although the use of **question intonation** to formulate questions must be evolutionary earlier.

- According to child psychologists, question asking appears among children in the form of question intonation in the babbling stage of their language development **before they turn one, much earlier than the use of *any* grammatical structures**.

All these facts strongly suggest that the origins of question intonation and the general human ability to ask questions must be amongst the oldest, most basic and most important elements of human communication and human language. Most importantly, despite its crucial importance, the emergence of the question phenomenon was not connected with the late (“syntactic”) stages of language development. Questions could have emerged at the earliest, pre-syntax, “one signal”, pitch-bases “musilanguage” (Brown, 2000) stage of language development. The syntactic forms of questions that Chomsky is talking about must be a much later phenomenon.

The foregoing strongly suggests that although the ability to ask questions was created for communication and expressed by communicative signals, its emergence was **primarily an event of cognitive significance. This was a cognitive revolution, leading later to language and social revolution.**

Is there a genetic component for questioning behavior?

The absence of the ability to ask questions among apes, who successfully communicate with their human trainers using elements of language and simple sentences, who can comprehend complex sentences with embedded meanings, can manipulate their trainers using elements of the TOM (theory of mind), understand the idea of question, know the question words and can answer complex questions, but at the same time still do not use them in communication and do not ask questions can give us a possible clue about the genetic character of questioning.

A couple of suggestions made by scholars as to why apes do not (or cannot) ask questions also suggests there is something in the inner organization of their intellectual abilities:

- David McNeill, discussing Washoe's problems in forming interrogative and negative questions, wrote: "The reason she did not [produce the simplest negatives and questions] must have something to do with the degree of internal organization they require" (McNeill, 1980:152).
- Premacks suggested that Sarah's failure to ask questions was "due to its inability to recognize deficiencies in its own knowledge." (Premack & Premack, 1983:29).

Both suggestions point to the fact that the mental processing in our closest living relatives is different from human mental processing, and circumstantially **point to the possibility of a genetic difference** between the apes' and humans' mental abilities.

I cannot help myself repeating that if the apes had the ability to ask questions, they would be asking innumerable questions of their trainers, very much like the 2-3-year-old children whom they so much resemble in their curiosity and syntactic comprehension.

Questions and mental retardation

Interaction between the question phenomenon, intelligence and language seems particularly interesting in the light of different cases of mental retardation. Neurologically, language and intelligence seem to be independent (at least partially; see Aitchison, 1996:39-43; 2003), because: (1) individuals with immense problems of language and speech production can have intact intelligence (some forms of Broca's aphasia and cases of Specific Language Impairment. Review: Pinker, 1994:48-50); or vice versa, (2) severely intellectually impaired individuals might possess grammatically fluent language and perfect speech (hydrocephalic children, schizophrenics, Alzheimer's patients, some autistic children and William syndrome

patients. Review: Pinker, 1994:50-53). As for the question phenomenon, it seems to be connected with intelligence rather than language and speech. I suggest that intact intelligence would **always** contain the ability to ask questions, while, in at least some forms of mental retardation, fluent speakers may lack this basic cognitive ability.

A study of the genetic components of some forms of **autism** could give interesting results, as autistic children find it notoriously difficult to learn questioning behavior. At the same time, it seems that autistic children lack not only the questioning behavior but they lack curiosity as well. It would be particularly interesting to check whether there are any cases where curiosity is present but the ability to ask questions is not.

Questions and Genie: Do we learn to ask questions?

Another very important question about human questioning behavior is whether we **learn to ask questions** at some early stage of development, and if we do, **how do** we learn this. Most of our mental abilities, including genetically predetermined language acquisition, depend on learning, or “triggering” the genetic mechanisms, and it would be natural to expect that our ability to ask questions is learned at some stage as well.

Over one hundred cases of “Feral children” from recorded human history would be particularly interesting to investigate in this context, but no data is available on this matter in most of the cases. One of the rare possibilities to discover whether questioning behavior depends on learning at an early age would be to check the case of language development of a girl known as “Genie”.

Genie was found wandering together with her almost blind mother on November 4th 1970 in the Californian streets. It was found later that her father imprisoned her from early infancy and kept her from any exposure to human language. She was about thirteen years old and could not speak. Later Genie acquired limited speech and could communicate with others. Her speech never reached the normal human capacity of syntactic complexity, and her sentences were no longer than 2-4 words. Derek Bickerton put Genie’s language in the category of “protolanguage” together with the language of children under two, ape language and pidgin languages.

Most importantly for our discussion, despite the intensive training received from her caregivers, and much to their frustration, Genie failed to learn to ask questions: “She had great difficulty in formulating questions – when she wanted to know the name of something, she gestured or pointed at it but did not learn to ask its name” (Wills, 1993:288). As tests made it clear that Genie had a normal intelligence, her failure to learn how to ask questions can only be explained by the fact that **she was not exposed to questions and human language behavior in the critical period.**

Answering questions, asking questions: Apes and children.

Another important sphere related to the question phenomenon is the comparative study of apes' and children's cognitive and linguistic abilities. There are principal differences on this matter among different scholars. One group of scholars (led by the experiments conducted by Sue Savage-Rumbaugh and associates) claims the mental abilities of apes are comparable to the mental abilities of a 2 – 2.5 years old human child. Another group of scholars dismisses such claims.

Comparing apes' and children's cognitive abilities, scholars mostly use tests based on **understanding** questions and orders and **replying** (and acting) on them appropriately. As Savage-Rumbaugh and her associates' experiments suggest, bonobo Kanzi can understand human questions and requests roughly as well as a human child aged two-and-a-half years old. Can we conclude that Kanzi's intellectual development is comparable to a child aged two-and-a-half years old? Despite the fact that the achievements of Kanzi and Panbanisha in the comprehension of human language are very impressive, I think it is a bit controversial to make a judgment about children's and apes' mental abilities on the basis of understanding and answering questions and requests **only**. Two- and three-year-old children could give the same kind of replies to questions and requests as enculturated apes, but we should not forget, that children ask an array of questions at that age, and even before that age, whereas even the smartest of the bonobos do not seem to be able to learn how to ask questions. I want to stress, that the strength of human intelligence seems to be in the uniting of individual brains into the "mental web" of our shared knowledge, and the ability to ask questions seems to be the crucial element of this unique mental cooperation.

So, unlike the apes, children from an early age possess the human ability to formulate and ask questions to enlarge their knowledge by referring to the cognition of other members of society. This crucial distinction should not be forgotten when comparing ape and child mental abilities. According to the existing literature, children start using correctly pronounced question intonation and asking their first simple questions at the babbling period of their development (Ferguson, 1977; Crystal, 1987:235, 243, 248; Moskowitz, 1991:147). Despite my deep appreciation of the linguistic achievements of our closest relatives, unless it is demonstrated that apes can learn to ask questions, we should conclude that **even the mental abilities of a one-year-old child has a unique cognitive element that is beyond the mental ability of the most advanced of our closest relatives.**

I suggest designing a special set of experiments to encourage apes to ask questions, and I cordially wish them success in this endeavor. Kanzi and Panbanisha proved many times that their mental abilities are beyond our expectations, and it is

possible that they have the ability to ask their human friends some simple questions (like “Where banana?”) as well. I want to repeat again that **asking questions is not a matter of constructing syntactic structures (questions do not need any syntactic structures), but it is a matter of fundamental cognitive abilities.**

Questions and protolanguage: A comment to Bickerton

Before we discuss the means that help infants learn the art of asking questions, let us very briefly discuss the notion of “protolanguage,” suggested in the influential works of Derek Bickerton (Bickerton, 1981, 1990, 2000, 2003). The idea of protolanguage rightfully became very popular, although discussions about what is the nature of protolanguage, still continues (see, for example, Mithen, 2005:3).

Bickerton suggested that for a long period of time during the hominid evolution our human ancestors were using a very simple surrogate of contemporary language, where the words were present, but very little grammar or none was involved. In appreciation of this simple and very useful suggestion I agree with the many scholars who view the notion of protolanguage, as one of the central elements of the evolutionary development of human language. Here I want to concentrate on one specific problem:

According to Bickerton, protolanguage is present among four different categories: (1) trained apes, (2) children under two, (3) Genie and other “feral children” (Bickerton uses the term “wolf children”), and (4) users of “pidgin” languages.

In my opinion these four categories of protolanguage users should be divided into two very different groups:

- (1) those who **do not use questions** in their speech, and
- (2) those who **use questions**.

Although syntactically their communicative abilities might look very much alike (simple two-word sentences with no or very little grammar), the difference between these two groups on a cognitive level is enormous. Those who cannot ask questions, are locked inside their own mental world and cannot develop further. On the other side, those who can ask questions, have the ability to develop mentally and to become a part of the great information web of humanity. To say this more simply, the members of the second group (who can ask questions) are in the human cognitive family, whereas the members of the first group are not. So, according to this criterion, the four groups nominated by Bickerton as protolanguage users must be divided into two very different groups:

First group: Trained apes and “feral children,” **who do not ask questions**, and
Second group: Children under two and pidgin users – **who can ask questions**.

I suggest that the difference between these two groups is too important on a cognitive level to remain in the same category of language users. I suggest recognizing the second group only (those who **can** ask questions) as human protolanguage users. At least, I suggest distinguishing two very different stages of protolanguage development – the first (pre-human) stage, without the ability to ask questions, and the second (human) stage, coupled with the ability to ask questions.

It is very important to remember that the members of the former group (signing apes, and Genie and feral-children) have **different reasons** to be in the “non-questioning” category. Signing apes are in this category because, despite intensive training and learning, they do not seem to possess the necessary **innate** basis that would allow them to learn to ask questions (at least it seems so at this moment). Genie and feral-children, however, have all the necessary innate basis to learn interrogatives, but due to **environmental** factors they missed out on the sensitive period for learning questioning. Therefore, **questioning appears to be innately guided behavior, in which inbuilt guidelines help the learner**.

How do we learn to ask questions?

Learning to ask questions, or “waking up” our genes that provide us with the cognitive ability to ask questions, must happen in early infancy, no question about that. Children use correctly pronounced question intonation before they can pronounce their first words. Another self-evident suggestion would be that questions are unintentionally “taught” by parents to their children. So, how do we teach our children to ask questions?

I hope most readers remember talking to their own (or even other’s) very young children. Somehow, instinctively, we all start **asking questions**. Of course, we do not ask them questions because we want to hear their responses – they are too young to respond, and the questions themselves, with often silly and self-evident answers and plenty of made-up cuddly-words, are not the ones that we would ask our colleagues or adult family members if we are interested in their opinion. **These questions are specially designed to get an emotional response from the infants**.

Most interestingly, **our infants with their responses teach us, parents, the correct and productive way of interaction** with them. If you speak to an infant in a “serious” tone for a few minutes, and then start speaking with an emotionally loaded tone with very significant pitch modulations and asking questions, the response of the

infant will immediately change. It will become more active, and the infant will immediately look happier. I think this way, through this kind of feedback, infants “encourage” and “teach” their parents to speak to them with exaggerated pitch modulations and ask plenty of questions. Why do infants enjoy and better respond to an adult’s speech when it is full of pitch modulations? I guess the answer to this question is **in our pitch-based evolutionary past and the brilliant musical hearing of human infants** (as we may remember, most infants have perfect pitch, which is extremely rare among adults (Saffran, 2003; Saffran & Griepentrog, 2001)).

I have not mentioned yet, but most readers would guess that when I am talking about adult’s speech to infants, containing exaggerated pitch modulations, I am talking about the well-known phenomenon known sometimes as “baby talk,” or “infant-directed speech,” or “motherese.”

Richard Byrne proposed that baby talk is an “unintentional way for teaching grammar” (Byrne, 1995:122), and that it is “an ideal vehicle for helping the child... to learn phonology and grammar” (ibid, 37). I find this idea compelling, although it seems to me that the primary “teaching” task (apart from the crucial emotional interaction between the infant and parent, see Dissanayake, 2000) of baby talk is to teach infants two-way question-and-answer-based dialogical communication and, most importantly, to teach them to ask questions (or: to activate their genetic ability to ask questions). I do not need to argue that asking questions with exaggerated question intonation is arguably the biggest part of baby talk. Infants’ particular interest in pitch modulations has been tested and confirmed (Fernald et al., 1989).

Question of chronology: When was the ability to ask questions born?

If we try to link paleoanthropological data and this revolutionary change in hominid cognition and language, we must take into account that question intonation, the remnant of this cognitive and linguistic revolution, as well as the syntactic means of forming interrogatives, are one of the most widely distributed language universals all over the world. This universality strongly suggests that: (1) question phenomenon occurred at one place and time, and (2) this happened before the wide dispersal of human ancestors from Africa (about 2 million years ago). Taking into account these factors, any of the human (or hominin) ancestors, not younger than 2-million-year-old, could have made this critical step in our cognitive development. If not earlier, this must have happened at least at the stage of archaic *Homo sapiens* (often known as *Homo erectus*). Barbara King wrote: “At present, *Homo erectus* seems to represent a kind of turning point for information donation among hominids” (King, 1994:109)

Therefore, I suggest that the time range for the emergence of the question phenomenon must be at least 2 million years ago. Thus, the Australopithecines, with their asymmetric brains and voluntary vocalizations, did not ask questions yet.

Although archaic *Homo sapiens* (or *Homo erectus*) seems to be the best nominee for the first inventor of the question and for the role of the first human, we should also consider the candidature of *Homo habilis*, the first human stone toolmaker (about 2.5 mya). I think there is a good chance that *Homo habilis* had already possessed the ability to ask questions. As for archaic *Homo sapiens* (*Homo erectus*), it must have definitely had this cognitive-linguistic ability.

According to this suggestion, archaic *Homo sapiens* (*Homo erectus*) were the first humans to cross the cognitive threshold, leaving behind the animal kingdom. Consequently, there is no “difference of kind” between the cognitive and linguistic abilities of archaic *Homo sapiens* (*Homo erectus*) and *Homo sapiens sapiens* (although there must have been a considerable difference in mastering *speech* – about speech see the next section of the book). This proposal complies with the idea about the equation of the taxons *Homo erectus* and *Homo sapiens* as expressed by a large group of scholars, who have mostly supported the multiregional evolutionary model (Weidenreich, 1943:246; Alekseyev, 1974; Jelinek, 1978, 1981; Wolpoff et al. 1984:465-467; Wolpoff, 1989, 1999:395-97).

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Essay Two

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Sexual Selection or Natural Selection? New Look on the Evolution of Human Morphology, Behavior and Art

Abstract

The author of the article argues that, contrary to Charles Darwin's assertion, sexual selection played only a marginal role in the early evolution of the *Homo sapiens*. Natural selection through the mechanisms of predator control is suggested as the central reason behind the crucial evolutionary changes of human morphology (appearance of longer legs, head hair, eyebrows, reduction of canines) and behavior (bipedalism, singing, dancing, painting).

In his classic book "The Descent of Man" Charles Darwin (1871) argued that sexual selection was no less of an important driving force behind the evolution of living organisms than natural selection. Despite the unique position of Charles Darwin in a scholarly world, this view was not shared by a number of scholars including Alfred Wallace, the co-discoverer of the principles of evolution, as well as scholars of the following generations (see, for example, the introduction by Moore & Desmond for the 2004 edition of "The Descent of Man").

At least several important evolutionary changes in humans and animal species, that were considered by Darwin to be a result of sexual selection (like human skin color, the stripes of a tiger or the sounds of a rattlesnake), are today believed to have been formed under the pressure of natural selection. On the other hand, when it comes to the origins of energetically costly and ostensibly non-adaptive human activities such as singing and dancing, the idea of sexual selection is still very popular (see for example, Miller, 2000). Miller, arguably the most ardent and influential contemporary proponent of sexual selection in human evolution, argues that not only the arts, but even the development of the human languages and the evolution of higher intelligence are the result of the sexual selection process (Miller, 2000a).

The author of this article suggests that one of the possible reasons why Darwin attributed such an extraordinary importance to sexual selection in human evolution was because Darwin virtually neglected the mechanisms of predator control by early hominids (apart from passing mention of the use of stones and clubs by our ancestors).

Darwin, 1871). I believe that many features of human behavior and morphology can be clarified if we pay attention to this important factor of human evolution.

How were the early hominids escaping the claws of large predators on the open grasslands of the African savannah, primarily from lions and their ancestral forms? On what mechanisms could they rely on during the vulnerable night-time sleep? Quite amazingly, virtually no scholar after Darwin attempted to answer these unanswered questions either, continuing the neglect of this crucial factor of the evolution of our species. Adriaan Kortlandt in an experiment-based article suggested that early hominids were possibly using thorny branches to fend off lions (1980), and Hart and Sussman dedicated a book to the critique of the “man the hunter” hypothesis, suggesting that early hominids were virtually defenseless against the prehistoric predators, and their best chance for survival was to climb a tree (Hart and Sussman, 2006).

Here we show that in the search of security, our hominid ancestors developed a complex strategic system of defence, based on a whole set of morphological and behavioral changes. It is crucial to remember that the early hominids had no usual means of defence from predators, unlike other living species: they could not run fast to escape predators, had no big canines, horns or poison, were extremely visible with their upright posture, and very noisy as well (being the only terrestrial singing species. Jordania, 2009). Humans are also several times weaker physically than any other primate of a corresponding size, and their naked soft skin cannot withstand even a relatively modest predator offence that many other primates’ hides can endure.

According to the suggested model, the total absence of a traditional means of defence in early hominids was amply compensated by the new strategic defense system of AVID (Audio-Visual Intimidating Display). I suggest that hominid primary defense was based on the principle of aposematic¹ display and included a large number of elements:

The **audio** element of the AVID system was based on a principle of “make as loud, as united and as intimidating a sound as possible.” This was achieved by combining the sound of a big group of hominids, developing singing in dissonant intervals (so called “Beau Geste” effect²), developing a uniquely human rhythmic unity

¹ Aposematic display – clear display of visual, audio, or olfactory signs (like the rattle of the rattlesnake, stripes of the skunk) to warn the predators that the prey has a strong secondary defence, or the prey is unpalatable (like brilliant coloring of many unpalatable insects. Ruxton et al, 2004: 82-114). Different strategy of the primary defense is crypsis, which is based on the principle “be unseen, be unheard.” The aim of crypsis is to avoid detection by predators (Ruxton et al., 2004: 7-25), contrary to aposematism, where the species try to be as noticeable as possible.

² Beau Geste effect - when vocal signals of few individuals create an audio effect of a much bigger group. Singing in dissonant harmonies can create such an effect (see, e.g., Harrington, 1989).

in singing, using drumming, stomping and also developing an unusually low male voice (for detailed discussion of the audio element of AVID see Jordania, 2009).

The **visual** element of the system of AVID was based on the principle: “look as tall, as big, as unusual and as intimidating as possible.” This was achieved by the following morphological and behavioral changes:

Bipedalism. Many animals use the so called “bipedal threat” in critical situations to look taller and more intimidating. The idea that the origins of human bipedalism might be connected to the desire to intimidate opponents was proposed a few decades ago (see, for example, Livingstone, 1962; or Jablonski & Chaplin, 1993). I suggest that hominids turned the occasional “bipedal threat” into the powerful element of aposematic display, used constantly in their locomotion;

Longer legs. Although humans are one of the slowest running animals among the terrestrial species (most herbivores and predators in the African Savannah can run at about 60 km/h compared to the top human speed of only 36 km/h), we have one of the longest legs among land animals, and longer legs than any primate. Amazingly, even the best human athletes, with their long legs and impressive running techniques run much slower, than chimpanzees with their awkward four-limb locomotion techniques. At the same time, longer legs would be definitely advantageous for early hominids to look taller and more intimidating to predators;

Long head hair. It was suggested that human head hair was primarily designed by evolution to protect the human head skin from the intense UV light (Jablonski, 2006). Desmond Morris suggested that overgrown head hair was a species-specific morphological sign for the hominids (Morris, 2008:21-22). At the same time, we must confess that the necessity to cover a naked patch of skin on the hominid head would hardly require such an amount of hair (untrimmed human hair grows about 1.5 metres, after this every individual hair falls out and the new one starts growing. Morris, 2008). Also, a species with such a unique method of locomotion (bipedalism) would hardly require any additional means for a visible species-specific morphological sign, and evolution, as we know it, is extremely economical. Instead, I suggest, the huge and most likely tightly coiled “Afro” style hair would have been a very effective addition in making the hominid body look taller to intimidate opponents.

Bigger body size and decreased body strength. The idea that the increased body size in hominids primarily had a function of visual intimidation, and was a result of species try to be as noticeable as possible, is corroborated by the well-known fact, that human physical power is several times less that the power of our closest primate relatives. Scholars often use men’s physical strength (in comparison with women) as

hard evidence of the direct physical competitiveness between males³, forgetting that in case of direct intrasexual contest it is hard to explain the drastic decrease of the physical strength in human males. It is obvious, that in case of direct physical contest (male to male combat), the strength of human males would increase⁴.

Aposematic (warning) display gives the predator a sign (with bright colors on the body, specific smells, sounds, or a demonstratively slow motion) that the intended prey is not profitable for a predator to attack. A slowly walking and very visible skunk is one of the best-known examples of aposematic display. Slowly moving and colorful poisonous snakes are also in this category. As a rule, a species which employs aposematic display as a primary defense strategy must have a powerful secondary defense (Ruxton et al., 2004).

Secondary defense of early hominids. In my earlier publications (Jordania, 2006, 2009). I suggested that the early hominid secondary defense consisted of two crucial elements: (1) throwing stones at the predators, and (2) going into a specific psychological state, which I called the “battle trance.”

Throwing objects: Hunting vs. Defense throwing. Calvin suggested that throwing objects played a crucial role in human evolution (Calvin 1993). For Calvin, throwing was primarily used by early hominids for hunting. I suggested that throwing was primarily used as a defense to keep a predator far from undesirable physical contact with a hominid body. “Defense throwing” has several important advantages over “hunting throwing”: (1) It is much easier to aim at an object when it is running towards you rather than running away from you, (2) the distance for the throw is much shorter in defense throwing, (3) as the distance is much shorter, a thrower can use much heavier rocks, can even throw very heavy rocks with both hands, and (4) when you are throwing a rock at an attacking animal, the speed of the attacking predator is actually augmenting the speed of the flying rock. So, in defense throwing we have much better aiming, much

³ See, for example, “Certainly, size, strength, speed, and aggression in men correlate with physical competitive ability, and manipulations that increase these variables lead to greater physical prowess” (Puts, 2010:162).

⁴ Although I suggest that cooperation was prevalent in hominid groups, it is also an irrefutable fact, that human males are generally more aggressive than females. To explain this fact, I propose to view the phenomenon of human intra-group aggression in historical perspective. I suggest that male intrasexual aggressiveness is a result of a “displaced aggression”: millions of the years of cooperative aggression towards African predators and competitors formed aggressive behavior in males, and later, when the external factor of aggression mostly disappeared, male aggression found outlet into intragroup aggression (let us remember, that males are aggressive not only towards other males, like this is a case among wolves, but towards females and children as well).

shorter distance, heavier rocks, and hit at a higher speed. The result: much more deadly power of the hit with a big chance to damage the skull of an attacking animal.

The psychological factor in defense. It is not easy to wait for the attacking lion, with only a piece of rock in your hand, to approach you until it is at a effective throwing distance with deadly power. The terrifying sight of an attacking lion can easily rush the prey into a panic stricken and unorganized escape. To withstand this terrifying moment, I suggest that early hominids developed special neurological mechanisms, and these mechanisms became crucial to hominid defense system.

The central element of the AVID system was going into a very specific, altered state of consciousness which I call the “battle trance” (Jordania 2011). This state may occur in contemporary humans in extremely stressful situations like combat during the war, or when their children or loved ones are under attack. In this state individuals lose their sense of pain (analgesia), lose their sense of fear (we could call this state “aphobia”), lose all their natural instincts of self-survival and they are ready to launch themselves to the much stronger opposition with total dedication to the point of sacrificing themselves.

Military commanders had always been dreaming for an army of such totally dedicated warriors, and without knowing the evolutionary mechanisms, but only from practical experience, they started using (and still use) some of those practical means to induce the battle trance that was developed in the course of human evolutionary history by the powerful forces of natural selection:

Repetitive rhythm. I suggested, that rhythmically united sound was primarily used to create a powerful neurological bond between early hominids to reach “collective identity” (see below). The secret of total commitment of hominids to the interests of their “pack” during a confrontation with lions, through loud rhythmic drumming and stomping, was re-discovered by military leaders in the 16th century. From this time on virtually every army uses long army drills as the most potent means of turning new recruits into dedicated soldiers, and to induce a trance-like state in their soldiers before going into battle (McNeill, 1995).

Listening to loud music. Another potent means to induce a state of trance in ancient and contemporary humans and make them totally dedicated to the interests of the group is listening to loud and of course rhythmically precise music. According to a recent study, listening and singing along with aggressive heavy rock music is still an important part of the psychological preparation for American soldiers for combat situations in the Vietnam, Afghanistan, and Iraq wars (Pieslak, 2009).

Vigorous dancing. A long dance session is still another potent means for humans to go into an altered state of consciousness, when humans lose their sense of self. Rhythmic and threatening movements of early hominids in the state of “battle trance”

is probably the direct ancestor of the universally human desire to dance, and the reason of human predilection to go into the trance-like state in some religious rites (for example, in ritualized long dance sessions of Brazilian Candomblé. Omari-Tunkara, 2005). There is also plenty of ethnographic evidence that tribes from across the world engage into specific group dancing sessions before they launch themselves into the military sessions (or hunting).

Face and body painting. Painting faces and bodies before going into battle (or hunting) is another virtually universal feature of human cultures, and I suggest that face and body painting could also have helped early hominids to go into an altered state of consciousness to stand their ground against the deadly predators without feeling fear and pain. Although the tangible evidence of hominid singing or dancing could not survive in archaeological records, at least some traces of the use of coloring substances have been found. Red ochre was used by our ancestors at least over 230 000 years ago, and black manganese dioxide was used by Neanderthals (McBrearty & Brooks, 2000). As no signs of painting on external objects have been found, scholars propose that our distant ancestors were painting their own bodies (Barham, 2002; Mithen, 2005:230).

Using clothes. The use of animal hides or other objects to look bigger and more intimidating would be very logical in the earliest stages of hominid behavior. Very much like face and body painting, a new external look triggers in humans the feel of a different identity, thus contributing to the transition into a different state of mind. The recent suggestion that human lice (which can only live in human clothes) originated more than 3 million years ago, also point to the possibility that clothes were used by our ancestors millions of years ago (Wade, 2007). As our ancestors still lived under the hot African Sun at that time, it is more likely that clothes initially had functions of visual display and psychological transformation, rather than the function of protection from cold and other environmental factors. Protection from cold might have become a leading factor for using clothing much later, after our ancestors migrated from hot Africa to other, colder environmental conditions.

Reaching collective identity. All the above-mentioned factors, including rhythmically united loud group singing together with vigorous threatening body movements, face and body painting and the use of different clothes had a function to transform hominids' mental state into the "battle trance," where they did not feel pain or fear and were dedicated to the group's interest with the most zealous, religious devotion. This kind of total dedication to the group's interest was in the best interests not only of the group, but of each individual in the long run as well. With the intimidating look, fearless behavior, loud group sound and the "firepower" of the close-range rock throwing, early hominids became not only difficult to hunt, but also superb competitors in scavenging opportunities, even being able to chase away the lions and scavenge their kill.

Cannibalism as a survival strategy of early hominids

Archaeological and paleoanthropological evidence strongly suggests that our ancestors practiced cannibalism (White, 2001). In my opinion the primary evolutionary function of cannibalism was predator control. For a carnivore predator, the killing of the prey is not the final aim of a hunt, eating is. Even when one of the strongest African herbivores, buffaloes, come to the rescue of their fellow member from the lion's fangs, if the attacked animal is seriously injured during the attack, it will become a lion's dinner in few hours. Hunting and eating hominids was much more complex for lions. Although slow and visible hominids were badly equipped to hunt and kill prey themselves, they were superb intimidators as a group. Therefore, in the case of a fatal attack by a lion or another predator (which was not very rare in the African savannah) hominids could collectively attack lions to reclaim the bodies of their killed fellows. After reclaiming the dead bodies, they would cannibalise them, most likely in a ritualized manner. This was not a noble and crazy bravery, but an important strategic policy, because this behavior would make predators to realize the difficulties of dieting on hominids. It is widely known, that a group of unarmed noisy humans can chase away even a hungry men-eating tiger (or lion) from its prey, so it is possible to propose that a hominid-killer lion would most likely retreat without a fight when it was facing the well-organized, dedicated and stone-wielding hominid group.

Before our ancestors learnt other means to dispose of dead bodies of their fellow members, cannibalising bodies must have been an important and widespread practice. Humans even evolved a special gene (M129V), protecting against specific cannibalism-related prion disease. "The discovery of this genetic resistance, which shows signs of having spread as a result of natural selection, supports the physical evidence for cannibalism" (Roach, 2003). The belief that consuming someone's flesh gives one strength and other moral virtues of the deceased (both human and animal) is well known across the cultures. Karl Vogt even suggested that Catholic Mass can be a relic of cannibalism (cited from Moore & Desmond, 2004:XLIX).

Starvation, cultural norms, and insanity are usually known as the reasons for cannibalism, but I suggest that the central reason for the long-term and widespread practice of cannibalism among hominids and early humans was predator control.

Humans and lions: parallel evolution? Evolution of humans and lions has several strikingly similar features, and I want to suggest that these two species, as competitors and arch enemies for several million years on African savannah, had a profound reciprocal influence on the morphological and behavioral evolution of each other.

This was an evolutionary "arms race," where the development of one morphological and behavioral feature by one species was triggering the response from the other species. Here is the list of the evolutionary similarities between these two

species: (1) both humans and lions evolved in the open grasslands of savannah in Africa, within the similar timelines: first ancestral forms of both species appeared more than 5 million years ago, and more contemporary forms of both species were formed during the last 2-1 million years; (2) both humans and lions are social animals (this feature is not unique among primates, but is unique among cats); (3) both humans and lions have one very unusual and effective intimidating morphological feature in common: long hair on their heads (as a mane on lions), which is unique among both primates and cats⁵; (4) both humans and lions have low and very loud voices which they effectively use for the intimidation of their competitors. Humans obtained an upper hand in this “arms race” after developing rhythmically coordinated loud group singing & drumming; (5) both humans and lions went out of Africa and went to different regions of the World in the same historical period (about 2 million years ago); (6) humans and lions were the two most widespread large terrestrial mammals during the Late Pleistocene (100,000-10,000 years ago); and the most importantly, (7) the geographies of the Late Pleistocene period’s distribution of both humans and lions coincide virtually completely (Africa, most of Eurasia, and North America. See Turner & Antón, 1997); (8) Even the contemporary theories of the evolution of humans and lions have significant similarities: very much like two most popular theories of the origins of *Homo sapiens* (multiregional evolutionary model and the single origin replacement model), scholars studying the evolution of lions are also grouped behind two models, where one group of scholars maintains that regional varieties of the lions had a successful uninterrupted transformation into the modern groups (Hemmer, 1974), and the other group of scholars claims that a single population of lions from Africa later replaced all the local populations in Africa and southwestern Europe (Barnett, et al. 2006).

Contrary to the traditional view, according to which migrating humans followed the migrations of herbivores, I propose that humans were following the lions, and that for millions of years the main strategy used for obtaining food by our ancestors was to chase away lions and scavenge their kill. That is why so many important elements such social lifestyle, intimidating strategies, and the range of distribution of humans and lions coincide.

⁵ Here we should remember, that unlike humans, where both men and women have long head hair, in lions only males have mane. The absence of mane in lionesses could be explained by the fact that lionesses do most of the hunting and large manes would interfere in this crucial activity (it is widely known that although males with big manes are better at intimidating competitors and fighting, they are very poor hunters). According to the more traditional view, the absence of mane in lionesses might be pointing to the role of male lion’s mane in sexual selection. Lion’s mane can combine both of these functions: sexual selection (through intimidation and defense from competing males) and natural selection (the same intimidation and defense from the competing hominids and the hyenas).

Another important and mostly neglected factor of human evolution is the mechanisms of **nighttime defense of the early hominids**. I suggest that early hominids used the following strategies:

(1) **Evening AVID display** – before going to sleep hominids could organize a long and loud singing-dancing-drumming display, very much like contemporary chimpanzees and some native Africans do (Kortlandt, 1973:14), warning nearby predators about the size of their group and the cohesiveness of the group (Hagen & Bryant, 2003);

(2) **Eyespots on a human face** – big cats prefer to attack when their prey cannot see them, that's why cheap plastic masks of a human face tied to the back of one's head are effective in deterring the attacks of the man-eating tigers in the Sundarbans marshes (Jackson, 2003:78-80). I suggest that eyebrows (arched upwards) and eyelashes (arched downwards) form quite good oval "eyespot" on a sleeping human face⁶. Therefore, seeing "eyespot" on sleeping human faces could deter the attack of lions at night, contributing to the formation of this conspicuous facial morphological feature in our ancestors;

(3) **Smell of human body** – Hominids used a whole set of visual and audio aposematic signals during the day, and it is plausible that during the nighttime they used olfactory aposematic signal as well: a strong smell emitted by a human body (particularly from the hair-covered parts of the human body, like armpits and genitals). With the renowned power of all human secretive glands, and without a shower literally for millions of years, this must have been quite a powerful olfactory sign to all prowling carnivores (who try to approach their potential prey against the wind) with even the faintest sense of smell.

Conclusion: I suggest that central driving force of human evolution was a complex defence system of Audio-Visual Intimidating Display (AVID, or AVOID)⁷. This system allowed early hominids to control predators, and provided them with

⁶ There are two alternative hypotheses on the function of the eyebrows: (1) older and generally better known in popular culture suggestion is that eyebrows have been formed to prevent sweat flowing from the forehead into the eyes (this suggestion has been dismissed by Morris as ineffective, Morris, 2008). (2) Eyebrows also had been suggested to be an effective means of communicating moods between humans (Morris, 2008). Although eyebrows are definitely effective in communicating moods, this hypothesis still does not offer as much direct benefit to the bearer of the eyebrows as the suggestion that eyebrows were providing night-time security to sleeping hominids, so I suggest that security was the primary function of eyebrows, and communicating moods was a secondary function. Later, after increasing security standards, the mood-communication function of the eyebrows became leading.

⁷ Later the author started using acronym AVOID instead of AVID. Additional letter "O" stands for "olfactory."

protein rich food via so called “aggressive scavenging” (Blumenshine, 1986). As a revolutionary new **non-contact system of defence**, AVID allowed our ancestors, over millions of the years of evolution, to lose their canines, bodily hair, reduced their physical strength and also the resulting fatalities from inter-group violence. The art of the inner transformation and the reaching of the altered state of consciousness became the crucial element of this new revolutionary system of defense (laying foundations of human arts, religion, and rituals). We know today that many wonderful human inventions were primarily invented for military purposes (like internet, GPS, or digital photography), so I hope readers will not be too shocked to hear that the strong emotions that human arts elicit from us might be the result of millions of years of struggle for survival in the African savannah.

Despite the fact, that my model might provide explanation to many morphological and behavioral features that are usually explained through sexual selection, with the help of natural selection, I by no means reject the importance of sexual selection for the explanation of a few other morphological and behavioral characteristics of our species⁸. But I do suggest that natural selection, through the neglected so far factor of defence from predators, was the decisive factor of evolution of the most of the morphological and behavioral characteristics of our species. The central aim of this article is to provoke further scholarly interest towards hominin/human defence mechanisms.

Every new suggestion needs time. Most of the ideas presented in this article are new. Only future careful examinations of all the conflicting hypotheses on human evolution will be able to clarify whether the forces of sexual selection or the forces of natural selection are behind the crucial morphological and behavioral changes in human evolution.

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⁸ Puts (2010) clearly distinguishes two different mechanisms of sexual selection: (1) female choice and (2) intrasexual competition through intimidation and direct contest, and suggests that the importance of the mechanisms of “mate choice” is greatly exaggerated in the existing literature (Puts, 2010). Although I suggest that the primary subjects of hominid intimidation were external forces (predators, other hominid groups), there certainly is a possibility that hominids (particularly males) were using the same intimidation strategies during the inter-group conflicts as well.

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Essay Three

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New Interdisciplinary Approach to the Study of the Origins of Traditional Polyphony

Abstract

The article discusses the new model of the origins of choral singing in the context of human evolutionary history. Hominin interaction with predators is seen as a crucial force for the evolution of human morphology and behavior. Group singing and dancing, with body painting and the use of masks are seen as crucial elements of the strategy to deter predators and to put hominins into the altered state of the consciousness. In this state, humans do not feel fear and pain and are ready to sacrifice their lives for the common goal. This psychological state is still important to many human group activities, particularly in religion and military. Mosaic distribution of polyphonic traditions is discussed in the context of the origins of language and articulated speech.

Introduction: Problem of the origins of polyphony at the turn of the millennium

Origin of polyphony is one of the biggest problems of musicology. Ability of human groups to sing in complexly organized musical texture has captivated attention of musicians and culture historians for centuries. Apart from the scholarly importance, this phenomenon acquired wider ideological dimension as well. Polyphony was considered a hallmark of European high musical culture. As to the problem of origins of this phenomenon, it was widely believed to be a cultural invention by medieval European Christian monks. This belief remained unshaken for centuries despite the occasional appearance of contradicting facts⁹.

The paradigm of the medieval Christian invention of polyphony continued well into the 20th century, until the newly developed field, comparative musicology, proposed a different model for the birth of polyphony. As the evidence for the presence of polyphony among non-European peoples, the representatives of the great Berlin

⁹ Among such facts was, for example, the discovery of polyphony among Polynesians during their first meetings with Europeans in the 1770s (see Burney 1975:84; Beaglehole, 1967:944). Such uncomfortable for the dominating paradigm facts were declared untrustworthy and as a result were neglected (see Kaeppler et al., 1998:14).

school of comparative musicology came to the conclusion that polyphony was not invented in the 9th century by Christian monks, but rather was born earlier in traditional music and later spread to the European professional music (see Schneider, 1934-1935). Proposing a new paradigm has never been a safe issue, particularly in Nazi Germany, and Schneider's book was publicly burned along with other banned literature that contradicted the idea of white European supremacy.

In regards of the origins of European professional polyphony the new paradigm allowed two possibilities. According to the first one, polyphony was born somewhere outside of Europe, and reached Europe later via cultural contacts (the popular research trend of the time was the model of "cultural circles"). The main proponent of this idea was Marius Schneider, who considered polyphony to be born in South-East Asia (Schneider, 1934-35). According to another point of view, the main source for the European professional polyphony was archaic polyphonic traditions of local, European peoples (Collaer, 1960). In regards of the birthplace and age of polyphonic singing there were various suggestions. Victor Lederer proposed polyphony was born in Northern Europe (1906), Vasil Stoin suggested that polyphony was born in the mountainous regions of Bulgaria and later spread in other countries of Balkan Peninsula and the rest of the Europe (1925). Dimitri Araqishvili did not claim that polyphony spread to the world from Georgia, but was sure it was a local pre-Christian invention (1925).

During the comparative period of development of our discipline (1880-1950) the interest towards "big themes" was dominating. It was not only the origins of polyphony that comparative musicologists were researching. Works on the classification of scales and musical instruments, or the origins of music itself, together with other theoretical and historical themes were published in this period. Most of the works from this period had serious problems though. There was insufficient number of high-quality regional studies of the world musical cultures. So, the new global theories were mostly based on a mixture of inferior facts and second- and third-hand incomplete information¹⁰. Even worse, comparative studies were often making ambitious classifications of various musical cultures from the "lowest" to the "highest" forms, and the adjective "primitive" was routinely used in reference to many non-European cultures. This trend became particularly untenable after the events of the Second World War.

From 1950 onwards the situation has drastically changed. A revolutionary new paradigm based on the methodology of cultural anthropology, tipped the balance to the

¹⁰ For example, representatives of comparative musicology, Siegfried Nadel and Marius Schneider, who were writing extensively about the possible interactions between Georgian folk and European professional polyphony (Nadel, 1933; Schneider, 1940, 1951, 1961, 1969), have never visited Georgia, leave alone such arduous endeavours as learning Georgian language or organizing a fieldwork in Georgia.

opposite end. Even the name of the scholarly field changed, from “comparative musicology” to “ethnomusicology” (see Merriam, 1960). The existing works, dedicated to the big theoretical and historical themes and based on comparative methodology had been severely criticised. Wide (“horizontal”) comparative works were replaced by the deep, “vertical” regional studies of a single culture, based on a long-term participant-observant modelled of fieldwork (see: Merriam, 1977; Hood, 1960, 1971; Nettl, 2005).

New studies were written by the experts, who, as a rule, were proficient not only in musical traditions, but in language, history, cuisine, psychology, and many other intimate parameters of a studied culture. Once omnipotent comparative method was discredited and mostly rejected together with the major part of comparative studies of pre-war Germany. The problem of the origins of polyphony, very much like the other “big problems” of musicology, had disappeared from the mainstream publications. Even during the explosion of the interest in the origins of music (the first decades of the 21st century), despite the obvious relevance of ethnomusicological perspective in this problem, mainstream ethnomusicology stayed at a “safe distance” from this “big” topic (although see Grauer, 2006, 2007; Jordania, 2006, 2011). The most ambitious research project of this era, Alan Lomax’s “Cantometrics” was created outside of academia and was mostly criticized by professional ethnomusicologists.

By the end of the 20th century the situation started to get more complicated. Part of ethnomusicologists started voicing concerns about the absence of the “big themes” in the discipline and started questioning the total rejection of comparative methodology from mainstream publications. One of them was Tim Rice, the head of the biggest ethnomusicological department in the USA, UCLA. During the 2001 ICTM Conference in Rio de Janeiro, Tim Rice characterized the rejection of comparative methodology after the 1950 with a phrase “the baby was thrown out together with the bath water” (personal communication on July 9th, 2001). 2001 ICTM World conference in Rio de Janeiro itself had the first theme about the possible comeback of the comparative methodology. Mainstream ethnomusicologists were not too enthusiastic in their response to this theme. This concern was well defined in the polemical article by the same Tim Rice, published almost a decade later in the central journal of the field *Ethnomusicology* “Disciplining Ethnomusicology: A Call for a New Approach” (Rice, 2010). Sympathy towards the comparative methodology is quite evident in the works of another prominent American ethnomusicologist, Bruno Nettl (Nettl, 2005:60-73). Nettl noted the returning sympathies towards comparative method among some scholars from the 1970s, although we by no means can talk about the acceptance of the comparative methodology by the mainstream ethnomusicology of the time.

Today we are possibly at the verge of the third period of development of our discipline. Return of comparative perspective seems a logical step after the long period of extensive regional studies. Nettl notes that by the year 2000 comparative method “it

is clearly here again, though without an explicit methodology and usually without being named” (Nettl, 2005:63). Part of ethnomusicologists and musicologists (among them Steven Brown, Michael Tenzer, Pat Savage, Victor Grauer, Joseph Jordania), active supporters of the official return of comparative methodology, tried to bring comparative methodology back to life during the recent years. They seek closer contacts with a broader circle of scholars from several fields. The first meeting of the supporters of the revival of comparative method was held in Vancouver, Canada, at the conference “Analytical Approaches to World Music conference” in May 2012.

Of course, if we have to compare regional (“vertical”) and comparative (“horizontal”) methods, we have to acknowledge that deep regional studies are the “backbone” of ethnomusicology, because regional studies can certainly exist without comparative studies, whereas comparative studies totally depend on the number and quality of regional studies (Hood, 1960:233). Selection of the method of any research project should naturally depend on the research aims of the project. Any decent research project of the wider circle of topics, like the phenomenon of the drone, distribution of string instruments or the origins of round dances, are impossible to conduct without wide comparative approach. Research of the origins of polyphony is one of such obvious cases when comparative method is absolutely necessary.

More so, during my research I came to a firm conclusion that for understanding the processes that led to the origins of polyphony as we know it, comparative method alone is not enough. Studying the amazing variety of vocal polyphonic traditions throughout the world and creating stylistic parameters for their comparison is in itself a formidable task, but it is the first step of the research only. In order to gain a clue into the historical forces that brought the existing picture of distribution of polyphonic styles I had to go much further. I gradually entered the realm of cross-disciplinary and interdisciplinary research including such widely ranging spheres of physical anthropology, speech pathology, primatology, and even military psychology.

The conclusion that I reached during over the 30 years of research proposed complete change of my understanding of the roots of choral polyphony. According to my new model the phenomenon of vocal polyphony is not a late cultural invention, but is an important part of hominid¹¹ survival strategy. This strategy was developed by the forces of natural selection. Tradition of vocal polyphony, according to my model, was an integral part of the wider defense system from predators, and is of extremely ancient origins. Since the development of articulated speech polyphony has been gradually

¹¹ The term “hominid” is traditionally used by evolutionists to define variety of ancestral forms to *Homo Sapiens*. In recent years some scholars started using this term to define a wider circle of species, including extant and extinct apes. They suggested the term “hominin” to be used to denote human ancestral forms. In this article the author uses the term “hominin.”

disappearing throughout the world¹². My research brought about a number of unexpected proposals and bold predictions not only in ethnomusicology but in several other disciplines as well, from the origins of human intelligence, language and speech to the distribution of stuttering and dyslexia.

Now, after the short introduction of the history of the research of the origins of polyphony, let us discuss main characteristics of the new possible solution of this problem. As I will be trying to present the results of very wide circle of problems, it became inevitable that some important ideas will not be mentioned, some will be presented very briefly (with the due references to other publications where the full accounts can be found), and some topics will be granted a bit more detailed account.

Comparative Study of the Origins of Polyphony and Beyond

Comparative study of the variety of the polyphonic traditions in the world was the starting point of my research. As I soon found out, apart from two editions of the book “History of Polyphony” by Marius Schneider (1934-35 and 1969), no other major work was available where the information about various polyphonic cultures was gathered. When Schneider re-published in 1969 his 1934-35 book with a newly added chapter, for some reason he did not include many known by that time polyphonic traditions. I used variety of strategies to fill the caveats in my knowledge of the polyphonic traditions in various regions of the world. Organizing special conferences (from 1984 onwards) on traditional polyphony provided a much-needed breakthrough, as I was able to gain knowledge not only from the papers presented at the conferences but from the direct contacts with the experts from various cultures. I have to say that gathering the information about various polyphonic traditions is still going on, and I am sure will be going on until I am alive.

It was an important methodological advance for me when I classified various elements of musical traditions according to their potentially stable or mobile character (Jordania, 2006: 189-196, 2011:47-50). Based on the analyses of several examples of intercultural exchanges (involving Georgian, Middle eastern, African, Polynesian musical examples), I came to a conclusion, that some elements of traditional musical culture can be extremely fluid and mobile (for example, melodies and instruments). On the other hand, I proposed that some elements were extremely stable. Two of the most stable elements were the type of polyphony (drone, ostinato, parallel polyphony), and the intervals that were predominantly used as the “harmonic ethno-ideal of polyphonic

¹² Russian-Jewish scholar Miron Kharlap was first to propose the idea of the initial wider distribution of archaic forms of polyphony and their subsequent loss (Kharlap, 1972). But for Kharlap music and polyphony were not very old phenomena, as he believed music was born out of human speech.

culture” (dissonant seconds or sevenths, or consonant thirds and sixths) in these cultures.

The first major breakthrough in understanding the reasons behind the mysterious stratigraphy of monophonic and polyphonic cultures was the understanding of the correlation between the distribution of vocal polyphony and the data of physical anthropology (Jordania, 1988, 1989)¹³. It was nothing short of a shock when I first read in the publications of prominent Russian physical anthropologist Valeri Alekseyev that populations of Caucasian Mountains and Dinaric Mountains from the Balkans were extremely close by their craniological parameters. Many other such correlations followed for the next several years, to the point that I was able to predict the presence of polyphony by the data of physical anthropology (for example, this happened in the case of North Japanese Ainus, and mountain populations North and Central Vietnam). My meeting with Georgian physical anthropologist Malkhaz Abdushelishvili and Valeri Alekseyev in 1985 was the first serious cross-disciplinary contact in my search of the origins of human choral singing. Valeri Alekseyev’s untimely death in 1991 cut short our plans for our interdisciplinary collaborative work. My 2006 book “*Who Asked the First Question? Origins of Human Choral Singing, Intelligence, Language and Speech*” is dedicated to the memory of Valeri Alekseyev and Malkhaz Abdushelishvili.

I cannot elaborate here on the correlation between the distribution of vocal polyphony and related physical anthropological types. This is a huge sphere and those who are interested might find a couple of examples of this correlation in my English language books (Jordania, 2006, 2011, 2015), but those who want to read the whole story, I would suggest to read my Russian language article in Soviet journal Soviet Ethnography, written after Valeri Alekseev’s request, or my first book, also published in Russian (Jordania, 1988¹⁴, 1989).

In 1995 I arrived to Australia. In about the same time a new communication tool, email, revolutionized the interaction between scholars. By the time, when my second book came out (Jordania, 2006) my knowledge of the world polyphonic traditions was much fuller than in 1989.

¹³ Marius Schneider was the first who noticed that the distribution of choral polyphony and the data of physical anthropology were coinciding (Schneider, 1934-35, 1951, 1969). For a scholar, who is interested in a worldwide distribution of polyphony this is virtually impossible not to notice. On the other hand, Schneider believed in the late cultural origins of polyphony and in my opinion, he did not go deep enough to reach the primary causes of the human tradition of group polyphonic singing. Apart from this, Schneider identified “race” with language, obviously a false premise.

¹⁴ This article from “Soviet Ethnography” was soon translated and published into Bulgarian, in journal “Musikalni Xorizonti” (Jordana, 1989a)

Is Polyphony Appearing or disappearing?

For the development of current model of the origins of polyphony the crucial moment came when I started compiling facts for two contradicting tendencies:

- (1) disappearance of polyphonic traditions, and
- (2) appearance of polyphonic traditions.

I soon realized that there actually was only one historical tendency: **disappearance** of polyphony. I was able to find plenty of examples of the disappearance of the polyphonic traditions all over the world¹⁵, but I could not find a single example of the appearance of the vocal polyphony in a previously monophonic traditional singing culture. So, it became clear to me that the historic link between monophony and polyphony was working in the opposite direction that was believed for centuries: the initial musical culture of humanity most likely was based on polyphonic singing, and for some reason it was gradually disappearing during the centuries and possibly millennia. This was a complete change of the widely accepted

¹⁵ Here are a few facts of the disappearance of polyphonic traditions: In Italy, Lombardy, singing in seconds has been documented in the 15th century, but later disappeared (see Ferand, 1939). In Lithuania, the unique vocal polyphonic style *sutartines*, based on the almost constant use of secondal dissonances, has disappeared during the last two centuries (Rachiuonaite-Viciniene, 2002). In Latvia, a tradition of three-part drone singing, recorded by A. Yurian at the end of the 19th century, disappeared (Yurian, 1907). In Estonia, a tradition of drone polyphony was recorded by Tampere in the beginning of the 20th century, but disappeared later (Tampere, 1938). In Russian north, a unique tradition of duet and trio singing with independent melodies was recorded by E. Gippius in the 1920s, and was never heard again (Zemtsovsky, 2000:758). In Sicily, according to the archive recordings, the western part of Sicily was as polyphonic as the rest of this Mediterranean island, but after the 1968 earthquake the tradition seems to be lost (Macchiarella, 2008:142). In Macedonia, according to local ethnomusicologists, the tradition of Macedonian singing in dissonant seconds has been disappearing during 1950s – 1980s (Bicevski, 1986). In USA, California, according to the historical sources and archival recordings, interesting forms of vocal counterpoint that were present among South Californian Indians, also disappeared (Keeling, 2001:418). In Taiwan, according to the archive recordings, the small mountain tribe Saisat had a tradition of singing in parallel fourths that disappeared within the first few decades of the 20th century (Tsang-houei, 2002:525). In Indonesia, according to Dana Rappoport, part of the traditions of vocal polyphony in Central Sulawessi has disappeared during the last decades (Rappoport, 2004). In Polynesia, according to A. Kaeppler, a tradition of six-part polyphony on Tonga was eventually lost, and partly replaced by late European three-part singing (Kaeppler, 1990). In Africa, according to Simha Arom, the tradition of vocal and instrumental polyphony has been declining among pygmies from the 1970s (personal communication, letter from 7th August, 2007). In Georgia, cases of losing the traditions of vocal polyphony are documented in Meskheta and Saingilo Magradze, 1986; Jordania, 2000:827. For more detailed information and more cases see Jordania, 2006, 2015.

idea of the relatively late cultural origins of polyphony from the natural development of monophony.

Before we start discussing the reasons of the gradual and mosaic disappearance of the choral singing in various regions of the world, we need in the first place to discuss the evolutionary forces that prompted our ancestors to start singing in harmony. This problem is very close to the problem of the origins of music, as the evolutionary forces that prompted our distant ancestor to start singing in harmony, were very close to the forces that prompted our ancestor to start singing.

To be brief, I will go straight to the core points:

I was the first to pay attention to the fact, that most of the singing species on our planet live on the trees (Jordania, 2006:303-306). I suggested that this was due to fact that singing on the ground is an extremely costly activity, as singing attracts predators. Even more, when the singing species, that spent most of the time on the trees and can fly away from danger, go down to the ground for a short visit, they become silent (Jordania, 2006:305);

I proposed that human ancestors most likely were already a singing species when they came down from the trees (this happened, as we know today, between 7-4 million years ago). Amazingly, humans are the only ground-dwelling species that sing (another neglected fact). On the other hand, there are thousands of singing species, including singing primates that live in the trees (for example, gibbons sing, even in family duets and groups. See Geissmann, 2000).

As we know, apart from human ancestors, the ancestors of other big apes also came down to the earth. Even if they were singing species at the moment of transition, it is very likely that following the life-saving strategy of tree dwellers that are visiting ground, they would become silent. So, the crucial question to answer for us is not why our closest living relatives stopped singing (this is clear – for survival), but why our ancestors did not stop singing. To answer this question, we are now going to another sphere, the sphere of the defense strategies from predators in animal kingdom.

Vocal Polyphony and Human Defense Strategies

Despite the popular belief, not all the animal species try to conceal themselves in order to avoid predators. Some species do the opposite: they try to be very visible, noisy, and even develop a body smell. For this purpose, they develop bright colourful or striped bodies, try to look big, they make hissing, growling, and clicking sounds, develop an unpleasant and constant body smell. With their easy-to-notice appearance, noisy behaviour and smell they try to communicate to the would-be predators that they are not afraid of them, and predators would be better to leave them alone. For this

purpose they even developed specific style of locomotion – awkward, sluggish walking style, and fearless behaviour (they as a rule do not run away from predators). Such animal species are known as “aposematic species” (Ruxton et al., 2004).

Some examples of aposematic species are brilliantly coloured snakes and spiders. They often make hissing, rattling, or clicking sounds to warn others to leave them alone. Among mammals, aposematism is not very well studied (but see, for example, Caro, 2009). Skunk can provide a good and widely known example. Not many people know that before using its deadly spray, skunk goes through the routine of aposematic display: feet stomping, waving his big and highly visible bushy tail, standing on two legs to look taller, making growling and stomping sounds. Apart from these display features, skunk is constantly accompanying by a musky smell. In regards of behavior, as other aposematic animals, skunk does not try to run away from predators, and moves slowly. All these are the elements of aposematic display aimed to intimidate the predator.

After learning about the behaviour of aposematic animals, I proposed that following their descent from the trees, humans started using aposematic strategy of survival (Jordania, 2011:182-196). This had been another completely new proposition, as humans had never been seen in the light of aposematic behaviour. Apart from behaviour, aposematic strategy gradually changes the animal morphology. Aposematic nature of our ancestor’s behaviour can explain plenty of human morphological and behavioural peculiarities: human bipedalism, long hair on the top of our heads, long legs, or the use of high military helmets could have developed in hominid/early human evolution to look higher (Jordania, 2011: 104-105). Use of body painting, clothes and masks can be explained as strive to look more intimidating (Jordania, 2011: 106-107). Human instinct to freeze in the most critical situations is also very characteristic for the defence strategy of aposematic animals (Jordania, 2014: 179-182). Besides, humans are also known for a strong body smell, which does not exist among the cryptic species (for example, cats. Jordania, 2014: 170-173). And of course, singing in a group, accompanied by stomping, clapping, and synchronized intimidating body movements, makes a highly effective intimidating tool (think of something like a Māori Haka, traditionally performed in to intimidate the opponent before the battle).

I cannot go into details of another extremely important for evolutionary theory topic – interaction between aposematic strategy and the strategy of sexual selection. Most human morphological and behavioural characteristics were explained by Darwin with the help of sexual selection (Darwin, 1871). According to his theory, most of the colourful and oversized additions to the animal bodies, as well as singing and dance-like body movements, were developed in animal kingdom to attract attention of the females. But evolutionists must remember that aposematic display is based on the same principles: display of colours, oversized additions to the body, singing and dancing. So, proponents of sexual selection theory must take into the account the possible

aposematic nature of such displays. When looked with an unbiased eye, it is possible to see that even in the case of the peacocks, the classic symbol of the power of sexual selection, the peacock's magnificent tail (known as "train") was not developed by the forces of sexual selection. Seven years long study of the behaviour of peacocks in Japan came to the conclusion, that peahens do not pay any attention to the male display of tail (Takahashi, 2008). Readers can see the detailed account of this fascinating topic in my other works (Jordania, 2011: 192-196, 2014:86-92). It is interesting, that in aposematic species females are often cryptically coloured as they must stay with the young. Symptomatically, in the species where males take the care of the young, usually females are more conspicuous and males are cryptic (Ruxton et al., 2004)

Let us go back to loud rhythmic group singing of our distant ancestors and discuss a feature that brings us to the sphere of military psychology. Loud group singing, apart from the intimidation of the predators and competitors, had another, possibly even more important function: it was putting our ancestors in the altered state of consciousness. In this state hominids were forgetting about their individual interests and were totally dedicated to the interests of the group. This specific state, which I call the "Battle Trance" (Jordania, 2011:98-102) might occur both in men and women, and can occur instantly (for example, when a child is attacked by a predator and a parent goes into all-out fight without any back thought for the self-survival), or can be induced by various means, most importantly by loud rhythmic collective drumming-singing-dancing sessions. Such sessions are very well known to ethnographers from array of traditional societies before they would go for military sessions. Even in contemporary army, the exhaustively long rhythmic marches are the primary force that turns new recruits into the killers that are ready to follow any order (McNeil, 1995). In the state of the battle trance soldiers do not feel fear and pain, can do extremely altruistic things (for example, sacrifice his life for others), but at the same time they can also do extremely violent things (for example, participate in mass killing of civilians. Jordania, 2014: 184-189). Another characteristic feature of this state: if combatants are deeply in this trance they might have partial or full amnesia of the critical events. This extremely important and powerful psychological phenomenon is studied surprisingly insufficiently.

American ethnomusicologist Jonathan Pieslak studied the use of music among American combat forces positioned in Iraq, and came to the conclusion, that music plays extremely important role in military (Pieslak, 2009). Apart the use of music for relaxation and socializing, that comes to mind first when thinking of music in military, soldiers use music for much more practical purposes. Very much like in traditional societies, contemporary military forces also often use group dancing before commencing their combat missions. Taking benefit of the existing technology, contemporary military forces as a rule listen to loud recordings of rock songs. Impressed by the importance of music in soldier's life, American actor and soap-opera

writer, Tom Wiggin started a campaign to distribute personal MP3 players to all soldiers stationed in Iraq and Afghanistan (Villarreal, 2010).

We do not have here a space to discuss the evolutionary importance of loud rhythmic music in the origins of such human institutions and sentiments, as religion and patriotism (see Jordania, 2011: 102-103). One seems obvious: all such group activities that use communal singing, have deep connections to the ancient evolutionary role of music. Music is a powerful medium to connect individual humans via changes in the brain chemistry (Benzon, 2001:23), leading them to experience the exhilarating feel, when the feel of individuality dissolves into a common Collective Identity.

Sounds of Primordial Polyphony

Now I would like to devote couple of pages to the discussion on musical side of my model. In several book I proposed that the initial loud and rhythmically precisely organized music was based on very specific dissonant intervals (Jordania, 2011:110-111, 2014:162-165).

Singing in harmony makes the overall sound more robust, creating the impression of a larger and more imposing group, and this was exactly the aim of singing of our hominid ancestors. Professional musicians know that there are several different ways of singing in harmony. You can sing in parallel thirds and parallel sixths, and this will lead to a nice relaxing harmony, prevalently used in classical and contemporary pop music. Parallel fourths and fifths make a very different sound – rough and somehow hollow – early Christian liturgical music and rock music had been the ardent users of this harmonic element. Singing in dissonant intervals, particularly seconds, creates the most startling, the most robust, and the most impressive overall sound. These characteristics make singing in seconds, the best possible option for creating a loud attention-grabbing and intimidating sound¹⁶. Dissonant sounds would have been perfect to intimidate predators for our ancestors.

In my 2011 book I suggested that singing in dissonant seconds was created by the forces of natural selection, and that the tradition of singing in seconds was taken by our distant ancestors from their African ‘cradle’ to the different regions of the world. Most importantly, I also suggested that the remnants of this primordial singing style are still surviving in the most isolated regions of the world (Jordania, 2011:111-112). Many of my colleagues probably reject this possibility off hand because of the sheer amount of time involved in this model. I suggest before rejecting this idea, to simply check the existing facts.

¹⁶ It is no accident, that car honks are often tuned so that they create the most dissonant sound, often the interval of second, as sharp dissonances are able to grab the attention quicker.

To check this possibility, we need to search for a specific polyphonic style with a loud and piercing sound and with very sharp dissonances. And most importantly, if this singing style is an ancient survival, examples of this style must be scattered in the geographically most isolated places (like mountain ranges, islands, forest massifs, continental fringes), and must be present among totally unrelated cultures.

Now, if we look at the stratification of singing styles all over the world (see Jordania, 2006:30-176, or to hear sound examples, see Jordania 2015), we can see that a very specific polyphonic style comes to our attention. This is a piercingly loud singing style, based on an acoustically maximally dissonant interval of the second. Even more precisely, this interval is often between the major and minor seconds, measuring 14-16 hertz. This is “the most dissonant dissonance” – the neutral second, known in ethnomusicology under the German term ‘Schwebungsdiaphonie’ (lit.: “rough sound,” “rough harmony.” Messner, 1988, 2013).

Another extremely important fact is that singing in this style as a rule is distributed in the most geographically isolated and distant regions of the world – in Tibet, the mountain ranges of Hindu-Kush, the Caucasian and Balkan mountain ranges, North Vietnamese and Taiwanese mountains, South-West China’s forest-covered mountains, hard to reach mountain regions of Central Papua New Guinea, some islands of Indonesia and Melanesia, the swampy forests of East European Polesie, fringes of Europe in the Baltic region, in isolated pockets of Africa, and among North Japanese aboriginal Ainu people among others (Jordania, 2011: 110-111). The amazing similarity between the polyphonic styles of such geographically and culturally isolated regions strongly suggests that these scattered traditions of dissonant polyphony might be remnants of an ancestral common singing tradition of humanity. The development of such a specific polyphonic style independently by so many differing cultures as a simple coincidence is virtually impossible to imagine.

We know that the striking resemblance between Balkan and Indonesian traditions of polyphony left the brilliant Dutch ethnomusicologist Jaap Kunst totally astonished¹⁷. He published a book in 1954 on this subject, in which he tried to substantiate a

¹⁷ The similarity of stylistic elements and the sound between these traditions is amazing. When, in the 1980s, Austrian-Australian comparative musicologist Florian Messner, following Kunst’s footsteps, played a recording from Bulgaria to Indonesian villagers, the Indonesians were sure that this was a recording made in a neighbouring village, and the reaction of Bulgarian villagers was exactly the same upon hearing a recording of the Indonesians’ polyphony. I can also say that, although I have been studying these polyphonic styles for years, I still struggle to distinguish some of them from each other.

farfetched hypothesis of a major prehistoric transcontinental migration from the Balkans to Indonesia. On my point of view, the central problem with the Jaap Kunst hypothesis is that mentioned parallels between the Balkans and Indonesia is **only one of many such parallels**: the same style of dissonant-based harsh singing is present in many geographically isolated places. Scholars universally agree that a phenomenon that is predominantly present in geographically isolated regions is most likely to be the most ancient (Nettl, 2005:320-338; Sachs, 1940:62). Wide distribution, on the contrary, often points to the late distribution of the phenomena – see the examples of distribution of contemporary phenomena, like pianos, guitars, mobiles, or cars. Distribution of a similar phenomenon in a few isolated village communities in Tibet, Papua New Guinea or the Central Africa is a much more potent indicator of the ancient age, than the widest possible distribution of another phenomenon.

When Kuba wrote about the possibility of Balkan dissonant style of singing being very old, scholars thought in terms of centuries, and possibly millennia (Kuba, 1909). Victor Grauer famously declared that Bushmen/Pygmy style polyphony can be a survival of the earliest singing style of humanity, stretching back for the last 100 000 years (Grauer, 2006, 2007). In his reconstructions Grauer relies on the ‘Recent African’ or ‘Total Replacement’ model. My research and polyphonic data support the ‘Multiregional model,’ also known as the ‘network model’, where the count for the age of humanity starts at least two million years ago (Wolpoff, 1999).

If we believe that such a long survival of a singing style is simply impossible, then we are facing the even more difficult task of explaining the presence of amazingly similar and very specific dissonant singing traditions in very specific intervals in such wildly different and geographically isolated places of the world. I suggest we should not discount the simple and elegant possibility that these dissonant-based loud singing traditions are all remnants of the oldest human singing style, the style that helped our ancestors get into the battle trance and obtain collective identity to fight together, as a unit, for their common survival.

It is widely known that many cultural inventions that make our life safer, more convenient, and more meaningful, were initially invented for the reasons of national security and military capability. Four-wheel drive, microwave, GPS, and computers are among such primarily military inventions. I am proposing that human choral polyphony has the similar origins. It was designed not by a human inventor, but by the genius of natural selection through the battle for survival. Music most likely became the sphere of culture much later, after it lost its initial leading role in human communication to human speech and human life became much safer. We will discuss this important issue in the next section of the article.

Proto-polyphony and the origins of speech

We logically came to the point when we need to discuss the forces that brought the initial universal distribution of vocal polyphony to the mosaic distribution of polyphony that we observe today. This is a crucial question for the presented model: OK, if we accept, that all human populations took with them from Africa the similar singing traditions, based on polyphony, why we have then polyphony distributed only in some regions of the world?

Here, before discussing the main argument, I must note that musical materials support the historical picture presented by the Multiregional hypothesis of human evolution (see Wolpoff, 1999). I agree with the proponent of this hypothesis that archaic *Homo sapiens* had all the necessary cognitive abilities that are present in *Homo sapiens*. In explaining their archaic facial details, I proposed that the only feature that differentiated archaic *Homo sapiens* from anatomically modern *Homo sapiens* was articulated speech.

Here we must remember that by the time of the dispersal of humans from Africa (about 1.8 million years ago) human intelligence and language was present, but the language was not based on articulated medium, it was most likely based on pitch-based communication. The difference between the **language** (cognitive ability to create and manipulate ideas) and the **speech** (one of the mediums of language) is crucially important in linguistics. Language existed much earlier than speech (see for example, the review by Hewes, 1977. See also Krantz, 1980, 1994). Grover Krantz famously proposed that the change of the archaic facial features with contemporary facial features was connected to the acquisition of the articulated speech (Krantz, 1980, 1994).

Let us now come back to the story of initial dissonant polyphony that was taken from the common African cradle. What has happened after this? I proposed that various human populations, who reached their places of habitat without articulated speech, **shifted to articulated speech in different epochs**. What is the logic behind such an unusual proposal?

After the advent of articulated speech, musical (pitch based) language lost its initial survival value. Articulated speech gradually became the main communication medium in human societies. Musical communication and group singing tradition were marginalized and started gradual disappearance. The key point of my proposal is that **the shift to the articulated speech happened in very different epochs, some earlier and some later**. If we assume that various groups of peoples reached their areas of habitation without speech, it is more likely that they shift to the speech would happen at different times. After this point the logic is quite straight: in the regions where the shift to speech happened earlier, the primordial tradition of vocal polyphony must have

already disappeared. On the other hand, in the regions where the shift to articulated speech happened later, the slow and gradual process of decline of polyphonic traditions must be still going on.

As a result of this asynchronous decline of ancient singing traditions, in some regions the tradition of vocal polyphony is completely lost (in East Asia, Australia, and among most of Native Americans). East Asia is arguably the most monophonic region of the world today. According to my proposal, it must have been among the ancestors of East Asian populations that the shift to the speech first occurred. Second most monophonic continent is probably Australia, so I proposed that the ancestors of the native Australians were the next to shift to the articulated speech.

On the other hand, polyphony is still strongly present in European and particularly in sub-Saharan African populations, therefore, I proposed that after East Asians and Australian aboriginal populations, European and finally African populations also shifted to articulated speech.

I cannot go into the details of the wide range of supportive evidence to this idea (see Jordania, 2006:347-375), but I will briefly mention several fields that support the idea of asynchronous shift to articulated speech:

Paleoanthropology. Contemporary human facial details were most likely formed by the emergence of speech (Krantz, 1980, 1994). Most importantly for us, contemporary facial details in the contemporary populations appeared in various regions in different times: the earliest shift happened in East Asia, and the latest in sub-Saharan African populations. Differences on time range is huge, from about 350 000 years (for East Asian) to about 11 000 years (for sub-Saharan) populations (Wolpoff, 1999).

Epidemiology of stuttering. Stuttering is a genetic disorder, connected to the late acquisition of speech in human evolutionary history¹⁸. Despite the belief of most of speech pathologists that epidemiology of stuttering is the same everywhere in the world (Bloodstein, 1995), there are publications indicating that there are in fact big differences between different regions. Stuttering is much more prevalent in sub-Saharan African populations, and it is extremely rare among East Asians and Native

¹⁸ Onset of stuttering had been linked to our evolutionary past almost a century ago. According to Robert West, “human speech is a function overlaid on ancient systems for eating and respiration [and I would add “and singing” JJ], and because speech is one of the latest abilities we acquired, it is one of the most readily lost or impaired” (see Bloodstein, 1993:179). This idea is widely shared by speech pathologists.

American populations (Bloodstein, 1995:136; Cooper & Cooper, 1993:194-196; Finn & Cordes, 1997:222. See also Reece & Jordania, 2001).

Epidemiology of dyslexia. Like stuttering, the epidemiology of dyslexia also shows increased prevalence among sub-Saharan African populations and extreme rarity of the condition in East Asian populations (Makita, 1968; Spaeth, 2003; see also Jordania, 2006:373-375; 2015:476-480).

Acquisition of phonology in children. According to the available information, there is a significant difference in the age of acquisition of phonologic system between European and East Asian populations. Children in East Asia acquire the same system much earlier (from the age of 1 to 3 years), than children with European descent (from the age of 2.5 years to 6 years. Menyuk, 1968:140-141; Nakazima, 1962; So and Dodd, 1995; see also Jordania, 2006:374-376).

Therefore, (1) scholars should not exclude the possibility that speech origins might have different timelines in various regions of the world, and (2) different populations might have differences in genetic predilection towards stuttering and dyslexia. For the research of the origins of polyphony this line of research is important as it gives a solid explanation to the fact of the uneven distribution of polyphony throughout the world.

Very brief conclusions

We are approaching the end of our discussion of the new model of the origins of polyphony. Probably the most important conclusion of the research is obvious: such big problems, as the origins of polyphony, are impossible to investigate within musicology and ethnomusicology, without wide cross-disciplinary and multidisciplinary approaches. Hopefully works based on comparative methodology will make more than occasional appearance on the pages of mainstream publications¹⁹;

In regards of the origins of polyphony ethnomusicologists must admit, that existing facts do not support the old idea of choral singing being a late cultural invention. Facts suggest that Polyphony is gradually disappearing all over the world. It

¹⁹ An interesting fact: the research of polyphony seems to be of the interest primarily of European ethnomusicologists. Out of 25 special conferences, dedicated to the research of polyphony from the 1970s, none was held in the USA, one was organized in Asia, and 24 – in Europe.

is becoming increasingly clear that the origins of human choral singing are intimately connected to the various aspects of our historical past, and should be studied in a broadest context of human evolutionary history.

The previous conclusion provides us with a potentially very important methodological tool: if we accept the idea, that after the appearance of articulated speech polyphony and more generally, human musical traditions lost their initial survival importance and started decline, our general view on the development of human musical history will be profoundly affected²⁰.

And finally, if we are ready to accept the previous two fundamental propositions, the research of the origins of polyphony has a rich potential to make serious contributions to the wide circle of issues of human evolution.

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²⁰ New evidence that made appearance during the last few decades also suggests that our musical abilities are of extremely ancient origins and that humanity might be gradually losing musicality. If we take into account such facts, that (1) every normal newborn human baby has the perfect pitch, which then gradually disappears during the child's "verbalization" (Saffran, 2003; Saffran & Griepentrog, 2001), or that (2) musical faculties are placed in the most archaic part of our brain, so-called "reptilian brain" (Peretz, 2003), we might have a grasp of the new reality of the age and the origins of our musical abilities. Are musicologists ready to see the field of music, traditionally dominated by the theories of music as a gradually developing cultural invention, in this new light?

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Essay Four

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Distribution of Singing in Arboreal and Terrestrial Species, with Implications for the Origins of Singing Behavior among Humans

The issue I want to discuss in this short article, is the so far neglected connection between two well-known evolutionary developments in human prehistory:

1. Descent from the trees to the ground of our ancestors, and
2. Origin of singing behavior among humans.

There is a full and equivocal scholarly agreement about the crucial importance of descending from the trees to the ground of our primate ancestors for the evolution of *Homo sapiens*. With this fact in mind, it is difficult to comprehend why none of the scholars of human evolution, or even broader, the evolution of animal species, ever discussed the existing differences in living conditions in these two very different ecosystems (trees and ground).

So, let us try to analyze what kind of differences we are talking about.

Animal species living on the ground (terrestrial species) live in a two-dimensional world, and animal species living in the trees (arboreal species) live in a three-dimensional world. This difference is similar to the difference between the two forms of art: painting and sculpture, and is profound in its essence. This third dimension – vertical, which is present in a tree-living environment and is absent in a ground-living environment, makes a marked difference, particularly in the *survival strategies against predators*.

In the trees, in a three-dimensional environment, every species lives according to their weight. So, if you are a lighter monkey, you can climb higher up the tree than other, heavier animals. The deadliest enemy of primates, the leopard is several times heavier than most of the tree-living monkeys. For this reason, 40-60 kilo leopards simply cannot climb high enough up trees to reach a place where 10-20 kilo monkeys are spending most of their time.

The same is true for our distant primate ancestors, small-bodied primates. While staying on the tree branches, they were out of reach of not only the biggest cats, like lions, but also out of reach of the mid-sized tree-climbing predators like leopards.

So, let us remember, because of the morphology of most of the trees, which have thicker branches closer to the ground, and thinner branches higher up, tree-living animal species live there according to their weight, virtually on different tree “floors.” Lighter animals can climb and spend most of the time safely higher on the trees, as thinner branches can withstand their weight, but the same branches cannot withstand the weight of heavier animals.

Living on the ground is a totally different story. The ground has only two dimensions, and irrespective of your weight, you still live on the same “ground floor” with all other ground-living species, from rabbits to lions, buffaloes, and elephants. So, unlike the light monkeys who can sleep safely from predators high up in tree branches, ground-living prey species like rabbits and antelopes are never safe from predators.

Let us now have a look at the second topic of this article: *singing*.

The central suggestion of this article is that singing is much safer for arboreal species than for terrestrial species, and would be natural to expect singing to be found in many more arboreal than terrestrial species. Let us consult the numbers:

Currently, there are about 5400 known species on our planet who sing. Most of the singing species live in trees (mostly birds and primates). What about ground-living species? There is only a single singing species that lives on the ground and sing²¹. To my knowledge, this unique fact of human musicality has also been so far neglected.

Even more. I proposed that because singing is inherently more dangerous on the ground than on the trees (attracting predators), many singing, and otherwise noisy birds might be becoming more silent when visiting the ground. A few weeks of my personal observation of singing birds in Australian parks, and consulting the existing literature confirmed that this is probably true. One of the world’s leading experts on birds singing behavior, Peter Slater from St Andrews University also confirmed that birds do stop singing while they are on the ground (see Catchpole & Slater, 1995:74-76). Although bird experts consider this is primarily for the reason for better sound transmission (this idea is well represented in scholarly publications, for example, see Marten & Marler, 1977), Slater also confirmed that one of the main reasons for this silence might be the fear of terrestrial predators (personal letter from March 3rd, 2008,

So, as we can see,

1. Almost all the singing species (more than 99%) live on the trees, and
2. When tree-living species visit the ground, as a rule, they become silent.

²¹ Possibly the only other confirmed terrestrial singing species is the Australian flightless bird lyrebird. There are also coyotes, wolves, and lions singing in choruses. Also, couple of dozen singing species among sea mammals (whales, dolphins, sea lions), an interesting fact itself, as the sea is a three-dimensional environment as well.

If we remember here, that before becoming terrestrial, human ancestors also were arboreal species, it would be a very likely scenario to consider that human ancestors were already singing species while they were arboreal.

We should also keep in mind that two most skilled primate singers today are gibbons (lesser apes) and humans. We were separated from lesser apes over 16 mya, therefore there are two theoretical possibilities for the origins of human musicality:

1. The human-gibbon common ancestor was already a singer some 17-20 mya, and
2. Humans started singing only after separating from other African apes some 6 mya, already being a terrestrial species.

The first possibility seems more plausible in the light of the arguments mentioned above about singing among arboreal and terrestrial species. The question that we should be asking is *why our ancestors did not follow the “wise” strategy that other singing species followed in the past and still follow today – stop singing when they descend on the ground*. Our closest living relatives, African apes, unlike our ancestors, most likely followed this survival strategy, so they stopped singing and grew bigger teeth in order to survive predator-infested new environment.

Our ancestors, most likely, chose a very different survival strategy, where singing was possible, and even a vital part of defense strategy (for the alternative idea, see the suggestion of humans using the aposematic strategy of survival, with group rhythmic singing and dancing as an effective intimidation tool, see Jordania, 2014). See also the final Essay in this book.

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Essay Five

This is the Introduction of the book “The Human Story Behind Scientific Discovery” (2020), Tbilisi: Logos.

Introduction of the book “The Human Story Behind Scientific Discovery”

People use different strategies to grasp the general idea of a new book they stumble upon. The title of a book or the name of an author is usually the first stage of getting interested or putting the book aside. If the title gets the reader’s attention, the next step would be to read the back of the cover, or possibly have a look at the intro, the table of contents, or the index. If you were interested by the inviting title of this book and are now looking at the introduction, then allow me to make the best use of your time.

There are different types of readers and although I believe some readers will find this book refreshing, others will probably hate it. The central problem is how to determine what kind of the reader are you before even you start reading it. To help you with this, I designed a short, fifteen-second test. Please, read these four simple statements and note in your mind how many of them you agree with:

- Scientific research must be undertaken and developed by professional scholars only;
- If a person does not have a Ph.D. in the relevant field, no one should take any of her/his new ideas seriously;
- Peer review is a fair system of evaluating scholarly works and recognizing new important ideas for the advancement of science;
- Most of the significant problems of the natural world are already solved, so there can be hardly any more ground-breaking discoveries;

If you agreed with all these ostensibly reasonable statements, I suggest you put this book down without reading it any further, as there is a significant probability you will get frustrated and possibly even angry as you read further.

If you agreed with only one or two of these four statements, you might find this book confrontational, albeit you might still enjoy reading it, and might even agree with some of the comments and ideas.

And finally, if you disagree with all these four statements, this book is for you.

So, what this book is about? It is about how scholarly research is organized in our human society. We will discuss how our future scholars are educated and prepared for the rich creative work that scholars are supposed to do. We will also discuss how scholars are acknowledged and rewarded for their scholarly activities. Most importantly, we will discuss some mechanisms in academia that hamper the free development of scholarly ideas. We will discuss, for example, how the existing system of grants, coveted university positions, and the continuous demands for the number of peer-reviewed publications put immense pressure on professional scholars and turn them from creative thinkers into shrewd, calculating businessmen. We will discuss why and how professional scholars often does not have the freedom to develop their work most creatively in the direction they consider to be most productive. We will see they often have to bend their ideas and proposals to fit with the demands of funding bodies and publishers. Sadly, scholars are required to continuously pen articles with the anticipated outcomes for most of their productive years and publish them in peer-reviewed journals to make their employers at the university happy. Many professional scholars spend most of their professional lives, as a Russian poet Mayakovski once said poetically, by “stepping on their own throat while singing,” to keep their positions and grants rolling.

The book has several aims. One of the most critical messages of this book is that scholarly research is not something only professional scholars should do. Contrary to popular belief, some of the most celebrated scholars in the history of science were not professional scholars. Charles Darwin, one of the icons of scholarly progress, did not have a Ph.D. in biology, zoology, or geology. He did not even have a master’s degree in biology, and even more, he did not even possess a bachelor of science.

As far as his formal education was concerned, Charles Darwin **Error! Bookmark not defined.** was a pure amateur, his highest educational achievement being a Bachelor of Arts. That’s why throughout his life he was known as “Mr. Darwin,” not as “Dr. Darwin,” or “Prof. Darwin.” Despite this fact, we can all probably agree that Mr. Darwin did contribute to the development of biology more than many professors and scholars with Ph.D. did. The same goes for another great scholar of evolutionary science, Alfred Wallace, who did not have a Bachelor’s degree or even finish school. Gregor Mendel, widely recognized as the father of genetics, is still another example. So, let us remember from the very beginning, science is done not only by professional scholars; non-professionals can make spectacular contributions to the advancement of various scholarly fields.

Another important message of this book is that our existing system of education is too rigid to prepare scholars the way we would expect them to be: free and creative thinkers, who can think outside of the box, and who are striving to make significant

changes in their spheres. I will argue that our system of education is methodically and mercilessly fighting against natural human curiosity from the very beginning of our educational process to the very pinnacle of educational achievement – the fabled Ph.D. As a direct result, we are raising future scholars primarily as obedient thinkers, who can work very well when they are told what to search and where to search, but who are afraid to enter uncharted seas. And uncharted seas, we all know, are the only place where one can discover new continents. The result of the existing system of professional education is that some of the most creative parts of our future scholars drop out of the formal training at different levels, tired being a part of the rigid school of obedience.

I will also argue in this book that although to become a scholar one needs to have sufficient education, there are also born scholars, who have no formal training. For very different reasons they had never been fully educated as scholars, but they still are scholars just by the very type of their cognitive ability, the ability to notice things around them others fail to see. They naturally have scholarly inquisitive and creative minds and sometimes can leave a brilliant legacy in various academic fields. Sure, some scholars luckily combine both: they are born with an inquisitive scholarly mind and are also educated as professional scholars. We will discuss in detail what our system of education is doing to such lucky professionals at all levels, including tertiary school and getting the Ph.D.

Then, of course, there is an issue of money, or more precisely, funding for scholarly activities. Most of the works on the history of science neglect this profoundly important sphere. Contrary to popular belief, the existing system of funding is a mixed blessing for the development of science. Most of the professional scholars who make a living from their scholarly activities soon become dependent on the funding bodies, so in the existing system of funding, it is the fund-giving bodies that pressure scholars to follow their vision and needs, not the scholar's imagination.

Sadly, the current system of grants and financial rewards feeds scholars, but not the advancement of science. We will follow the route of excited young enthusiasts of scholarly progress, with their romantic ideas of the development of the science, and see what happened to them when they encountered the real world with the strict rules of funding and the atmosphere of competitive obedience towards the existing paradigms and the older generation. Let us also remember that the proponents of the established paradigm, as a rule, are the majority among the most established and mainstream scholars of the day, and they usually hold key positions in funding bodies and the most prestigious peer-reviewed scholarly journals.

As you can see, the subject of this book is dauntingly big. Of course, no single human can have a comprehensive view of this vast topic, so I do not even dream to present that in this book. Contemporary scholarly research is conducted in an array of disciplines and methods; there are countless problems and specific details in each of these spheres that must be taken into consideration. So, I must declare once again from the outset that I am not going to address these problems comprehensively. This book is rather a stream of thoughts and arguments from a scholar who had the recklessness to wander into various scholarly fields with unorthodox ideas and met with many professional and non-professional scholars in the process. The only reason for writing this book is that, in my view, there seem to be many common problems that both non-professional and professional free-thinking scholars face, so sharing my personal experiences might give food for thought to those who are interested in the topic of how scholarly activity is organized in our society.

I am by no means the first scholar to address this issue. There is a special field of scholarship known as the history of science. This book probably falls into that category although I am not going to discuss the main historical stages of development of the scholarly ideas. Three important thinkers contributed significantly to the history of science and provided our understanding of scholarly progress: Karl Popper, one of the most revered philosophers of the 20th century, Thomas Kuhn, physicist and an influential self-styled historian of science, and Paul Feyerabend, Austrian philosopher of science. The best-known contribution from Popper's legacy is the idea of the fallibility of the hypothesis. According to Popper, no hypothesis can ever be declared "correct" or "true," and new ideas are not necessarily closer to the truth than the older ones. The viable hypothesis, according to Popper, should make predictions that allow other scholars to falsify it. Those hypotheses that are based on assumptions that cannot be falsified cannot be considered viable. The best known of Kuhn's legacy is the idea of a paradigm shift. Kuhn's idea of "paradigm shift" describes the dynamics of the development of science, characterized by long periods of "normal science," interrupted by the short times of violent scientific revolutions, labelled as a "paradigm shift." And finally, another influential thinker of the field was Paul Feyerabend, who argued that there can be no clear demarcation line in terms of method between science and any other form of investigation.

Most of the aspects of scholarly life discussed in this book affect the everyday development of science, but they had never been discussed seriously by Popper, Kuhn, or Feyerabend. Kuhn, for example, wrote: "*...except in occasional brief asides, I have said nothing about the role of technological advance or of external social, economic, and intellectual conditions in the development of the sciences*" (1962:ix-x). Scholars and their ideas are presented in their works mostly separate from their life stories,

without any reference to their education, way of making a living, financial situation, ethical standards, and personal beliefs. For example, the simple and telling fact that Charles Darwin was by education a Bachelor of Arts, and that he never depended on his scholarly activity to make a living, is not even mentioned in most of the writings on the history of science. On the contrary, I will specifically address these and similar questions such as: How is the existing system of education shaping future scholars? How do the problem of funding the science and policy of grants affect scholarly development? How do the academic requirements of the universities influence scholarly progress? How does the peer review process work? I will also mention such fleeting and overlooked notions as the problem of scholarly integrity, scholarly reputation, and scholarly corruption. We will also touch on the sensitive issue of the political sanctioning of the “correct” research topics and research outcomes. These all are topics that fundamentally affect the real everyday lives of thousands of fellow scholars, both professional and non-professional, and have a profound influence on the development of science.

At least some readers might think that the rebellious flair of this book comes from the fact that I have no “proper” professional education, or any other scholarly credentials, like many of my heroes of this book. Sorry, but I must disappoint such readers. I studied how to become a professional scholar in my sphere of expertise for two long decades, including specialized primary, secondary, and tertiary education, followed by all the subsequent postgraduate studies, including obtaining a Ph.D., even two of them.

After finishing my professional education, I have been involved in scholarly research and the university education system for over three decades. I have written five books and many articles as an ethnomusicologist and evolutionary musicologist, had been a Head of the Board of the professional encyclopedia in my sphere, served as a professor and the head of the International Bureau of the International Research Center, and successfully supervised MA and Ph.D. students. I was also involved in the establishment of a new International Research Center and had been closely involved in organizing international scholarly conferences and symposia with the subsequent publication of conference proceedings. In 2009, I even received the most prestigious international award in the sphere of my primary expertise (ethnomusicology).

So, in this book, I am criticizing academic scholarship, though, in a way, I represent the very scholarship I criticize. As I consistently followed the topic of my lifelong fascination—the origin of the human passion for choral singing—during the last three decades, I had many experiences of approaching scholars from very different scholarly fields, from physical anthropology, linguistics and evolutionary biology to speech pathology and behavioral ecology. During these long years of Odyssean travel

through the various academic disciplines, I met with many professional and non-professional scholars and found both admirably wide and extremely narrow thinkers in both groups. I gradually learned not to get frustrated by the negative responses and neglect of new ideas, and finally decided to share some of my experiences with those who might be interested.

The ultimate message of this book is that those studying the exciting world around us for the love of the subject, without monetary remuneration, should be happy and content for the opportunity to do so. And those who have positions and receive funding for doing the same thing are not necessarily better scholars.

And finally, as the main direction and the spirit of the book are more or less clear for readers, I would like readers to have an idea about the structure of the book.

There are seven chapters. The first is dedicated to the problem of how we educate future scholars. Everything starts with education. The educational goals of our society shape the next generation of our young citizens, including scholars. Does our educational system prepare future scholars to be independent and critical thinkers? Of course, not all humans become scholars, but arguably all humans need to have independent and critically thinking brains. We probably all can agree with this statement, but is this what our system of education is doing? Are we preparing our citizens and scholars to have an independent thinking mind and to be able to tackle Big Problems? I will argue that our educational system completely reverses the natural circle of development of the human brain, and instead of thinking and creative humans, we are mostly raising obedient citizens who are afraid to think out of square.

In the second chapter, I argue that the critical feature of a scholar's individuality is not a scholar's intellectual life, but the scholar's emotional life. I will argue that the most important feature of scholar's nature is their integrity, sincerity, and natural inability to follow the mainstream if they do not sincerely agree with it. When Charles Darwin's future wife, Emma, who was by the time of their marriage considered much better educated and established than her husband, was asked the most charming feature of her future husband's nature, she answered "sincerity." She added that Charles was the only person she knew who was always saying exactly what he was thinking. Well, is this *so* important in scholarly life? We'll discuss exactly this. We will also talk about how the emotional sincerity of a scholar and the awe of nature are vital for the fulfilment of scholarly life.

In the third chapter, we discuss whether there are any objective means to judge more-or-less the success of a scholar. Can this be measured by the number of grants and amount of funding money secured by a scholar? Or by the number of publications in peer-reviewed journals? Or possibly by the number of published books? What about

the number of citations their publications received? What about a scholar's professional and general popularity? We will see that many of these ostensibly clear indications of the success of scholarly assessment might be misleading. As the dominating paradigm dictates the mainstream of academic research and directs the bulk of scholars towards the "normal science," or "puzzle-solving" (as Kuhn put it), more inventive and revolutionary scholars are pushed aside and their work often labeled as "bad science" or "fringe scholarship." Truly revolutionary ideas, as a rule, stay off the mainstream publications for a long time and find acknowledgment and acceptance only if they are lucky. So, the received grants, peer-review publications, and books produced by the top publishers might be just indicating that the scholar (or the institution) is indeed an established and conservative one, with little or no ability (or desire) to bring any revolutionary changes to the field of science.

The fourth chapter discusses one of the most important practical issues of contemporary science: the problem of funding for the development of science. I argue that the perennial search for financing often makes professional scholars forget about their passionate involvement with the subject of their research. By making scholars paid professionals who do science to make a living, we turn them from independent thinkers into paid mercenaries, whose priority is to have a good and stable income, instead of maintaining their initial romantic drive of developing their scholarly fields. With the existing system of grants and funding, we are turning most of the natural-born rebels who want to change the world into paid content clerics. We know from the history books that not every revolutionary and rebel stays loyal to their initial calls after reaching the top positions of power. That's why the controversial example of Comrade Che is still so fascinating to many, mainly the young romantic rebels. The scholarly world is no different. With the problem of funding naturally comes the issue of professionalism with the system of elaborate professional "clubs," where they build impenetrable barriers between their professional caste and the rest of the community. Such barriers are built around the internal rules of respecting the status quo, their secret technical language, their vigorous own popularity contests, and their disdain for "tall poppies" among their colleagues with broader popularity.

In the fifth chapter, we talk about the central issue of science development, the all-important paradigm shift. We will discuss the relativity of the Kuhn idea of the crisis in science and will see that it is impossible to detect any such explosive "critical" situations. Most established scholars have no idea and no feel for the looming crisis. The scholarly establishment tries to keep the old paradigm alive and influential as long as possible, or at least until the end of their scholarly careers. They have all the motives to keep the doomed paradigm connected to the life support system. The paradigm shift is nothing short of the true "Environmental Catastrophe" that will inevitably wipe out

plenty of species from the Planet of Science, particularly those who represent the “megafauna” of the scholarly establishment. The ultimate dream of every generation of an academic establishment is that their scholarly field has reached the pinnacle of its development and no breakthrough is expected in the next 100 or 1000 years, or even forever. We will see how serious and sincere scholars are in believing such myths.

In the sixth chapter, we discuss the scholarly establishment’s means of keeping new dangerous ideas from gaining acceptance in order to keep the current paradigm clear of danger. The institute of peer review is the primary keeper of the holy gates of the scholarly establishment. Professional mastery of sceptics is impressive in refuting all the potentially plausible suggestions, although they often fail to notice even the smallest blemish in the existing paradigms. Methods of scholarly mobbing and neglect are the most widely used tools.

We discuss here also why professional scholars have an innate dislike for amateur scholars, although amateurs almost never compete with them directly for university positions and lucrative grants. We also discuss why and how professional scholars attack their professional colleagues if the dangerous-for-the-old-paradigm ideas come from within their circle of peers. Yes, professional scholars also suffer from the same attitude from their peers towards their views, if their new ideas do not agree with the dominating paradigm. The scholarly fraternity subconsciously pushes towards developing neophobia among peers.

Scholars who refuse to follow this unwritten trend are seen as whistle-blowers who can irreparably damage the prestige of institutions, scholarly fields, and the most revered eminent scholars. Such whistle-blowers are seen as egoists who, for the sake of their own agenda, threaten the well-being and financial security of their colleagues. I argue that true scholars by their nature are always whistle-blowers. They are rarely appreciated for their activities; on the contrary, they are often mobbed (or abused by another extremity – total neglect) by the established scholarly community.

Finally, in the seventh chapter, we discuss the fundament of many scholarly fields: the axiomatic truth that is clear to everyone except for heretics. We will review several cases when the postulates that seemed axiomatic turned out to be wrong and how the resulting cognitive dissonance effect pushed established members of the scholarly academia towards more extreme defensive measures. Despite being wrong, these axioms put powerful and long-lasting holds on acquiring new knowledge and reaching a new understanding. We discuss that some of the well-known old problems that many tried to solve possibly need not a successful answer to the question but comprehending that the question was not formulated correctly in the first place. Most importantly, we should remember that we all are humans, and like all humans, from the head of a

national defense force to the most dedicated and proud wife or husband, we usually make our biggest mistakes in life not when we are hesitating, but when we are absolutely sure.

So, the background is set. You had a chance to stop reading this book. In case you have not stopped reading and are ready to follow me into the rest of the book, let us move forward. In the first chapter, as we remember, we are going to tackle the problem of the education of future scholars.

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Essay Six

This is a chapter from the book *The Human Story Behind Scientific Discovery*, Logos, 2020

Paradigm Shift as Environmental Catastrophe

*Normal science does not aim
at novelties of fact or theory and,
when successful, finds none.*

Thomas Kuhn

Humans are naturally terrified by the possibility that our planet Earth might be hit by a wandering, sizeable asteroid. During the few billion years of its existence, our planet had been hit a few times by cosmic bodies of various sizes, sometimes with catastrophic consequences. No wonder this rare possibility is one of the favorite themes of catastrophe films. The most vulnerable population of our planet in the case of such a catastrophic event is the megafauna. It is not their bigger bodies that make megafauna more vulnerable, it is the length of their reproductive cycle that is lethal in the case of such catastrophe. Why?

Imagine a hit like the one that rocked our planet some 65 million years ago, most likely leading to dinosaur extinction. Apart from the site of the catastrophe, where the hit would be felt like a monstrous nuclear weapon (with the energy of 10 billion times size of the Hiroshima bomb), the rest of the living population would have problems because of the countless cubic kilometers of earth going into the atmosphere, obscuring the sunlight probably for months and even years and drastically reducing the Earth's temperature. The lack of sunlight and resulting glaciation is probably the most damaging factor of such a catastrophe. Monstrous tsunamis would wipe out mostly the shorelines of the continents but not reach the interior territories. In a drastically changing environment, where the temperature drops and the atmosphere changes for several years, those species with shorter lifespans, have a great advantage as they adapt faster to the new environment. For example, species that live about a year or two, like house mice, start reproducing in six weeks, so they can have eight generations within a single year, 80 generations within a decade. More generations mean better chances of adjusting to the new harsh environment via random genetic drift. Many insect species live much shorter than a year, sometimes only days, and they start the reproduction cycle sometimes within hours. This means thousands of generations

within a year. Such species have vastly better chances to adjust to the changing environment than large mammals that need years to reproduce. No wonder the number of insect species vastly outnumbers all other categories of living organisms. Actually, the number of insects is growing faster than science can classify them. According to some estimates, less than 20% of insects are currently identified and described. No wonder insects would be able to survive the greatest catastrophes that would drive large mammals towards extinction. A short lifespan might seem a disadvantage for the living organisms, but from the evolutionary point of view, a short lifespan and shorter reproduction cycle is a great advantage in a changing environment.

Such is an evolutionary logic – what is good for an individual (for example, living a long life or a predator-free environment), is not good for the species in the long run (Jordania, 2014:322).

It is probably time to ask why all this discussion of the consequences of an asteroid-induced catastrophe in a book dedicated to scholarly progress? The reason is simple: I propose a similar environmental catastrophe takes place in a scholarly community when a field is rocked by a powerful force known as paradigm shift. Let us try to understand the impact of the paradigm shift for a scholarly field to understand the forces and emotions involved in the event.

Suddenly all that we knew changes drastically. What was believed to be a solid and stable ground becomes a wobbly and shaky mass. The big books believed to be the Truth Tellers are suddenly revealed to be incorrect. Iconic names viewed as founding figures of our contemporary understanding are suddenly proven to be wrong. The balance of power shifts drastically, universities and grant-awarding bodies try to adjust their policies to the new understanding of the scholarly field. New names start to dominate the elite of the scholarly establishment. And exactly as it was during the asteroid-induced catastrophe, the megafauna of the scholarly establishment are the prime victims of the paradigmatic catastrophe. Bigger names, particularly the founding members of the dominating paradigm have most to lose if the new paradigm wins the battle. For the smaller fish in the middle and the lower part of the ladder, it is relatively easy to avoid the looming catastrophe.

Nevertheless, despite all the noted parallels, there is a big difference between the two types of catastrophes. When the asteroid hits the surface of the planet, it does not care whether the living population of the planet accepts this fact or whether we knew it was coming. The hit is still felt by everyone immediately, and everyone must deal with the consequences.

On the other hand, the paradigm-change-induced catastrophe only happens when a scholarly field *accepts* the change of the paradigm. So, the paradigm-change-induced catastrophe can be successfully concealed for a very long time. Can it take years and even decades? Oh, yes. Ideally, the paradigm change can be considered completed

when the Big Names, the champions of the old paradigm, accept that the new paradigm works better than the old one. So, when do you think the established scholars are ready to agree that the new paradigm works better? You guessed correctly – never.

Kuhn famously wrote that in most cases the champions of the old paradigm never concede defeat, and therefore the full paradigmatic change happens only when the biggest names from the older generation pass away. Kuhn used the famous words from Max Planck, “a new scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it.” And do not forget, humans have a very long life...

We are approaching the central idea of this chapter. Although so far I have not mentioned anything that would not be covered by Kuhn’s idea of the paradigm shift, I will attempt to critically re-evaluate Kuhn’s model.

According to Kuhn, the development of science consists of long periods of static state, of “normal science” when the establishment and their followers are busy in “puzzle-solving,” and the dynamic short moments when this static state is punctuated by violent periods of change. It is crucial here to remember that the new progressive paradigms do not announce themselves as soaring asteroids, seen in the sky and felt by everyone. They can be concealed very successfully for years even decades by the highest-ranking members of the scholarly establishment and their loyal followers. And do not forget, they have both the powerful motives, and the powerful means to defend the doomed paradigm:

(1) They have lots to lose with the victory of the new paradigm, their authority, position in the history of science, access to publishing houses and journals, grants and other elements of financial security, to mention a few things that motivate their resistance to a new paradigm.

(2) They have the most powerful means to keep new dangerous ideas from reaching the very heart of any scholarly establishment, the most prestigious peer-reviewed journals.

Of course, they also have the old and well-tried methods, such as a highly critical article signed by a great number of high-status scholars, or another surprisingly effective method – total neglect of an inconvenient new idea. And for how long do they need to halt the advance of the new potential idea? Until they pass away.

So, we have the following situation with two conflicting sides:

(1) The supporters of the established ideas, represented by the biggest names behind the current paradigm, with all their active and passive supporters; and, on the other hand,

(2) The little-known proponents (or even a single proponent) of the new revolutionary paradigm.

How do they react to the situation of a crisis? The established scholars virtually never feel there is a looming crisis. They might feel (this is a perennial feeling for most professional scholars) that there is a crisis in the funding policy of the government or pressure from various ideological and political sides, but feeling that the dominating paradigm they support is in trouble is usually impossible for them to notice.

Have you ever heard from any of the established scholars: “We are lost! We do not know what to do with the anomalies that we observe! The old paradigm does not work anymore! We need a new paradigm!” Most of the established scholars are frozen in the blissful state of “normal science,” and they will never declare a crisis at their hands. So do not expect them to declare the crisis in the field. Most likely, diehard adherents of the old paradigm will die still believing they were correct, exactly as Kuhn (and Max Planck) described.

On the other hand, the proponents of the new ideas, mostly researchers from other fields of expertise or relatively young scholars, are not actually waiting for the situation to become critical for the dominating paradigm. Their activities are not bound to the crisis. On the contrary, they claim the presence of better alternative ideas virtually constantly. They are usually ridiculed or neglected by the established big names and their supporters. In terms of the power tools to propagate their ideas, the proponents of the new and potentially progressive ideas have no effective means to push their ideas towards acceptance by mainstream scholarship, as the most effective ways to achieve the breakthrough are blocked by the representative of the dominating paradigm.

There is also another powerful force that works against the proponents of new ideas and in favor of the “conservatives.” It is the unity of the supporters of the old paradigm, whereas the group of “progressives” is often divided, with different ideas, and the worst of all, sometimes the various progressive groups are more hostile towards each other than towards the old paradigm.

Very gradually, as the new idea (or one of the new ideas) obtains a few supporters, it will have a chance of a real success, but only after the supporters of the old dominating paradigm wither and die out. So, we have the following situation regarding the paradigm shift:

(1) on one side of the confrontation, we have a group of established scholars who are never going to declare a state of crisis in their sphere, let alone accept defeat.

(2) On the other side, we have a group of scholars (not necessarily united around a single idea) who are constantly pushing for change.

So, for the “conservatives,” there is never a crisis situation, and for the “progressives,” every opportunity is a time to shatter the existing paradigm. The conflict becomes more pronounced only if one of the alternative ideas obtains a few supporters. That’s when the proponents of the dominating paradigm start writing critical letters against the new idea. We do not have a critical moment for the paradigm change when it is felt that the old paradigm is having troubles (as this is never acknowledged by the established group), but only when a new potential idea gets supporters, mostly among the “smaller fish,” who do not fear the consequences of the catastrophe of the paradigm shift.

As for the top representatives of the megafauna, the potentially catastrophic consequences of the paradigm shift bar their objectivity. This is hardly a revolutionary process, it is so constant and gradual. I propose that the development of scholarly progress and the revolutionary change of the old paradigm happen roughly according to the following scenario:

(1) To start with, there are never-ceasing, ongoing arguments against the dominating paradigm from various thinkers and from different directions;

(2) There is usually not a single archenemy to the dominating hypothesis; instead, there are several rival ones, each claiming to be the right one;

(3) Many of these new ideas may be wrong, but there may be a suggestion that is destined to replace the dominating paradigm;

(4) Among the ideas not destined to become the next winning paradigm might be one destined to become the basis for the new paradigm after a generation or two (it is just too early for this idea);

(5) A big part of these new ideas never reaches the attention of the scholarly community or a wider audience;

(6) Only in some rare cases (and for various objective and subjective reasons) will a new potential suggestion gain momentum and find a very small number of supporters;

(7) The supporters of the new idea start proclaiming the necessity of the paradigm change, advertising they have the new Big Idea, the game changer;

(8) The fact that there are claims of more than one revolutionary idea is usually used skilfully by the proponents of the old paradigm: it is always easier to bunch together and dismiss out of hand several new ideas floating around than the single critical (and for them the most threatening) idea;

(9) Most illustrious defenders of the old paradigm never accept the new paradigm, or even the fact that the old paradigm is not working;

(10) Apart from the adherent of the new idea, and the conservative adherents of the old paradigm, there are other schools supporting other ideas as potentially alternative new paradigms.

(11) As the defenders of the old paradigm wither and die, the most promising (or the most supported) new paradigm has a good chance to become the dominating paradigm. This is time for the fabled “Paradigm Shift.”

(12) Only after the “paradigm shift” is accomplished are scholars able to notice there was a period of struggle and violent change in a scholarly field;

(13) By the time the new revolutionary paradigm is accepted, there already may be scholars who can see caveats in the new paradigm and come up with a better idea that has the potential to overthrow the just-accepted paradigm.

(14) This better idea can be one of the competing new ideas that were around for years, but did not attract the attention it deserved as it was miles ahead of the other ideas;

(15) But the momentum for this newest idea is still far away, the followers of the just established paradigm are not yet old and frail, and the author of the newest idea is ridiculed or neglected.

The never-ending cycle goes on another circle. We can only hope that the author of the newest revolutionary idea is a young person.

Sadly, some truly revolutionary ideas start gaining supporters only after the author of the idea has passed away (like Gregor Mendel). So, the process of development of science is much more “bushy” and “unorganized,” with many more steps and gradations than, in the clear and slick model proposed by Kuhn: “long stretch of static puzzle-solving – accumulation of anomalies, leading to short violent revolutionary shift – followed by another stretch of static puzzle-solving.”

Most potentially worthy ideas are left out of the interests of mainstream science, and it is hard to tell which ideas that exist today in various corners of our planet will be praised in fifty or a hundred years. We only learn about the scholarly revolutions and paradigm changes when they are the news from yesterday’s newspaper. Science, like a famous joke by Winston Churchill about Russia, has an “unpredictable past.”

On Fear and Cravings for Paradigm Change

Despite the fear of mainstream scholars for paradigmatic changes, there is a widespread desire to present paradigmatic changes in many spheres of science. Two questions arise naturally. The first is why? And second is how is it possible to be terrorized by the possibility of paradigm change and at the same time to strive to come up with the paradigmatic changes?

It is relatively easy to answer the question of why paradigmatic change is so coveted by many scholars. Paradigmatic changes are the Big News, they are publicized in the pages of the national media, are presented in the most prestigious journals, give a boost to the reputation of the scholar or institution that proposes the new paradigmatic finding, and of course, confirms that the new idea is definitely worth generous funding.

As we can see, paradigmatic changes can bring highly desirable and lucrative results. But how can this tendency live with the fear of a paradigm change that can wipe out the megafauna of the scholarly establishment? Let us try to answer this much more difficult question. The only possibility to propose paradigmatic changes in a scholarly field that will not threaten the establishment is to propose a relatively important finding as a paradigmatic change.

Many important discoveries, like mapping a DNA sequence of a species for the first time, or finding a new animal subspecies, or unearthing a new type of hominid remains are often claimed to be a paradigm shift, whereas paradigm shift is what it is – the profound shift that declares an earlier system of understanding fundamentally wrong. It is not a mere accumulation of facts or describing a new species.

“The transition from a paradigm in crisis to a new one from which a new tradition of normal science can emerge is far from a cumulative process, one achieved by an articulation or extension of the old paradigm. Rather it is a reconstruction of the field from new fundamentals, a reconstruction that changes some of the field's most elementary theoretical generalizations as well as many of its paradigm methods and applications. During the transition period, there will be a large but never complete overlap between the problems that can be solved by the old and by the new paradigm. But there will also be a decisive difference in the modes of solution. When the transition is complete, the profession will have changed its view of the field, its methods, and its goals.” (Kuhn, 1962:84-5).

As we can see, the real paradigm shift is nothing short of real violent revolution, with big names trampled in a bloody coup. The scholarly establishment will never allow such a coup, as they themselves will be the most likely the first victims of the revolution. “Not allow” is a very mild word, they will be the greatest enemies of such a revolution. And they have the most potent army and weapons to fight such revolutions and to prevent major loss of careers and jobs.

This army includes troops of well-disciplined peer soldiers, the unbreakable bastions of peer-reviewed journals, sniper fire of well-informed skeptics, the power of scholarly mobbing by a critical letter with many dozens of well-known names. So, who can overtake them? They are unlikely to allow any democratic elections and leave in peace, so the change of generation is usually the most likely background for the paradigm shift, as Kuhn (based on the words of Max Planck) claimed.

For the sake of objectivity, we should note, that non-professional scholars like the sound of the claim of “paradigm shift” even more than professional scholars. For them the claim of paradigmatic changes is often used to get others’ attention. So, there is an obsession with the notion of paradigm changes everywhere. Listen to Stephen Jay Gould: “Before Kuhn, most scientists followed the place-a-stone-in-the-bright-temple-of-knowledge tradition, and would have told you that they hoped, above all, to lay many of the bricks, perhaps even the keystone, of truth’s temple. Now most scientists of vision hope to foment revolution. We are, therefore, awash in revolutions, most self-proclaimed” (Gould, 1986:27). Hard to disagree.

So how do I propose to approach this bottomless topic? We will approach this issue by discussing one by one various factors of scholarly progress: the importance of progressive ideas and consensus, fear of generalizations, predictions, dislike of exceptions, the coveted notion of the Final Truth, and the value of praise and critique. Let us have a quick look at several elements of the notion of paradigm changes and, by extension, the general progress of science.

On Progressive Ideas

A man with a new idea is
a crank until he succeeds.

Mark Twain

First of all, I would like to make a suggestion that will sound controversial to many readers. I suggest considering all the critical (critical to dominating paradigm) ideas as “progressive.” Well, is it really fair to call every new idea “progressive” in comparison with the established idea? Let us agree that not every new idea is really progressive. The new idea might result from the fact that its author idea lacks understanding of the basic premises, might belong to an unscrupulous amateur, whose writings are hardly worthy of reading. Yes, it is true that many new ideas might offer little to the progress of science, but unfortunately, this becomes clear only after a considerable time. We should never forget that behind the badly written text, misspelled names and irritating absence of solid references might be a worthy revolutionary idea. As bad as it might sound, today we cannot give the final diagnosis to most of the new ideas floating around. Even if the bearer of the idea is a confirmed medical case, this does not guarantee that the idea she or he proposed is totally off target.

“There are sadistic scientists who hurry to hunt down errors instead of establishing the truth,” said great Marie Curie. “No idea should be suppressed. ... And it applies to ideas that look like nonsense. We must not forget that some of the best ideas seemed like nonsense at first,” said brilliant British-American astrophysicist

Cecilia Payne-Gaposchkin (1996), who firsthand experienced such treatment. Despite all the shortcomings of my suggestion, I want to direct your attention to the important feature that all the new progressive ideas have in common – they try to find the caveat in the old idea and try to achieve changes in our understanding of the field of scholarship.

Bombarding the dominating paradigm with critical comments to question its basis is probably the healthiest way of development of any scientific discipline. The suggested changes might be small but could be paradigmatic as well. All these critical comments and ideas are like the countless small genetic drifts that take place in all living species all the time. Most of the proposed changes are neutral or even negative and never go into the main pool of the species, but some changes gradually result in the establishment of important changes in morphology and behavior leading to new subspecies and even new species.

By the time a new progressive idea finally becomes established and accepted by the community of peers, very often it is already time to replace this idea with another, more progressive one. But of course, those scholars who were fighting for the idea that has been finally accepted are not ready to give up and accept the new idea. After the paradigm shift, former progressives gradually become conservatives...

Conclusion: I suggest that every new idea, every new critique of the old paradigm, should be considered potentially progressive as they try to reveal weak points in the dominating paradigm, and this critical approach is invaluable for the progress of any scientific field. Even if the critical idea sounds very much like the old paradigm that was discredited decades or even centuries ago, it still deserves a new objective and careful look. With a little twist, the old idea might prove to be the winner.

On Consensus

John Ziman, British-born New Zealand physicist and humanist, called consensus “the touchstone of reliable knowledge.” Possibly the consensus of most peers in a certain sphere is a good indication of the reliability of the knowledge on the subject for mainstream science, but we know too well that the most progressive ideas at any moment in history were and are believed by a very small group of scholars, sometimes by a single scholar. Consensus only highlights the current level of understanding, not the cutting edge of the progressive understanding of the problem.

Considering that most of the mainstream scholars receive funding for following their spheres according to mainstream views, and take into account that if they change their point of view, they might be out of the “circle of trust” of peers and grant-giving bodies, you can understand how dangerous the idea or “consensus as a touchstone of reliable knowledge” is.

Even seemingly very reliable knowledge might prove to be incorrect in a few years. So, what are the majority of scholars doing to achieve a coveted consensus and search for new solutions? According to Thomas Kuhn, “Normal science does not aim at novelties of fact or theory and, when successful, finds none.” Kuhn again: “Under normal conditions the research scientist is not an innovator but a solver of puzzles, and the puzzles upon which he concentrates are just those which he believes can be both stated and solved within the existing scientific tradition.”

And let us remember what seems to be quite a fair assessment of what consensus represents: “Consensus is invoked only in situations where the science is not solid enough” (Michael Crichton). So, can we make a general conclusion about the phenomenon of consensus? Here is my personal conclusion:

Scientific consensus is dangerous. It is often invoked to support the existing paradigm against the new ideas. Be critical and think twice if you are going to use the existing consensus as a support for your position, and most importantly, never, never confuse (and never misrepresent) consensus for a fact.

On Generalization

If you check the existing opinions and sayings on generalizations, you will soon find that most of them are negative, accusing generalizations of being false, misleading, even dangerous. The creator of the immortal *Three Musketeers*, Alexandre Dumas said, not without his famous irony: “All generalizations are dangerous, even this one.” The creator of *Huckleberry Fin*, Mark Twain seconded, accusing generalizations of another vice: “All generalizations are false, including this one.” So, generalizations can be false and dangerous.

Generalizations are understandably unwelcome in many fields of science. “Men are more apt to be mistaken in their generalizations than in their particular observations,” attributed to a mastermind of political games, Niccolò Machiavelli. Fear of generalization is not new. Charles Darwin, writing to Henry Fawcett in 1861 said: “About thirty years ago there was much talk that geologists ought only to observe and not theorise; and I well remember someone saying that at this rate a man might as well go into a gravel-pit and count the pebbles and describe the colours. How odd it is that anyone should not see that all observation must be for or against some view if it is to be of any service!”

To avoid being accused of rushing to conclusions, Darwin delayed publication of his speculations: “After five years' work I allowed myself to speculate on the subject, and drew up some short notes; these I enlarged in 1844 into a sketch of the conclusions, which then seemed to me probable: from that period to the present day I have steadily pursued the same object. I hope that I may be excused for entering on these personal

details, as I give them to show that I have not been hasty in coming to a decision” (1859:22).

Apart from the negative attitude towards generalizations in science, there are also positive ones that show the need for generalization for the good of scholarly progress. “The essence of knowledge is generalization ... The art of discovery is therefore the art of correct generalization.... The separation of relevant from irrelevant factors is the beginning of knowledge” these words are from Hans Reichenbach, author of *The Rise of Scientific Philosophy*. “Every science begins by accumulating observations, and presently generalizes these empirically; but only when it reaches the stage at which its empirical generalizations are included in a rational generalization does it become developed science,” these are the words from Herbert Spencer. “There is nothing particularly scientific about excessive caution. Science thrives on daring generalizations,” said L. Hogben, a British experimental zoologist and medical statistician. Generalization is considered a key element of scholarly activity – prediction (see the next section): “The trick in discovering evolutionary laws is the same as it is in discovering laws of physics or chemistry — namely, finding the right level of generalization to make prediction possible,” said Matt Cartmill, an American paleoanthropologist.

As an open-minded scholar Darwin deeply believed in speculation: “I am a firm believer, that without speculation there is no good and original observation” (Letter to A. R. Wallace, 22 Dec 1857). Clearly in defense of generalizations, Darwin wrote: “False facts are highly injurious to the progress of science, for they often long endure; but false views, if supported by some evidence, do little harm, as everyone takes a salutary pleasure in proving their falseness; and when this is done, one path towards error is closed and the road to truth is often at the same time opened,” (1871, Vol. 2, 385).

Any hypothesis, any theory, or any other product of scholarly mind starts with generalizations, and we should not see this as something negative. “Every fundamental law has exceptions. But you still need the law or else all you have is observations that don't make sense. And that's not science. That's just taking notes,” said British physicist Geoffrey West.

Once again, the attitude of Charles Darwin can set an example for us: “I have steadily endeavored to keep my mind free so as to give up any hypothesis, however much beloved (and I cannot resist forming one on every subject) as soon as the facts are shown to be opposed to it.”

Conclusions: Despite many obvious flaws, stigma and existing negativity towards generalizations, we have to accept that science starts with generalization. So do not avoid generalizations but be careful and keep them to yourself for some time –

check the exceptions, make predictions, and be honest and brave to discard your generalizations when you discover contradicting facts.

On Predictions

We make predictions in everyday life all the time. But there are different types of predictions, and their value varies greatly. For example, if you advise a family member to take an umbrella because the sky is cloudy, this kind of prediction would hardly astonish anyone, but if somebody in 2004 predicted that on December 26 there would be a big earthquake in Indonesia, well, this prediction might have a life-changing effect for thousands of people.

There are experts making predictions in various fields, sometimes for a living. Some experts can, for example, predict the winning horse, or the directions that the stock market will take, etc. But alas, they are not as accurate as we want them to be. What about science? Does science need predictions? To discuss this very interesting topic, I will start from a little strange and even somehow scary story from my own teaching experience.

Many decades ago, still in Georgia, I was teaching an aural training [ear training] to a young aspiring musician, a girl of about 17, who was planning to study at a tertiary musical institution. Let us call her Maggie. Maggie was extremely talented, played efficiently both guitar and piano, sang very well and composed songs. All was fine; Maggie was brilliant, but during our lessons in aural training we suddenly hit an unexpected problem: she had great difficulties in recognizing directions correctly. For example, if I was playing notes of an ascending scale, “A, B, C, D” she sometimes (not always) would recognize them as “A, G, F, E.” When she repeated the phrase, she was always singing correctly, but her naming (and writing down) of the notes was often in the wrong direction.

It was strange hearing her going up correctly by singing “A-B-C-D” melody and pronouncing the notes as “A-G-F-E.” We probably all know people who have problems correctly naming directions “left” and “right,” and we also know that they never make mistakes in showing the correct directions by hand gesture, but I had never seen this problem so pronounced in music.

As the aural training was the first and the most important demand at Georgian music tertiary institutions, she had great difficulty passing the very first exam in aural training. While struggling to teach Maggie, I recalled that my mother also had serious directional problems. Although she did not make mistakes in musical directions (she was a piano teacher), she was constantly baffled by right and left in the physical world and would confuse in which direction the train must go, etc. And I am sure that the most probable cause for my mother’s directional confusion was that she was a very

strong left-handed person, and in her childhood she was forcibly made into a right-handed person. Actually, she still does everything with her left hand but writes with her right hand. I am not a neurologist, and never had any training in the problems of forced right-handedness, but I had a feeling that Maggie had a similar problem.

“Maggie, are you left-handed?” I asked. “I was left-handed, but now I am mostly right-handed” she replied. Hearing her reply, and after a few seconds of silence, I told her quite strange words “Maggie, I think it will be dangerous for you to drive a car when you grow up.”

I said this because I knew her father was wealthy, and as a single daughter, Maggie most probably would have a car in a couple of years. And here comes the scary part of the story. Maggie looked at me and I saw fear in her eyes: “You are the second person telling me this!” she said. I was shocked. “And who was the first person?” I asked. She replied with a small story from her childhood: “I was about seven or eight years old and was walking with my father down the streets. My father met someone I did not know, and they talked for a few minutes without paying any attention to me. I was just standing there bored, waiting for them to finish the conversation and to continue my walk with my father. At the end of their conversation the stranger paid attention to me. “Is this your daughter?” he asked my father. “Yes” replied my father. “Do not allow her to drive a car,” he said to my father and went his way. I was shocked by his rudeness, and as I was always dreaming to drive a car, I asked my father who the hell this person was and why he said such a strange thing about me. “I have known him, not very well, for several years,” said father to me. “I do not know why he said such a thing about you, but he is known in our town as a clairvoyant. He sometimes helps people find their lost belongings.” “I never remembered his strange words,” finished Maggie “until now, when you told me the same thing!”

I explained to Maggie my train of thought, telling her about my mother’s confusion of directions and her forced change of handedness. I had no idea how the stranger could make the same conclusion without information other than just seeing a little girl. Possibly he noticed any abnormalities in her eye or hand movements? Difficult to say.

We are fascinated by predictions, and we value true predictions. In the above small story, there are two predictions. My prediction was based on first-hand knowledge of Maggie’s condition, the struggle most likely going on in her head, and another case with a similar problem. My prediction, so to speak, was more or less a result of “scholarly” reasoning. Conversely, the prediction from the local clairvoyant was seemingly beyond scientific scope, and I have no clue how to discuss this kind of prediction.

But why do we need to discuss predictions in a book dedicated to the scholarly issues in the first place? Predictions might seem a very unscholarly endeavor to those

uninitiated in scientific methodology. Make no mistake: predictions play an important, I would even say, a crucial role in science. Scholars, particularly those, who are making discoveries, are supposed to make predictions. And the unlikelier the predictions, the more valuable they are. And if it happens that the prediction is confirmed, the vulnerable hypothesis has a right to be labelled a “theory.” And if the prediction was not correct, well, then the hypothesis was “falsified.”

Therefore, predictions are a vitally important part of scholarly life. One of the most famous predictions of the 20th century was made by Albert Einstein, when he famously predicted the unusual behavior of the light during the solar eclipse. When the prediction was observed to be true on May 29, 1919, the theory of general relativity received strong confirmation.

There are various attitudes towards predictions and their value. Some believe predictions are inaccurate to the level of joking openly about them: “Predictions can be very difficult — especially about the future,” said one of the greatest physicists, Niels Bohr. Alan Cox, a British computer programmer and a key figure in the development of Linux, might have found the winning formula to make predictions, with a healthy dose of humor: “I figure lots of predictions is best. People will forget the ones I get wrong and marvel over the rest.” And here is a joke from brilliant Mokokoma Mokhonoana “Historians predict the past for a living.”

Predictions are distrusted by many: “If you learn one thing from having lived through decades of changing views, it is that all predictions are necessarily false,” this is M. H. Abrams, an American literary critic, and this is Jodi Kantor, award-winning American journalist, author of the best-seller *The Obamas*: “I’ve learned that the best political reporters never make predictions.” The legendary Chinese philosopher, Laozi even contrasted those who “know” with those who “predict:” “Those who have knowledge, don’t predict. Those who predict, don’t have knowledge.” And Rick Perlstein, American historian, went further in discouraging predictions: “Let there be a special place in Hell for pundits who make predictions.”

But if you are a scholar and claim to have made a discovery, you have no choice: you have to make predictions! And frankly, predicting is not easy. Listen to Lisa Randall, American theoretical physicist from Harvard “We have this very clean picture of science, you know, these well-established rules with which we make predictions. But when you’re really doing science, when you’re doing research, you’re at the edge of what we know.” Some believe the correctness of prediction comes from the data available: “Big data is mostly about taking numbers and using those numbers to make predictions about the future. The bigger the data set you have, the more accurate the predictions about the future will be,” said Anthony Goldbloom, who became famous by creating predicting models in Kaggle. Well, we might argue with this: is this only about the data? What about the correct methodology and out-of-square approach?

Predictions are a vital part of hypotheses and theories. “Theory is a window into the world. Theory leads to prediction. Without prediction, experience and examples teach nothing” said W. Edwards Deming, American engineer, one of the pillars of the Japanese Post-War economic miracle. “Till facts be grouped and called there can be no prediction. The only advantage of discovering laws is to foretell what will happen and to see the bearing of scattered facts,” words of Charles Darwin.

Surprising and risky predictions are particularly valued. Karl Raimund Popper, the key figure in the 20th-century history of science confirms this “It is easy to obtain confirmations, or verifications, for nearly every theory—if we look for confirmations. Confirmations should count only if they are the result of risky predictions.” “The job of theorists, especially in biology, is to suggest new experiments. A good theory makes not only predictions, but surprising predictions that then turn out to be true,” seconded Francis Crick, Nobel Prize-winning British molecular biologist. And here is my favorite saying that I would recommend displaying at every science department of every university: “Science is not, despite how it is often portrayed, about absolute truths. It is about developing an understanding of the world, making predictions, and then testing these predictions.” This one is from Brian Schmidt, an American-Australian Nobel-laureate astrophysicist.

Conclusion: very much like professional clairvoyants, scholars are supposed to make predictions. Unlike the clairvoyants, they need to have a logical thread leading to the subject of their prediction. The riskier and the more unexpected predictions are particularly valued. So, if you are an aspiring scholar and want to make revolutionary discoveries, try to predict things in the light of your new hypothesis. Even more, because of human striving towards the unknown and fascination with the future, your predictions might get more attention of the scholarly world, than the hypothesis itself.

On Exception

If you are a scholar (professional or amateur) you know how annoying exceptions can be. You just came up with an original explanation of the problem, there are so many facts that fit beautifully in your model, and suddenly, you find a fact, of a group of facts that do not fit. Even a single exception might stick out like a sore thumb. “One gram of suspicion weighs heavier than a kilo of truth,” said Mehmet Murat Ildan in his 2001 play *Galileo Galilei*.

Most scholars, when they formulate new hypotheses, are carried away by the long list of facts that fit comfortably into their hypothesis, and they often tend to neglect the facts that do not fit their hypothesis. Understandably, most scholars dislike exceptions and they use various strategies to deal with exceptions:

- (1) Some scholars manage to coerce exceptions into their hypothesis;

- (2) Some try to discredit (or as they say “critically check”) the annoying fact;
- (3) If there is no good reason to discredit the fact itself, then some try to discredit the person (usually another scholar), who brought the inconvenient fact;
- (4) Some manage to neglect the exceptions altogether (particularly if they were not mentioned in a peer-reviewed journal);
- (5) And if nothing helps, notorious sayings like ‘no rule without exceptions,’ or even worse, ‘the exception proves the rule,’ are always at hand (although the original meaning of this saying had a different connotation).

Of course, to a non-biased person, it is obvious that an exception cannot prove the rule, and that a rule with “exceptions” is actually a bad rule. My favorite literary hero, Sherlock Holmes, once said: “I never make exceptions. An exception disproves the rule.” I agree with Mr. Holmes and consider the saying “exception proves the rule” as the last resort for a bad hypothesis. “Science does not permit exceptions,” said Claude Bernard, French psychologist, symbolically the inventor of the crucial concept of the “blind experiment.”

So, how to assess the complex phenomenon known to us as an “exception?” It all depends on how you look at the exception. For the majority of scholars, an exception is a deadly enemy, a hostile detractor to the dominating paradigm, or the new promising idea. But it is very different for broadly thinking scholars. For them exceptions feel like gifts from God:

(1) An exception is a scholar’s best friend, the only true friend that tells the bitter truth. Do not listen to the calming array of facts that prove your hypotheses; they are like flattering friends who are ready to lie to you to make you happier. Listen to your only true friend – exception. And only if this friend is silent, not complaining of facts that do not fit your idea, can you be truly happy. One exception can outweigh dozens of proving facts. There is no greater proof for your hypothesis than the absence of an exception. In case of exceptions, it is true that “silence is the sign of approval.”

(2) An exception is a door to discovery. This is not only a metaphorical comparison. An exception is always pointing the direction to an improvement. Many exceptions known in scholarly fields and never addressed are the lost opportunities for a better explanation, or even for a paradigm shift. So, instead of fighting exceptions, try to use them as the leading force towards the new development of your ideas.

“Exceptions are not always the proof of the old rule; they can also be the harbinger of a new one,” said Marie von Ebner-Eschenbach, Austrian writer. Or as G. K. Chesterton, an English writer, philosopher, and critic said, “Paradox has been defined as ‘Truth standing on her head to get attention.’” It is up to you how to view exceptions. If you are broad thinking scholar exceptions fascinate you and provoke to

think of new ways of solutions, but if you are conservative, you are afraid of exceptions as troublemakers in an otherwise clear picture. We could even coin a saying: “Tell me how you deal with exceptions and I will tell you what kind of scholar you are.”

The progress of scholarship mostly starts with the exceptions that do not fit the existing theory of a hypothesis. Neglecting them is neglecting the new golden opportunity of the progress of science.

Conclusion: if you want to make discoveries, start appreciating and even collecting exceptions, by far the best tool to lead towards the progress of science.

On Truth

“Philosophy is the science which considers truth,” said Aristotle. “Plato is my friend, Aristotle is my friend, but my greatest friend is truth,” said Isaac Newton. “The first business of a man of science is to proclaim the truth as he finds it, and let the world adjust itself as best it can to the new knowledge,” said Percy W. Bridgman, American Nobel Prize laureate physicist and a philosopher of science. Here is Konrad Lorenz: “Scientific truth is universal, because it is only discovered by the human brain and not made by it, as art is.”

In the next quote the scholarly arrogance reaches unusually high levels: “I no longer count as one of my merits that I always tell the truth as much as possible; it has become my metier,” this is Sigmund Freud, in his letter to none less than Albert Einstein. The following words about the truth sounds like a religious statement: “We know truth, not only by the reason, but also by the heart.” These words come from one of the greatest scholars of the past, a French mathematician, physicist, inventor, writer, and importantly, a theologian, Blaise Pascal.

At the same time, truth and searching for it can be a butt of the jokes: This is George Bernard Shaw: “People exaggerate the value of things they haven’t got: everybody worships truth and unselfishness because they have no experience with them.” “As scarce as truth is, the supply has always been in excess of the demand,” this is Josh Billings, famous American writer-humourist, rival of Mark Twain. Deeper truth might be very complex and even contradictory. Listen to Niels Bohr: “The opposite of a correct statement is a false statement. But the opposite of a profound truth may well be another profound truth.”

So, what is the truth? How can we characterize this complex phenomenon from our contemporary scholarly perspective?

Truth, particularly the notion of the Final Truth, is an extremely dangerous phenomenon for the progress of science. The scholarship is done by **discovering a better explanation of the existing facts than the current theory, not by discovering**

the Final Truth. And do not believe that your idea, even if it has been accepted by the mainstream scholarly community is the Final Truth. This kind of belief might put you in a very dangerous state of mind. It is this state of mind that turns progressive scholarly ideas into subjects of belief and turns progressive scholars into conservative believers who reject out of hand any new ideas.

Why is this so? This happens because knowledge (and particularly belief in certain knowledge) is very much like a beast of highly territorial habits. It does not tolerate another of its kind on the same territory. You must be very careful not to lose the long-term perspective of scholarly development and not to fall into this trap of worldwide acceptance. Even if you receive the most prestigious awards, and your idea is popular within this generation of scholars, almost inevitably in a few decades or a few hundred years the science will bring currently unimaginable changes.

So, think for a minute: do you believe the idea you support will be as valid in 1000 years? Or 500, or even 100 years? Newton's phrase probably shows a good understanding of the limits of human scientific capabilities: "I do not know what I may appear to the world, but to myself I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, whilst the great ocean of truth lay all undiscovered before me." "The scientist knows very well that he is approaching ultimate truth only in an asymptotic curve and is barred from ever reaching it; but at the same time he is proudly aware of being indeed able to determine whether a statement is a nearer or a less near approach to the truth." — this is Konrad Lorenz.

The search of the truth has been recognized as the source of mistakes. "To know the history of science is to recognize the mortality of any claim to universal truth," said Evelyn Fox Keller, American physicist and author. "Truth in science can be defined as the working hypothesis best suited to open the way to the next better one," said Konrad Lorenz. The partial nature of truth was also known long ago: "Truth is a remarkable thing. We cannot miss knowing some of it. But we cannot know it entirely" — this is Aristotle. "We have to be ready to live today by what truth we can get today and be ready tomorrow to call it falsehood" declared pragmatist William James. Austrian philosopher of science, Paul Feyerabend accused Kuhn of retreating from the more radical implications of his theory of scientific revolution, that scientific facts are never really more than opinions, whose popularity is transitory and far from conclusive.

In my personal opinion, searching for truth is fine, but scholars should be beware of believing they have found it, as the staunchest enemies of new progressive ideas, as a rule, are those who believe the Truth has already been found. Let me repeat: in the best-case scenario, scholars are expected to discover a better explanation of the existing facts, not finding the Final Truth.

Conclusion: Probably the only Final Truth is the statement that there is no Final Truth, and even if there is one, we will never know it. Final Truth is a very negative force in the development of science, and for scholars, believing that they have found a final truth is the shortest way to scholarly death. If it seems you have found the one, calm down and ask yourself, will the knowledge of the next 500 of 1000 years bring anything new in this sphere? And mind, 1000 years is a very short time in history.

On Simplicity

When reading scholarly writings, sometimes you will be amazed, possibly even disturbed, at the heaviness of the professional jargon, complexity of the sentence structure, overwhelming amount of references, and complicated logic of the arguments. And then might come a moment when you ask: “Is this author trying to tell something new and very complicated, or the absence of fresh and interesting ideas concealed with this overtly complex language?”

If we have something really important to say, we naturally want to express our idea in as simple as possible words. “Simplicity is the ultimate sophistication,” said Leonardo da Vinci. “Truth is ever to be found in simplicity, and not in the multiplicity and confusion of things,” said Isaac Newton. “You must learn to talk clearly. The jargon of scientific terminology which rolls off your tongues is mental garbage,” said Martin H. Fischer, German-American physician. And finally, listen to Karl Popper: “The method of science depends on our attempts to describe the world with simple theories: theories that are complex may become untestable, even if they happen to be true. Science may be described as the art of systematic over-simplification—the art of discerning what we may with advantage omit.” And Popper again, this time more harshly: “In my view, aiming at simplicity and lucidity is a moral duty of all intellectuals: lack of clarity is a sin, and pretentiousness is a crime.” I am afraid if Popper’s suggestion was accepted as a law, plenty of scholars would have been accused of committing this crime.

Conclusion: if you have something new and important to say, try to be as clear and direct as possible, in language as free from professional jargon as possible. This is particularly important if you are saying something new, and hope to reach a larger audience, especially to have more chances to reach open-minded and sympathetic thinkers out there.

On References

References are important to scholarly work, there is no question about that. They tell us about the existing background of the research, and how informed the author of

the existing scholarly literature is. Many scholars, when looking at the work of an unknown author, look at the references first. Possibly because the references are often viewed as the visiting card of the scholarly publication, for some scholars to have many references (and to have your works included in the references of many articles) became one of the criteria to assert their prestige and scholarly worth of the new research.

I want to raise a question of how important excessive references are in our time, when any new work, any author, any idea and any quote can be easily found on the internet. It seems to me the attitudes towards references should change, at least, partially. For example, the reader can find many quotes on many subjects from various thinkers in this book. Well, the traditional wisdom requires that quotes need precise referencing, but presenting all these references (which can be easily verified on the internet) will make the text less readable, heavier, and will distract readers from the argument.

Of course, if an author has nothing new to say, then the use of heavy technical language with excessive references has a very practical aim of distracting readers from the absence of a new idea, but if the author is trying to communicate important content and to use the clear and direct language, excessive references are probably better to avoid.

Do you remember what Leonardo da Vinci said about the official scholars of his day and their method of proving their dominance? “Though I may not, like them, be able to quote other authors, I shall rely on that which is much greater and more worthy — on experience, the mistress of their Masters. They go about puffed up and pompous, dressed and decorated with [the fruits], not of their own labours, but of those of others. And they will not allow me my own. They will scorn me as an inventor; but how much more might they — who are not inventors but vaunters and declaimers of the works of others — be blamed.”

No amount of knowledge of the existing works and their precise referencing can replace original thinking.

Conclusion: references are an important part of any scholarly work, but do not overestimate them and do not use them excessively. If the readers are particularly interested in a quote from your text, an idea, or the author you are mentioning, they can easily check everything on the internet within seconds. Excessive references might be distracting to many readers. Instead of impressing readers with your wide knowledge of the existing scholarly publications, try to impress them with the originality of your ideas and bold predictions.

On Praise and Critique

I was not sure I needed to discuss these issues in this book. Praise and critique are not a part of the scientific method, neither research tools. At the same time, the issue of receiving or giving praise and critique is extremely important to every scholar, and by extension, to the history of science. Remember, science is not only happening when you are formulating a brilliant idea or publishing it. Communicating with other scholars, giving or receiving positive or negative comments, and answering to them is an important part of scholarly life. That's why I decided to mention several points on this hot and somehow neglected issue.

First of all, let us remember that we are dealing with two very different phenomena: positive (praise), and negative (critique). Second, it is hugely different whether we are at the receiving or the giving end of the praise or the critical comments. Apart from this, your current position (beginner or established authority) also affects strongly your emotions when receiving praise or critical comments. All these cases are naturally different and need various treatments. Therefore, we will discuss a few points on each of these situations.

We will start from the situations of being on the receiving end of praise and particularly of critical comments. As a rule, it is nice to be praised, although the praise might have a very different weight for us. It is one thing to receive praise from your girlfriend or boyfriend, or any of your relatives or friends, and, on the other hand, to hear positive words from someone totally unrelated to you. And of course, praise has a special significance (we might even say, life-changing significance) when an expert from the field, who is neither your friend nor a relative, suddenly gives acknowledgment to your idea.

You have done very well if your new idea was noticed by even a single expert from the field. One sad detail should be also briefly mentioned. We have to remember that sometimes our friends and family are among the last to acknowledge our ideas. They need to hear that the ideas had been appreciated by someone else from the field. We might understand their reservations, as it might be beyond their grasp to understand the importance of your ideas.

Generally speaking, receiving praise is a very positive experience, so we do not need too much of the discussions on this issue. On the other hand, receiving critical comments is something that we all hate more or less. And it is exactly here, in reacting to critical comments, that scholars differ drastically, and it is here we might all benefit from sharing experiences and strategies on how to deal with critical comments.

Let us discuss what kind of differences we are talking about. Most scholars (I would even say, most humans) virtually instinctively go into the defensive mood as soon as they are faced with critical comments. As a result, they are missing the

tremendous potential possibilities that critical comments can bring to their work. Remember, a critical comment is not a dead-end; it is a challenge, and like any other challenges of life, if we react wisely, they can make us stronger.

And what is a wise reaction to the critical comments? We need to remember that potentially all critical comments can be used to make your argument stronger. Even if the comment was designed to destroy your idea and your confidence, you can still extract a positive outcome, by thinking more over the substance of the critical comment and sharpening your idea. So, the right first reaction on the critical comment is to entertain the idea that the author of the critical comment is correct (despite the unacceptable tone of the critical comment). Search as objectively as you can if there is even a small constructive element in the comment. And even if you are dealing with dismissive or vitriolic comments, you will do very well if you respond to the essence of the critical comment, clarifying your position, or indicating the possible change to your idea.

Remember, hearing and appreciating objectively critical comments are as difficult for the author of the new revolutionary idea, as for the critics to objectively appreciate the new revolutionary idea that goes against their long-held professional beliefs. Try not to pay much attention to unsubstantiated critique only stating that your ideas are “bad science” or a “fringe science.” Some of the best revolutionary ideas in the history of science received the same treatment, so you are in a good company!

Also, if you think that a harsh critique is the worst treatment that might happen to your idea, you are mistaken. The first and universal stage of reception for most revolutionary ideas is that you and your idea are just ignored. So, be ready for long years of neglect.

This might sound ironic, but receiving critique is the first sign of appreciation, the start of a dialogue. So, congratulations! And in case if you are ridiculed by someone from the field, you can always calm yourself down recalling the words of Oscar Wilde: “Ridicule is the tribute paid to the genius by the mediocrities.” Only the time will tell which of the arguing sides is correct. It is also possible that after looking objectively at the critical comments (which is not easy and takes lots of courage and patience), you internally agree that your idea has a fatal flaw, or a serious discrepancy with the existing facts. This is not a tragedy; be optimistic, and very possibly after admitting this to yourself, your obsessed mind (see chapter two) will immediately start searching for other possible solutions to the problem.

There is great wisdom in the words of Heinrich Heine: “He only profits from praise who values criticism.” Unfortunately, not many scholars are open and appreciative of criticism. Try to be one of the rare exceptions. Be grateful to your critics; remember in most cases they could have just ignored you, but they took time to

inform you about their opinion, however rushed and inadequate the opinion might seem to you.

It is a totally different game when you are criticized after you have been more or less accepted by a scholarly community. This is not to say all critics suddenly go silent. Sometimes critical comments might even get louder, as with recognition more people are aware of your ideas. Try to see the difference between your critics, such as the difference between the “conservatives” and “progressives.” If these are “conservative critics,” critics from the past paradigm, it is natural for them to fight; this means they are still alive and kicking. Do not be arrogant, particularly if you already are a winner, as the next paradigm might be based on their idea that you helped to overthrow.

Be particularly sensitive and open-minded if there are new students from the field, or “progressive critics,” who are telling you some strange new ideas and facts that you can hardly even understand. They might be telling you about the next level of the development of your field, snippets of the next successful paradigm. Try to see the problem in your hypothesis or theory through their eyes, respond, stand your ground if you believe you are right, but be generous and praise every serious attempt to find caveats in your ideas. And be frank in responding to their critique: state whether you still think your idea stands all the challenges, or indicate, if you think so, that your idea is still the “best that we have at the moment” (without bringing the notion of “truth” in the discussion, please, and ask your critics not to use this category in a scholarly discussion as well!).

Basically, remember a simple and correct life strategy: if you want to change anything in your life, want to make it better, happier, and successful, you need to better yourself. You are the only human being you can really change. Blaming others for not understanding you, or even for betraying you, does not improve things. So, if you had been betrayed by your best friend, a business partner, or colleague, or your spouse, try to analyze in the first place how you could miss such a possibility from them, and make sure that you are better prepared for the future serious relationships in your life.

In the same way, you cannot change the conservative attitude of most scholars, or their pessimism towards new ideas, but you can make your idea more appealing to them, make it better formulated, and think of more effective predictions. You can do all of this primarily by looking at the critical comments that you received.

Now let us change the direction and discuss a few ideas about giving praise or a critique to others. First of all, if you are going to praise someone, make sure that it is really praise, not flattery. “Many know how to flatter, few know how to praise,” said Wendell Phillips, American activist and abolitionist. Be precise and sincere by indicating what you liked in the text/idea you are commenting on. Basically, if you liked any part of the text (idea), and you liked the broad thinking or originality of the

idea, or simply the boldness of the author, do give some words of support, even if you do not agree with the idea and see the flaws in it.

Offering critical comments is very different. When you hear a new hypothesis or a new idea, the first and natural reaction is to start searching for caveats in it, trying to prove it wrong. There is nothing wrong with this attitude: in fact, this is the only proper scholarly reaction to any new idea. “If we watch ourselves honestly we shall often find that we have begun to argue against a new idea even before it has been completely stated,” said Wilfred Trotter, a pioneer in neurosurgery, expert on social psychology and herd instinct in humans. Be careful and aware of what means you are using to check the new idea.

Do not start using any available means in order to discredit the idea or the author, do not attack the author’s writing style, or the author’s inadequate education, or the lack of references. You can certainly mention them, but primarily try to criticize the essence of the hypothesis, show that the author does not take into account other important factors, or show the flaw in the logic of the new model. And if the new idea stands its ground, be prepared to accept that the new hypothesis might have a positive element (despite all possible shortcomings of the actual presentation).

Also, if you do not understand any part of the text, remember Leonardo da Vinci’s words when assessing someone’s ideas “You do ill if you praise, and still worse if you reprove in a matter you do not understand.” By accepting a new potential idea, you will be joining a small elite rank of wider-thinking scholars who can move the field forward. Remember, there are many more good ideas around than scholars who can selflessly appreciate the new ideas coming from other scholars.

One piece of practical advice: always try to praise your opponents, in sports, in competitions, and in scholarly disputes. This is not only noble but also very practical. By praising your opponent, you are praising yourself, as you are often defined by your opponents. So, having strong opponents makes you seem stronger.

When a sporting team defeats its rival, and claims that their opponents cannot play, they are stripping themselves of the glory of defeating a worthy opponent, whereas by praising the defeated opponent, sportsmen are praising themselves without even mentioning this. When criticizing something, apart from being specific, leave room for the possibility that the idea might have better prospects if the author can find a solution to the specific problem raised in your critical comments.

Remember, on the receiving end of your critique there is most likely an aspiring thinker for whom you represent a higher authority. Very importantly, if you consider yourself a critical thinker (as all scholars do), be critical towards all ideas, both established and new. Also, be critical not only towards your ideas, but towards your own critical comments. “The seeker after truth must, once in the course of his life,

doubt everything, as far as is possible,” said René Descartes. Basically, it is nicer not only to receive praise but to give praise as well. When did you praise your colleague last time? There is great therapeutic wisdom in the following words from Rumi, 13th-century Persian poet and mystic “Your depression is connected to your insolence and refusal to praise.” Probably most importantly, be aware of the forward-moving character of scientific progress and the very few members who are open-minded contributors of this move forward.

Many of our beliefs are going to change, so you might take part in this exciting process. Even axiomatic human beliefs change with time. For example, our ancestors believed for a very long time that the continents are eternal and unmovable. Only about a hundred years ago did we start understanding that they are subjected to continental drift. This drift is very slow and difficult to see but is constant and inevitable as the forces of gravitation, with their subsequent catastrophic earthquakes and tsunamis.

Similarly, many humans tend to believe that the dominating scholarly paradigms are solid and stable. But if you consider yourself a scholar, you must have an inner feeling that virtually all the dominating paradigms have to go sometime in the near or distant future, and it is your duty, as a scholar, to feel the approaching signs of the dooming scientific earthquake. Progressive scientists try to see the future, possibly sometimes by some false signs, but they have a feeling that the change is coming, and this is a healthy sense.

Conversely, conservatives try to lull the listeners into believing that continents and dominating paradigms are forever solid. And if you do not think there are serious scholars who believe there is not much further progress left to be achieved in science, read the next section.

On the End of Science

Believe or not, very serious scholars and experts in various fields throughout history sincerely believed that no more groundbreaking discoveries were left for the future. We can all agree that there is a certain temptation to treat the current position in science as the last word of scholarly progress. After all, “today” is the magical word for history, the very last day of civilization as anyone known it. But you need to remember, that every past day of every past year of our history was the most progressive day of the human civilization at the time, and every future day of every future year will be the same. It is easy to fall under the spell of “today” and believe we have reached the pinnacle of progress. We could call this phenomenon the “syndrome of today.” The strength of the belief in claims about the end of the scientific progress among some people could compete with the intensity of the claims of the end of the

world. And despite many disappointments in past predictions, there are recurring both religious and scholarly claims on this often-repeated topic.

So, let us have a quick look when were such claims made, and who made them. Let us go back to the very beginnings of the 20th century, the year 1900. Lord Kelvin was one of the best-known names from the history of science at that time. Born in Belfast in 1824, he did ground-breaking work in the mathematical analysis of electricity and thermodynamics and helped to bring the discipline of physics to its modern state. Absolute temperatures are stated in units of kelvin in his honor. For his work on the telegraph, he was knighted in 1866 by Queen Victoria, becoming Sir William Thomson. In 1892 in recognition of his achievements he was made Baron Kelvin. He was the first British scientist to be elevated to the House of Lords (by the way, Isaac Newton and Charles Darwin never made it this high). In short, it is not easy to find a scholar who had greater influence and recognition in his time, and to be fair, his fame lives on. So, what did Lord Kelvin think of the future of the science he represented?

“There is nothing new to be discovered in physics now. All that remains is more and more precise measurement.” In fairness, this widely known phrase might have been misattributed to Kelvin. Scholars are finding earlier expressions of this prophecy, which confirms that the idea seemed very possible to many thinkers of the time.

For example, eminent physicist, Albert A. Michelson, the first American to win the Nobel Prize in science, declared in 1894 that “it seems probable that most of the grand underlying principles have been firmly established.” German physicist and mathematician, Philipp von Jolly famously advised his student Max Planck in 1878 against going into physics, as “in this field, almost everything is already discovered, and all that remains is to fill a few unimportant holes.”

As we see, Kelvin was not the first (and definitely not the only) scholar to pronounce such pessimistic words about the end of physics by the end of the 19th century. Some even think that he never made such prophesy. Well, we know as a fact, that Lord Kelvin definitely made other similarly grand and false prophecies. If some were correct, airplanes would not be flying today (his words were: “No balloon and no airplane will ever be practically successful”), and more tragically, we should be heading towards extinction for lack of oxygen.

As we can see, even such an eminent scholar fell under the spell of “the syndrome of today,” and made declarations that make us rightfully doubt his prophetic abilities. Around the same time, in 1888, Simon Newcomb, a Canadian–American astronomer, autodidactic polymath, professor of mathematics in the U.S. Navy and at Johns Hopkins, who made important contributions to timekeeping as well as other fields in applied mathematics such as economics and statistics, also fell under the spell

of “today” and declared: “We are probably nearing the limit of all we can know about astronomy.”

A bit earlier, about 1875, future pioneer of the study of electromagnetic waves, Heinrich Hertz, still a student, had a similar feeling that there was not much left to discover: “Sometimes I really regret that I did not live in those times when there was still so much that was new; to be sure enough much is yet unknown, but I do not think that it will be possible to discover anything easily nowadays that would lead us to revise our entire outlook as radically as was possible in the days when telescopes and microscopes were still new.”

The inability to see the ways of further progress was expressed in many fields. Surgeons predicted the end of humanely possible surgeries. “The abdomen, the chest, and the brain will forever be shut from the intrusion of the wise and humane surgeon,” said Sir John Eric Ericksen, Surgeon-Extraordinary to Queen Victoria in 1873.

Some expert-engineers warned it was impossible to create something like a light bulb: “Such startling announcements as these should be deprecated as being unworthy of science and mischievous to its true progress,” said Sir William Siemens, a German-born engineer in 1880, replying to Edison's announcement of a successful light bulb.

Let us go earlier in history. The year 1490, two years before the historic trip to the Americas by Columbus, a Spanish Royal Commissioner, obviously with great expertise on the topic, rejected Columbus's proposal to sail an alternate route to the lands full of spices and potential new lands. We do not know the names behind the Royal Commissioner's advice, but we know that the same negative reply had come from Portuguese experts earlier. Fortunately for Columbus, the king and the queen decided to fund the expedition anyway. The reason for rejection was clearly expressed in the Royal Commissioner's phrase, “So many centuries after the Creation, it is unlikely that anyone could find hitherto unknown lands of any value.”

Similar sentiments are evident from earlier times. In the first century CE, a Roman statesman, engineer, expert of the system of aqueducts, Sextus Julius Frontinus authoritatively declared: “Inventions reached their limit long ago, and I see no hope for further development.”

By that time Romans were on the top of the Western world, and Frontinus clearly fell under the spell of the “Syndrome of Today.” We live twenty centuries after Romans, and we can certify that quite a few inventions, unknown to Romans, have been invented and put to use by later generations.

Sure, you might think scholars learned from history, that claiming the end of science is as doomed as searching for the Final Truth. Nope. Some of the most serious and prestigious scholarly journals publish articles on a similar topic written by very serious scholars even in our 21st century.

For example, does the name of the journal *Nature* sound serious to you? In 2013, an issue of *Nature* contained a very interesting article with the title “After Einstein: Scientific genius is extinct” by Dean Keith Simonton. Before discussing the central idea of the article, let us mention the author’s qualifications (remember, it is not easy to publish in this top-ranking peer-reviewed journal). Without a shred of doubt, the author is well qualified to discuss the complex issue of brilliance in science. Here are a few sentences from Wikipedia: “Dean Keith Simonton is a Distinguished Professor of Psychology at UC-Davis. He is particularly interested in the study of human intelligence, creativity, greatness, and the psychology of science. He obtained his M.A. at Harvard in 1973, and his Ph.D. in 1975 [at the age of 27]. He is a fellow of the American Association for the Advancement of Science and a fellow of the American Psychological Association. He has over 340 publications, including 13 books. One of his books, *The Origins of Genius*, received the William James Book Award.” To finish discussing the expertise of the author, we might also mention that in 2006 he published a paper that ranked the IQ and several other intellectual capabilities of all US presidents (Simonton, 2006).

Very impressive indeed! As we can see, Dr. Simonton is more than qualified to discuss authoritatively the intellectual brilliance of generations of scholars, and by extension the future of scholarly development. So, what did he have to say in one of the most prestigious journals of our time? Dean Simonton fears that originality in the natural sciences is a thing of the past. According to him, there just isn’t room to create new disciplines or overthrow the old ones. “It is difficult to imagine that scientists have overlooked some phenomenon worthy of its own discipline” [Sounds a little like the words of Spanish Royal Commissioner rejecting the proposal of Columbus]. Simonton asserts that most scientific fields aren’t in the type of crisis that would enable “paradigm shifts” (Kuhn), and instead of finding big new ideas, scientists currently work in large groups on the details in increasingly specialized and precise ways.

The most interesting idea expressed in the article is Simonton’s understanding of cutting-edge scientific research. Simonton points out that “cutting-edge work these days tends to emerge from large, well-funded collaborative teams involving many contributors” rather than a single great mind.

Wait a minute. Development of scholarship with new ideas is a very non-group thing: it depends on the development of thought that came to someone for the first time. So, by nature, it is a very individual endeavor. Groupism and peer bodies are a liability for science. “If you want to kill any idea in the world, get a committee working on it,” said Charles Kettering, one of the most prolific American inventors, and the founder of Delco. Let us recall Max Planck’s words about the role of individual scholars and big organized groups: “New scientific ideas never spring from a communal body, however organized, but rather from the head of an individually inspired researcher who struggles

with his problems in lonely thought and unites all his thought on one single point which is his whole world for the moment.”

There is a good correlation in Simonton’s text. No paradigm shifts are expected, so no need of the individual brilliance, the extensive efforts in puzzle-solving will do from now on. And let us be frank: for most of the big names of the scholarly establishment, Simonton’s words sound like a dream come true; what could be better? Their ideas will never be bettered, they will never be proven to be wrong, their grants can keep flowing forever, their reputations are forever assured, and their loyal followers will be forever working on puzzle-solving.

And most important, it is finally clear that all those ambitious heretics trying to herald scholarly revolutions (paradigm shifts) are just all crackpots – and all this is assured! For not only the next 10 years, but the next 500 years, or forever!

Well, if we think deeper about the idea of this eternal stability, scholars should be careful about embracing this point of the view. If we try to see the development of science from Simonton’s perspective, we will see that this “dream come true” situation actually creates a very dangerous reality for the future of a community of peers. If governmental bodies and the community at large realize that all these well-funded research groups are working hard only to solve minute puzzles, and no big ground-breaking discoveries are to be expected from them, they will start asking big questions about whether to continue funding all these existing well-funded research groups.

Let us remember that scientists are expected to come up with new revolutionary ideas. Do not forget, after the Second World War, the number of professional (read “paid”) scientists increased a mind-boggling forty-fold, and this was mostly the result of the final grand event of the war. After the brutal demonstration of the devastating power of science in the form of two nuclear explosions, governments drastically increased funding and talented youngsters started pouring in.

“We scientists are clever — too clever — are you not satisfied? Is four square miles in one bomb not enough? Men are still thinking. Just tell us how big you want it!” asked Richard Feynman. Apart from his famous irony, you can feel the belief in the power of scientific research. On the other hand, if we believe Simonton, and if the governmental and private funding bodies listen to his pessimistic ideas about the end of scientific revolutions, they might ask why anyone should put so much funding into something if some of the greatest authorities in the field forecast no more great discoveries.

Fortunately, governmental bodies, very much like the King and Queen of Spain, do not always listen to expert opinions. Even Simonton himself declared he would like to be wrong: “I hope that my thesis is incorrect. I would hate to think that genius in science has become extinct.” But do not forget: the idyll of the “large, well-funded

collaborative teams involving many contributors” sounds too tempting to established scholars and cohorts of peers busy working happily on puzzle-solving, hopefully forever, without any fear for the catastrophic event known as a Paradigm Shift.

How to Make a Discovery?

If I have a thousand ideas
and only one turns out
to be good, I am satisfied.

Alfred Nobel

I do not want to finish this chapter with a negative section about the end of science. On the contrary, as silly it this might seem, I want to discuss several practical issues for those who are passionate to embark on the difficult and exciting journey of making a discovery.

Why not? If you are fascinated by the world around you and, like Marie Curie, want to contribute to the growing knowledge of humanity, this might be your natural way to live your life. Thinking constantly on the problems of your interest and coming up with new ideas fills exciting hours, days, weeks, and years.

Of course, waiting to get a positive reaction from scholars from the field, not to mention the loss of opportunities to make your life more comfortable and successful, are negative sides of the life of a passionate discovery hunter. But as always, it is the process of the hunt, not of putting the hunting trophy on the wall, that makes life interesting and full. And of course, if you wish to be a free scholar, with freedom comes a new problem – you need to find some way to make a living somehow. This is definitely possible, as many celebrated scientific thinkers and famous artists had very mundane “day jobs.”

One of the greatest philosophers of all time, Baruch Spinoza worked as a lens grinder, composer-innovators Charles Ives and Philip Glass worked respectively as a clerk at an insurance company and as a plumber, and American writer Kurt Vonnegut worked as a car dealer, to name a few. For those who are not deterred by all the uncertainties of this path and still want to do the intellectual journey into the future of science, here are a few hints and practical suggestions:

To start with, **do not be afraid to be obsessed with your idea**. On the contrary, discoveries mostly come to obsessed minds. To be obsessed with an idea means that your brain is searching for new solutions for the problems in the sphere of your obsession every minute of your life, including your sleep. That’s how the discoveries

are made, when every word, every vision, every smell, every sound subconsciously reminds you of your obsession. Do not rush to find the solution; give time, get sleep, and live your everyday life with a positive feeling that the new idea might appear quite suddenly.

Do not be surprised if the new idea comes, not when you are sitting at your desk, but during unexpected activities, like walking, in the bathroom, while shaving, washing your hands, brushing your teeth, or doing some more private business, during eating, even during sleep, and some other activities. It is useful to keep a pen and a piece of paper in your pocket all the time to make small notes. Record not only fully formed ideas or potential discoveries, but questions and half-formed ideas even if you are unsure of their worth.

Re-read your old notes and questions after some time. You might suddenly see the old idea or an old strange question from your notebook in the new light, that suddenly makes eminent sense, and understand its true potential;

You probably have role-models among scholars. Read their original writings, and read about their lives. Try to follow their advice, although remember to trust your own judgment in the first place. Believe in your own abilities and your judgment; discoverers do not like to follow others, they chose their own, new, uncharted ways.

Try to deeply understand the historical fluidity of dominating paradigms. Even the strongest dominating paradigms of the day are more like the continents we live on: they seem stable but are in fact moving all the time. Contrary to the view of some serious academics, that fear that nothing big is left to discover, you need to feel that most of the existing paradigms will be rejected in a few decades or centuries. With your obsessed search, you are a vital part of the progress.

Do not try to find a “Final Truth” and do not hope that your ingenious idea will never be bettered. We will never know whether the Final Truth really exists. As a discoverer, you must be content if you can find a better explanation of the existing facts and controversies.

If you are willing to be a participant in these exciting changes, you have to prepare yourself for the bad news that I mentioned several times. Be prepared for years of neglect and ridicule. The good news is that your own belief that you are right, and the feeling that you are serving the progress of science, is constantly with you. Be optimistic; you are not the first one getting such a bad response – all the big discoveries went through this. Even if you are at some point proved wrong, you still will have (and should have) great intellectual gratification for serving the future of science with your daring thinking.

Regarding where to search for the discoveries, apart from the sphere of your obsession (if you already have one) try to critically check the reports of the phenomena that are not believed by contemporary mainstream science. Mind that such popular controversial topics as Bigfoot, the Loch Ness Monster, parapsychology, UFOs, or crop circles already have thousands of enthusiasts. If you are still passionate about any of these popular topics, go into it, particularly if you believe you have new interesting data or a new perspective to make your arguments more appealing;

Check the rejected reports of less prominent and less popular phenomena. Remember, for example, that one of the first recorded reports of meteorites falling from the sky was ridiculed (“I would sooner believe that two Yankee professors lied than that stones fell from the sky,” said Thomas Jefferson in 1807 on hearing an eyewitness report). Similarly, the perfect professionally written description of Polynesians part-singing was not believed by European musicians because of the paradigm that polyphony was a late invention by medieval Christian monks (see Kaeppler et al., 1998:15);

Check the exceptions in various fields of scholarship, and if any of them occupies your imagination, direct your intellectual power towards solving the mystery. Read as much as you can on the matter, and allow totally unrelated and various thoughts to arise that might have any connection to the problem;

Remember, some of the biggest discoveries are very often right under your nose. To reveal them you need to ask novel questions about the well-known things that we encounter every day. So, try to look at the phenomena around you from a new angle, ask questions about their origins, function, history, cultural diversity around the world. Thinking out-of-square is crucial. Remember, discoveries are usually found in directions scholars would not go naturally; that’s why it needs a fresh look from an unexpected angle;

If you like experimenting and you are doing an experiment to confirm a new or an existing hypothesis, listen to a Nobel Prize winner American-Italian physicist, creator of the world’s first nuclear reactor, Enrico Fermi: “There are two possible outcomes [of the experiment]: If the result confirms the hypothesis, then you’ve made a measurement. If the result is contrary to the hypothesis, then you’ve made a discovery.”

Remember what Alfred Nobel said about his ideas: “If I have a thousand ideas and only one turns out to be good, I am satisfied.” Be ready to discard your idea, if you find facts that contradict it, or think hard to accommodate these facts, without losing your integrity as a scholar.

And finally, please, discard all my advice if you already believe you have your own methodology or techniques regarding coming up with new revolutionary ideas and

making discoveries. As Paul Feyerabend suggested, there can be no rules in regards to scientific method, so just go on following your own path towards discovery. And by the way, there are a few other helpful hints from scholars to assist those who crave to make a scientific discovery (see, for example, Gottfredson, 2010; or Johnson, 2011). The exciting and mysterious world of discoveries is right in front of you!

Conclusions

In this chapter, I proposed deviating from Kuhn's model, where there are long stretches of time when scholars are happily engrossed in puzzle-solving within the old paradigm, followed by the short and violent crisis situation, when the old paradigm runs into a brick wall and ensures the appearance of a new paradigm. I propose that we actually have a much more complex, bush-like situation. On one hand, the followers of the old paradigm virtually never propose that their field is in a crisis. And on the other hand, there is hardly a moment when there are no attempts to find caveats in the dominating paradigm. Therefore, for some scholars, there is a constant crisis situation, while for others, there is never a crisis situation. That's why the paradigm shift is mostly seen when it is accomplished, and why science is mostly advancing, as Planck poetically put it, by "one funeral at a time."

Potentially, every paradigm is destined to be overthrown by another sooner or later, so scholars should never lose the feel of a scholarly perspective. Otherwise, we will start accepting those prophets who were quick to declare the end of science in various centuries. "If we worked on the assumption that what is accepted as true really is true, then there would be little hope for advance," said Orville Wright, one of Wright brothers credited with inventing and flying the world's first successful airplane.

In this chapter, we discussed several important elements of scholarly progress, including the issue of progressive ideas, the danger of relying on consensus, the need for generalizations and scholarly predictions, the importance of exceptions, the futility of the notion of final truth, and other issues, including some practical suggestions for those fascinated by the search for new ideas and making discoveries.

And finally, out of two faces of the paradigm change,

(1) the fearful environmental catastrophe, or

(2) a rejuvenating fire that brings new life over the land, it is up to you to decide where you stand.

Remember words of Helen Keller, a blind and deaf thinker who could see further than many of us with intact eyes and ears: "No Pessimist ever discovered the secrets of the stars, or sailed to an uncharted land, or opened a new heaven to the human spirit."

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Essay Seven

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Study of Polyphonic Music of National Minorities through the Historical Perspective

Abstract

In many countries minorities occupy geographically isolated regions. When big states establish borders, they naturally chose geographically isolated regions (like mountain ranges). The indigenous peoples of mountain ranges (often with polyphonic traditions) are isolated from each other, and are politically united with unrelated peoples living in the plains. This forced isolation from their historical relatives and unification with big states is an important source of instability in several contemporary countries, like among Basques living in mountain ranges between Spain and France; or Caucasian peoples living in mountains between Russia, Georgia, and Azerbaijan; or the Balkan peoples with many ethnic/religious/linguistic identities.

Introduction

Study of musical traditions of national minorities is an increasingly important and sometimes complex issue of the contemporary ethnomusicology. In this article, I will discuss a few problems associated with this issue in my native country, Georgia, and then I will touch on several aspects of the study of polyphonic traditions of national minorities in general.

There are two somewhat different scenarios of the existence of polyphonic traditions among national minorities:

(1) polyphonic traditions of national minorities exist among the polyphonic traditions of the prevailing culture, and

(2) polyphonic traditions of national minorities exist among the monophonic traditions of the prevailing culture.

The examples of the cases when polyphonic traditions of national minorities live among the polyphonic traditions of prevailing culture can be found among some European and African countries. For example, Abkhazians, Ossetians, Russian and Ukrainian groups, living in Georgia, or various ethnic groups living together in several

countries of the Balkan Peninsula. The same situation can be found in several sub-Saharan African countries, where the case of polyphonic traditions of Central African Pygmies in various African countries is particularly interesting.

As for the examples of carriers of polyphonic traditions of national minorities living among the monophonic traditions of the prevailing culture, such cases are more prevalent in Asia, but also exist in some European countries (for example, in France and Romania). Very often such minorities live in geographically more isolated regions and often represent the aborigines of the region.

Before we discuss several general issues concerning polyphonic traditions of national minorities, let me discuss the problems of the study of polyphonic traditions of national minorities on the example of Georgia.

Georgia as a National Minority, and National Minorities Living in Georgia

Georgia, the country of my birth, might serve as a good example to discuss various problems related to the study of the musical traditions of minorities, as during the last couple of centuries Georgia actually experienced being in both roles:

(1) Georgia as a minority: while Georgia was incorporated within the Russian Empire in 1901-1918, and then as a part of the USSR from 1921 till 1991; and

(2) Georgia as an independent country with a number of ethnic minorities living there – first for a brief period of independence in 1918-1921, and finally since the break-up of the USSR in 1991.

Before discussing the situation with the traditional music of Georgia, and associated problems of peoples living in Georgia, let us have a short review of the general situation of the tapestry of musical cultures of the country known today as “Georgia.”

As in most contemporary “nation-states” at a closer look Georgia reveals a complexity of ethnic elements that comprises Georgia today. Georgia (in Georgian “Sakartvelo”) shows an array of important signs of unbroken cultural ancestry. Aborigines of Transcaucasia, Georgians still speak the Georgian language, which survives from the epoch of the pre-Indo-European languages. Geographically Georgia is part of the region known as “Transcaucasia,” situated on the southern slopes of the Great Caucasian Mountain range, stretching from the Black Sea to the Caspian Sea (more correctly – the Caspian Lake, the world’s biggest lake).

Being surrounded by the highest mountains of Europe (reaching at several points more than 5.000 meters), the Caucasian Mountain gorges represent the ideal “hiding spot” from outer influences for isolated populations. Even today for a big part of the year the only way to reach some of the populated regions of mountainous Georgia is

by helicopter only. From the East and the West Transcaucasia is protected by the waters of the already mentioned Black and Caspian seas, and even the southern approach is not a very easy route because of a number of other (although smaller) mountain ranges, known as “lesser Caucasus”.

Despite of their long history of living at the seaside (at the east coast of the Black Sea), Georgians have never been great seafarers and most Georgians still live in Georgia. Most of Georgians are Christians, more precisely Eastern Orthodox Christians, being one of the first countries to declare Christianity as a state religion in 337. South-West corner of Georgia, known as Achara, is predominantly Moslem, the legacy of three centuries of dominating of Ottoman Empery here.

Unlike many countries in Europe, where the tradition of polyphonic singing is represented only in some of the regions, the whole of Georgia is one big group of closely related polyphonic traditions. Ethnomusicologists noted from the 19th century that traditional Georgian monophonic songs are always performed by an individual singer. More so – monophonic singing occurs only when the performer is alone (during agricultural work in a field, or on a road, or putting a baby to sleep, or lamenting alone). If, for any reason, the singing person is not alone, then even the traditionally monophonic songs can easily turn into polyphonic ones. So, there are polyphonic versions of lullabies, dirges, and field working songs, recorded by the generations of Georgian ethnomusicologists.

Very importantly for the topic of our discussion, as many other nation-states, at a closer look Georgian reveals a number of ethnographic regions, with various ethnographic details and spoken dialects, and even languages. Musical traditions also have interesting differences.

Georgia is usually divided into fifteen ethnographic regions (see the map). Some of them are very big, such as Kartli, Kakheti, Samegrelo, or Imereti, but some of them are very small – particularly in the northeastern part of Georgia.

Ethnographic map of Georgia (Tsitsishvili, 2004. Used with permission)



Let me first briefly discuss the common characteristics of Georgian polyphony, and then we'll mention the main stylistic features of the major regions.

(1) Two-, three- and four-part singing is spread through different regions of Georgia, with two-part singing mostly in the mountainous Northeastern regions of East Georgia, and four-part singing in the Southwestern part of Georgia. Three-part singing is the most widespread throughout Georgia;

(2) There are more than a hundred terms indicating the names and the functions of different parts of the polyphonic texture (Jordania & Gabisonia, 2011). There has been controversy over the traditional terminology of such names as the “first,” “second,” and “third” parts. Later it became clear that the middle part of the song is traditionally known as the “first part,” as it is the main melodic part of the song (as in many other traditional polyphonic cultures). The “second” part is the top part, and the third is the bass (M. Jordania, 1972);

(3) The individual singers always sing main melodic parts, and the group usually sings the bass. In the tradition of “trio” songs (only in western Georgia) the bass is also performed by the solo performer. In four-part western Georgian harvest songs there are actually two basses – one is a pedal drone in the middle of the texture, and another is a melodically active low base;

(4) Drone and ostinato are the two most important principles of polyphony in all regions of Georgia;

(5) Sharp dissonant chords are in high esteem in Georgian traditional polyphony.

Georgia is traditionally divided into eastern and western parts. East Georgia consists of two of Georgia's biggest ethnographic regions – Kakheti (the South-eastern part) and Kartli (the central part) and five (some maintain six) small mountain regions in the Northeastern part of Georgia: Khevsureti, Pshavi, Tusheti, Khevi, Mtiuleti (and according to some classifications – Gudamakari as well. Garakanidze, 1991).

The plain regions of eastern Georgia – Kartli and Kakheti - have always been historically central for Georgia. State unity started here, and the capital city (Tbilisi) has been the centre of Georgia for the last 1500 years. The best-known feature of eastern Georgian traditional singing is the presence of long, “drawn-out” table songs from Kartli and particularly Kakheti. These songs are performed by the two melodic lines singing against a background of a steady pedal drone on “O.” The leading melodies are always performed by individual singers and the drone by all the others. The leading melodic lines have a wide range (about an octave or wider) and of these two melodies one is usually a bit higher than the other. The lower melody is considered to be the leading part of the song (*mtkmeli*, “the speaker”, or the “first voice”), who usually starts a song, followed by the higher “second voice” or *modzakhili* (“the one who follows”).

The main task of both lead singers is to ornament their melodic lines. The tempo is usually slow, and the songs are mostly performed in free time. Some major sections of eastern Georgian table songs are performed in two parts, as the leading singers sometimes alternate with each other. Although the bass is a pedal drone in eastern Georgian “long” table songs, it does move, leading to key changes (modulations). These occasional bass moves are extremely important for the overall form of a song. These key changes, or modulations, make up the main tonal body of the table song. These modulations are one of the most fascinating elements of East Georgian table songs, as they are relatively rare among traditional polyphonic cultures (see Aslanishvili, 1954/1956, 1970; Jordania, 1982).

Polyphonic singing traditions in the north eastern ethnographic regions are not as developed as in Kartli and Kakheti. Two-part singing dominates here. The northeastern dialectal regions are usually united into two groups: the Tusheti, Pshavi and Khevsureti are generally regarded as more archaic regions (especially Khevsureti), and the Khevi and Mtiuleti are considered to be more advanced. The singing traditions of Khevsureti are of particular interest. They were traditionally regarded as the most archaic survival of the ancient Georgian singing tradition (Chkhikvadze, 1948, 1961, 1964, Arakishvili, 1905, 1916), although this idea was challenged during the last few decades (see, for example, Jordania, 2015:246-248).

Pshavi could be the classical representative of this small group, with two-part drone singing, antiphon between the two soloists, major second moves of the drone,

and the typical cadences on the unison. Tusheti is known as the region of the seasonal shepherd-travelers with interesting ties to the neighbouring North Caucasian peoples, and some features of their musical traditions, unusual among other Georgian regions.

Khevi and Mtiuleti represent a more advanced region, where two-part singing is well established and there are songs where three-part singing plays an important role. Interestingly, in the Khevi and Mtiuleti three-part singing traditions there are obvious links with Svanetian traditional polyphony from the highest mountain region of western Georgia (Garakanidze, 1991).

One more region which we have not mentioned so far, is Meskheti, in the southern part of central Georgia. This is the only region of Georgia where (mostly due to demographic reasons) the tradition of polyphonic singing began disappearing during the 20th century and was finally lost in the 1970s. According to the last survivors of the local polyphonic tradition, the Meskhetian polyphonic style was close to the eastern Georgian (Kartlian and Kakhetian) style, with the drone (both pedal and rhythmic), and with “long” table songs with ornamented melody (Magradze, 1986; See also Chkhikvadze, 1961:XXII-XXIII).

Georgians also live outside of Georgia, in the district of Kakhi, in neighbouring Azerbaijan, where they represent a national minority. This region is also known as Saingilo. The Georgian population of Saingilo is partly Christian and partly Moslem. According to the results of short fieldwork in 1988, the tradition of polyphonic singing (in harvest songs) was still alive at least in the village of Alibeglo in the 1920s and 1930s. Some of the melodies (both vocal and instrumental) recorded during the fieldwork combined (in one part) the elements of the melody and the bass as well (Jordania, 1988:56-57). The group of young local patriotic males was singing new songs in the traditional Georgian style of drone three-part polyphony. During the last decades a Georgian ethnomusicologist Giorgi Kraveishvili collected more materials from this region (Kraveishvili, 2020).

Western Georgia consists of six (according to some views – seven) so-called musical dialects. Unlike eastern Georgia, where we have two asymmetrically big plain regions and several much smaller mountainous regions, the differences between the regions are not as big in western Georgia. The musical differences from eastern Georgia are also quite obvious:

- (1) Rhythmically western Georgian polyphonic songs are always well defined (no free metre songs);
- (2) Melodic lines never use rich melismatic ornamentation, so usual for eastern Georgia and particularly for the genre of ‘long’ table songs (exception is some table songs in Racha);

- (3) Instead of two- and three-part singing we are now in the world of three- and four-part polyphony;
- (4) The drone is present, but it is mostly a rhythmic drone, and besides, in some of the most complex “Naduri” songs the drone is in the middle of the four-part polyphonic texture (higher than the main melodic voice, instead of being in the bass in eastern Georgia);
- (5) Unlike East Georgian drone and ostinato bass, the bass part in some West Georgian regions can be extremely active melodically.
- (6) The yodel (absent in eastern Georgia) adds another important element to the sound of the western Georgian singing style;
- (7) The tradition of “trio song” (sung by three individual singers) is also unique to some regions of western Georgia;
- (8) Triple metres $\frac{3}{4}$ and $\frac{3}{8}$, very popular in eastern Georgia (particularly in certain round dances), are rare in some regions and completely absent in other regions of western Georgia.

The best-known tradition from western Georgia is the highly developed tradition of contrapuntal polyphony in Guria. For example, in four-part Naduri songs from Guria and Achara we usually can see: (1) *Krimanchuli* (yodel, “distorted falsetto voice”, or according to the other version, “distorted jaw”) – a western Georgian yodel that was admired by Igor Stravinsky, (2) *shemkhmobari* (“the sound that accompanies” – this is a specific pedal drone in the middle of the texture and) (3) *mtkmeli* (lit. “the one who speaks”), the leading voice, who starts the song and which is the only part that recites the text, and (4) *Bani* (“the bass”), the lowest voice, which is melodically very active, and mostly sings a perfect fifth below the pedal drone of *shemkhmobari*.

Out of these four parts, two of them (*shemkhmobari* and the bass) are traditionally performed by groups of singers, and the two other parts (*krimanchuli* and *mtkmeli*) are performed by individual singers. The tradition of “trio” (“three singers”) is considered by many to be the climax of Georgian traditional polyphony. This is not to be sung by everyone present. All three parts are sung by individuals, including the bass part.

This feature (solo bass) is unique to a few western Georgian dialects (Guria, Achara, Imereti, Samegrelo). Unlike eastern Georgia, where the bass is mostly a drone or ostinato, and is always performed by a group of singers, in western Georgia the bass can be the most melodically active part of the song (Jordania, N. 1985, 1986). This is a result of the widest improvisational possibilities for the bass part to create new exciting dissonant harmonies. These possibilities of the bass part melodic and harmonic versions in trio songs attracted the most talented Gurian singers, and for this reason most of the well-known Gurian singers were known as bass performers (N. Jordania, 1985).

Interestingly, although well-known Gurian singers could sing all the parts of trio songs, when they meet, the most experienced singer is usually suggested to sing the bass as a sign of respect and acknowledgment of his expertise. This must be the reason why in western Georgia the bass also can start songs (unlike eastern Georgia where only the top melodic parts start a song).

Unlike European professional polyphony, Georgian polyphony does not use the principle of imitation. Each part of western Georgian counterpoint polyphony uses melodic phrases from the existing melodic and rhythmic “vocabulary” of their own parts. As a matter of fact, most of the traditional polyphonic cultures of the world do not use the principle of imitation (among notable exceptions are Ainus from North Japan, Sutartines from Lithuania, and San people from South Africa).

Different western Georgian dialects also feature elements that give them a special place in the tapestry of Georgian polyphonic tradition. The Imeretian dialect (the biggest region in western Georgia), for example, is famous for its riders’ songs and for the flourishing tradition of European-style urban polyphonic songs; the Megrelian dialect is known for its combination of sharp dissonances with a very soft manner of singing (Megrelians also speak their own language, and sometimes there has been mildly expressed nationalistic sentiments among Megrelians); the Acharian dialect (the only region with Moslem Georgians in western Georgia) has two very different styles: (1) the so-called Kobuleti region is very close to the Gurian style of complex three- and four-part polyphony (according to some scholars, residents in this part of Achara are Gurians who were under Turkish rule and changed their religion), and (2) the so-called Shavsheti region with a two-part polyphonic singing tradition (the only region with two-part singing in western Georgia. Garakanidze, 1991).

And of course, there are two very important mountain regions in western Georgia apart from the plain regions discussed above: Svaneti and Racha. Some researchers also separate the Lechkhumi dialect (for example, Garakanidze, 1991). Svaneti (particularly the so-called “upper Svaneti”) holds a special place in Georgian ethnographic literature.

This is the most mountainous region of Georgia (the mountains here are over 5000 metres high), that for most of the historical past was completely cut off for a good half of the year from the rest of the world. Svanetians are the tallest people in Georgia (and one of the tallest in Europe) with their own linguistically very archaic Svanetian language, archaic non-rhythmic poetry, impressive 8-12th century family towers, and a fiercely egalitarian society – they have never been under anybody’s rule, including any of the local noblemen. Together with this

variety of archaic features, Svanetians have quite outstanding polyphonic traditions (Arakishvili, 1950).

The following set of features will give the reader a general picture of Svanetian vocal polyphony:

(1) All Svanetian songs are three-part (except for a few solo monophonic genres, sung mostly by women);

(2) The great majority of Svanetian traditional songs are (or grow into) round-dances;

(3) Starting relatively slowly, Svanetian song-dances usually get faster by the end, and the key rises (so-called “dynamic modulation”);

(4) Unlike many other traditions of Georgian dialects, the melodic range of Svanetian songs is very narrow (usually within the fourth);

(5) Although dissonances are one of the most characteristic features of all regional styles in Georgia, they play a particularly important role in Svanetian polyphonic songs;

(6) Ostinato formulae and the parallel movement of the voices (“chordal unit polyphony”) are important in Svanetian polyphony, although a rhythmic drone is also important;

(7) Unlike most other Georgian singing traditions, where the men’s and women’s singing is gender-segregated, in Svaneti the men and women often sing and dance together;

(8) The singing volume in Svaneti is extremely loud;

(9) Most Svanetian songs are performed as the antiphon alternation of two choirs, sometimes competing with each other in loudness and endurance;

(10) Syllables and words that do not have any meaning are very widely used in Svanetian songs, and some songs are completely built on nonsense syllables.

If we add here that some of the geographical names from the Upper Svanetian region and mythology that does not have any current meanings, are mentioned in written sources from the ancient Sumer from Mesopotamia (creators of the first written language in the history of civilization, a language which has already been dead for four millennia), the range of archaic features of Svanetian culture will be clearer for the reader.

Racha, neighbouring Svaneti, is another very interesting region, although archaisms are not as deep in Racha as in Svaneti. Rachian men and women also often sing together like Svanetians (and unlike people from most of the other

Georgian regions), and melodies of the so-called “mountain Racha” group (geographically and ethnographically closest to the Svanetians) also have a small range. But, unlike Svanetian singing, at least some Rachian songs have obvious influences of the eastern Georgian singing style (pedal drone, mildly ornamented melody and specific modulations).

Unlike the Svanetians, who still widely use dialects of their own mostly unwritten Svan language, Rachians use the Georgian language. And finally, a small but potentially a sensational addition to this short review of regional styles of western Georgian polyphony. In recent years formerly unknown new style of Georgian two-part polyphony was discovered by young Georgian ethnomusicologist Giorgi Kraveishvili. This style was found in Klarjeti region (part of historic Georgia, today in Turkey, neighbouring to Georgia region). This two-part polyphony is based on drone and constant use of secondal dissonances, and displays amazing similarity to Balkan (also Baltic, and Nuristani) style dissonant polyphony (Kraveishvili, 2020).

Let us move now to the singing traditions of Georgian cities. The urban music in Georgia is particularly important for our subject, as cities, as a rule, are more cosmopolitan than rural populations. Tbilisi became the capital of Georgia in the 5th century, and from the 11th century up to the first half of the 20th century became the economic and cultural capital of Transcaucasia with its multicultural and cosmopolitan population. Being on the crossroads between Asia and Europe, Tbilisi harbored an array of extremely talented musicians from different backgrounds (mostly of Middle Eastern ethnic origin, and particularly Armenian musicians, including the famous Sayat-Nova).

As a result of this interaction with Middle Eastern music, eastern melodies with ornamented melodies and augmented seconds appeared in Georgian cities. Part of these traditions remained very close to the Middle Eastern original style and had a somewhat smaller circle of admirers, but part of this new musical style became very popular among a wider range of Georgians. These Middle Eastern songs, originally monophonic melodies, became polyphonic (three-part) when performed by feasting Georgians. This style was (and still is) distributed in Tbilisi and a few other cities of eastern Georgia. Besides this style, known under the name of the “Eastern branch of Georgian urban music,” there was another urban singing style in Georgia, influenced by European professional music. This style appeared much later, with the first contacts of Georgia with European music with the guitar-accompanied Russian romance and performances at the Opera House, which opened in Tbilisi in 1850 and became very popular almost overnight. Georgians from both the eastern and western parts of Georgia became very enthusiastic about this new music and new harmonies. Many of the popular arias of much-loved Italian operas were rearranged in three-part urban a cappella

style and are still sung (with Georgian lyrics) as a part of the Georgian urban tradition.

Two sub-types of the western branch of urban music became popular very quickly:

- (1) guitar-accompanied lyrical songs, and
- (2) a cappella choral songs.

Both of these traditions are mostly three-part (sometimes the fourth part can be added as well). The two top parts move mostly in parallel thirds (and sometimes sixths), with the main melody in the middle part, and the bass mostly follows the European TSD harmonic system.

Arakishvili wrote at the beginning of the 20th century that the urban singing tradition was having a negative influence on century-old Georgian traditional polyphony. This influence was mostly felt in the increase of parallel thirds between the two top melodic parts, instead of the traditional, more adventurous and often dissonant coordination between the melodic parts.

To conclude this section about Georgian music, I would like to say that despite the huge amount of research still needed in different areas of Georgian traditional music, Georgian traditional polyphony is perhaps among the best-researched polyphonic traditions in Europe.

Several generations of Georgian musicologists and ethnomusicologists from the end of the 19th century, as well as non-Georgian scholars, contributed to this process. Almost 40 years of scholarly tradition of organizing international conferences and symposia on traditional polyphony, held in Georgia (from 1984 onwards) and the establishment of the International Research Centre for Traditional Polyphony (with the help of UNESCO) in 2002-2003 greatly contributed to the flow of finances, technical equipment, and renowned international scholars, experts in traditional polyphony, to Georgia.

Increasing number of Western scholars are actively working on the rich traditions of Georgian folk and religious polyphony (from the recent decades: Susanne Ziegler, Simha Arom, Polo Vallejo, Frank Scherbaum, Frank Kane, Andrea Kuzmich, Lauren Ninoshvili, John Graham, Matthew Knight, to mention a few of them).

Minorities living in Georgia

Apart from Georgians, few other ethnic groups with polyphonic traditions also live in Georgia, being often considered as national minorities. We will discuss in more detail two of them, Abkhazians and Ossetians, both rich in traditions of vocal polyphony. Their story reminds us the complexity and even

tragedy of interactions of the central ethnic element of the state with other ethnic elements considered as national minorities.

Abkhazians

Abkhazians call themselves *Apsua*. There are various estimates of their population size, different sources indicate by 2003-2005 the population between 70 and 90 thousand. Abkhazians are the only people among the group of North Caucasian peoples, who live south off the Caucasian range. Abkhazians are autochthonous (aborigines) of the Caucasus. Ethnically and linguistically they are close to Adyghes (often known among westerners as Circassians) and together they form the Abkhazo-Adyghean branch of the Caucasian language family.

In the world of linguistics Abkhazo-Adyghean languages are known by one of the largest number of consonants known today among the languages of the world. Abkhazian traditional culture retains many archaic genres and rituals.

Abkhazian and closely related Circassians were decimated by the Russian Empire's Caucasian Wars during the 19th century (1817-1864). Many of ethnic Circassians and Abkhazians were forcibly relocated and many left native lands in Caucasia and went to Moslem countries, chiefly to Turkey. For several last decades Abkhazia has been a breakaway region of Georgia, with all the political, social, and economic consequences.

Polyphony plays a crucial role in Abkhazian traditional music. Polyphony is present in all genres where the social environment provides more than one singer to support the melodic line. Abkhazian two and three-part polyphony is based on a drone, sometimes a double drone. Two-part drone songs are considered by Abkhazian (and Georgian) scholars the most important indigenous style of Abkhazian polyphony. Two-part drone songs dominate in the Gudauta district, the core region of ethnic Abkhazians.

Millennia of cultural, social, and economic interactions between Abkhazians and Georgians in this territory resulted in reciprocal influences, and in particular, the creation of a new, so-called "Georgian style" of three-part singing in Abkhazia, unknown among Adyghes. This style is based on two leading melodic lines (performed by soloists – *akhkizkhuo* in Abkhazian), singing together with the drone or ostinato base (*argizra*).

The indigenous Abkhazian style of three-part polyphony uses double drones (in fourths, fifths, or octaves) and one leading melodic line at one time. Abkhazians use a very specific cadence: a tetrachordal downwards movement, ending on the interval fourth.

The first scholarly works about Abkhazian music appeared at the beginning of the 20th century, and belonged to a founder of Georgian ethnomusicology and a composer Dimitri Arakishvili (1916). A few other important works followed during the 20th century (Kovach & Dzidzaria, 1929, 1930; Akhobadze, Kortua, 1957; Khashba, 1977, 1983; Ashuba, 1986; Shamba, 1986), although none of them were published in Western European languages. The only available source on the traditional music of Abkhazia to Western readers is an article by the author of this article in the *Garland Encyclopedia of World Music* (Jordania, 2000:851-854).

Ossetians

About 300 000 Ossetians (*Iron* in Ossetian) occupy the central part of North Caucasus. They live on both (northern and southern) sides of the Caucasian range, respectively in Russia and Georgia. They are the only representative of the Indo-European languages in North Caucasus, and the only Christian (more precisely, mostly Christian) people in North Caucasus.

Ossetians were traditionally considered the descendants of the Medieval Alans, carriers of the Indo-Iranian language. Later archaeological and physical anthropological studies revealed, that despite the fact of the change of the indigenous Caucasian language into an Indo-Iranian branch of the Indo-European family of languages, the newcomers (Alans) did not have much influence on the indigenous population of Ossetia (Alekseyev, 1974:197-200).

Musically also, Ossetians are very close to other North Caucasian peoples, sharing most of the characteristic features with them. Most importantly for us, the polyphonic tradition is as important to Christian Ossetians, as to their Moslem neighbors. Ossetian polyphony is based on the wide use of drones (and double drones). Songs with a drone mostly represent two-part polyphony. In the case of double drones, these drones are the intervals of fourths, fifths, or octaves apart. In such cases (together with the main melody, which is always sung individually) the result is three-part drone polyphony.

There is another type of three-part polyphony in Ossetia as well (in southern Ossetia, within Georgia), with only one drone, but with two individual singers, singing together two top melodies on the background of the drone. This type of three-part singing is considered by Ossetian and Georgian scholars as the result of the influence coming from Georgian polyphonic music. The name of the bass part in Ossetia is *kirnin*, of sometimes – *fersag*. Male singing dominates. Besides the drone, Ossetians widely use ostinato formulas in the bass part. Rhythmically Ossetian songs are not very strict. Quite often they use complex meters and free rhythm, mostly following the reciting style of the singer of the main melody. Cadences quite often finish at the interval of a fourth.

Arguably the most important musical legacy that medieval Alans left in Ossetian traditional culture is the tradition of epic songs about the Nart heroes. Interestingly, these songs (called here *kadeg*) are performed arguably in the original Indo-European performance style: by a solo male performer (*kadeganag*), accompanying himself on a string instrument. Epic songs about the Nart heroes became very popular among Ossetians' neighbors and have currently spread throughout the whole of North Caucasia, although in all other North Caucasian cultures (apart from Ossetians) epic songs about Narts are performed by a group of singers, in a traditional polyphonic style with a drone.

In contrast to most of the other North Caucasian polyphonic traditions, which were mostly unavailable to European scholars, Ossetian polyphonic tradition became known among European scholars quite early (Lach, 1917, 1931). Before that, still in the 1880s, Russian composers Mikhail Ipolitov-Ivanov (who the author of one of the earliest studies on Georgian music), and Sergei Taneyev made transcriptions of Ossetian songs (in 1883 and 1888), unfortunately remaining unpublished. The 1964 volume "Ossetian Folk Songs" (Galaev, 1964) is still the best published source of Ossetian traditional songs. The collection presents 100 songs and instrumental melodies, supplemented with texts and ethnographic materials.

Ossetia, like Abkhazia, is in a complex political, social, and economic situation, as it currently represents another breakaway region from Georgia (supported by Russia), and possibly for this reason, the study of their musical traditions declined during the last decades.

State of Study of Traditional Music of National Minorities

Apart from these two aboriginal to the Caucasus ethnic groups, living within the official borders of Georgia, many more ethnic groups, living here, should be mentioned. Owing to its position between the East-West and North-South crossroads, Georgia has always been rich with the diverse populations from various ethnic, cultural, and religious backgrounds. Several dozen nationalities lived and still live here, some from the neighboring countries (like Armenia, Azerbaijan, or peoples from North Caucasia), and some from more distant regions (like Russians, Ukrainians, Greeks, or Jews). Some of them lived in Georgia for millennia (like Greeks and Jews) and some are relatively recent migrants (like Russians and Ukrainians).

The situation with the state of the study of traditional music of all these groups varies a great deal. If we have a look at the earliest period of studies of musical traditions of Georgia (before 1918), while Georgia was part of the

Russian Empire, we can see that some of the earliest writings about Georgian traditional music belonged to Russian musicians: Khristophor Grozdov (1894) and Mikhail Ipolitov-Ivanov (1895). It is widely accepted in Georgian musicology, that these Russian authors, despite the noblest of intentions, were not sufficiently informed (leave alone understanding of Georgian language) to make valid conclusions. For example, Ipolitov-Ivanov, a brilliant musician, composer (student of Rimsky-Korsakov in composition), and a generous personality, in his 1895 article proposed that vocal polyphony in Georgia could have been brought by Russian troops positioned in Georgia. Later Ipolitov-Ivanov gracefully accepted the criticism of this idea by Dimitri Arakishvili, admitting that when writing his article, he was unaware of rich village traditions of vocal polyphony, and was familiar only with the late urban singing traditions (see the “foreword” written by Ipolitov-Ivanov for the book of Dimitri Arakishvili “History of Georgian Music, 1925).

Before the abovementioned two articles of Russian authors, there were also earlier articles by Aleksandre Jambakur-Orbeliani (1861) and Davit Machabeli (1864), as well as a few minor collections of Georgian folk songs were published, chiefly for children (for example, collections by Mikheil Machavariani, and Zakaria Chkhikvadze).

Despite some interest toward the folk traditions, most of the activity in this first period (before 1918) was directed to the survival of Georgian liturgical music, as it was banned by Russian political and religious authorities and was facing extinction. Several thousand liturgical hymns were recorded in that period, but this is a separate big topic that we are not going to discuss in this article.

From the beginning of the 20th century, still within the Russian Empire, educated (mostly in St Petersburg) ethnically Georgian professional composers and collectors of traditional music became active. Dimitri Arakishvili and Zakaria Paliashvili took the lead. They are widely considered as the two most important composers of the new Georgian composition school, and they were also the most important collectors of the field recordings. They started using the gramophone and published transcriptions of hundreds of songs recorded from villagers (see, for example, Arakishvili, 1905, 1908, 1916, 1925; Paliashvili, 1909). Sadly, their original gramophone recordings are still missing, possibly residing anonymously in some dusty archives of Russia.

It is important to remember, that the new higher level of study of Georgian traditional music was achieved after professionally educated Georgians started study of the cultural legacy of their native country. The brief and turbulent period of independence (1918-1921) brought two positive changes for the future of

Georgian musical culture: Tbilisi State University and Tbilisi State Conservatory were established and generations of locally educated Georgian professional musicians and musicologists started to operate.

1921-1991: Seventy years in the Soviet Union

After three years of independence, Russia came back, this time in the shape of the communist USSR. We might discuss and not agree with the statement that Georgia should be considered as a “minority” within the USSR, as it was considered an independent republic (incorporating itself several official “national minorities”), but the political and ideological dictate from Moscow was so strong that it left very little space for the local initiatives. For example, study of religious music was totally banned; instead of naturally existing small local ensembles, the creation of big regional choirs was encouraged, with the subsequent loss of improvisation; a great number of songs about the Communist Party leaders and the communist ideology were hastily created, recorded, and promoted. All peoples of the Soviet Union, from dominating Russians to the smallest national minorities were to follow the same ideological lead. The USSR cultural policy was very aggressive. The new movement of creating a united “socialist culture” took place and all the peoples were supposed to “reach” the common level of “socialist musical culture,” with operas, ballets, and other complex musical forms composed.

Most importantly for the topic of our discussion, vocal polyphony became one of the central features of the new common “socialist musical culture.” A lot of resources and finances were spent to create new polyphonic traditions in a huge communist empire. Conservatory-trained musicians were sent from Moscow to various places of the USSR (to the carriers of monophonic singing traditions), in order to do polyphonic arrangements of local melodies and teach them to the newly created local choir.

In this atmosphere of aimed “mass polyphonization” of the huge country, Georgian traditional polyphony was regarded as a positive example for others to follow. After the break-up of the Soviet Union in 1991, all 15 republics went (more or less) their own ways, maintaining with Russia very different relationships, from close friendship to openly hostile. None of the formerly monophonic cultures acquired polyphony in their traditional music, and state choirs were disbanded.

Since 1991 Georgia also became a fully independent country, incorporating a number of national minorities, with various official status and various degrees of relationship with the Georgian state and culture.

Now we approach the central question of our discussion: how well the musical traditions of various peoples, living in Georgia, were (and are) studied in contemporary Georgia? If we compare the level of study of Georgian musical traditions, to the level of study of the music of minorities, as it would be expected, this latter is studied much less.

Also, interestingly, the archival recordings of musical traditions of minorities made by Georgian ethnomusicologists are relatively numerous, but on the other hand, the actual research output is very small. There are objective reasons for this scarcity of research activity. The two central reasons probably are:

- (1) the linguistic difference, and
- (2) insufficient knowledge of the culture of these peoples.

We need to remember here, that one of the most important factors leading to the reluctance (and even fear) of Georgian scholars to doing research of the music of national minorities are the long-established scholarly traditions of ethnomusicological research in Eastern Europe. Let me explain.

Unlike the widespread model of Western ethnomusicology, where traditional music of many countries from around the world is often studied by scholars from another cultural/linguistic background (usually by European and American western-educated scholars), in Georgia, as well in former USSR Republics (and to a certain degree in the countries of Eastern Europe) musical traditions were (and are) expected to be studied by the representatives of these cultures, native speakers of the language/dialect, with an intrinsic deep knowledge of the cultural norms and traditions of the society. Therefore, as the representatives of many national minorities among ethnomusicologists are a big rarity, the gap between the level of study of the music of the dominating culture and national minorities remain considerable.

As positive examples of a relatively rich study of the music of minorities, I can point to the serious scholarly studies of Abkhazian and Ossetian musical traditions that were discussed earlier. Can we make any methodologically valid conclusion based on the example of these two cases? I believe we can: The most productive (in a long run) policy for the successful and adequate study of the traditional music of national minorities, in my opinion, is to finance the professional education of young scholars from these minorities. With their deep intrinsic knowledge of their own language and culture, and equipped with academic education, a new generation of scholars from national minorities will do justice to their own musical traditions.

For example, in the case of Abkhazians, the major positive development was achieved after the appearance of a number of collections and studies of their rich

polyphonic traditions by local scholars and enthusiasts (see, for example, Khashba, 1977, 1983; Ashuba, 1986; Shamba, 1986). This seems to me to be the most prolific way to achieve the adequate study of musical traditions of national minorities. The only serious study of minority musical traditions that I am aware of by a Georgian scholar is the article by Nino Naneishvili, dedicated to the liturgical music of various denominations of Christianity in one of the regions of East Georgia (Naneishvili, 2012), and the Ph.D. of the same author dedicated to liturgical music of Tbilisi during the last two centuries (Naneishvili, 2020). Unfortunately, not all groups living in Tbilisi are researched in the study. Chiefly because of linguistic reasons, only Georgian-speaking religious minorities are discussed. And not to forget, this study concerns religious, not traditional music.

As I have already mentioned, there are relatively rich archival recordings from a number of minorities living in Georgia, but scholarly studies are absent, and probably will be absent until the professionally educated representatives of these minorities pay serious attention to their own musical traditions. Only after achieving this, the rich recorded materials that are sitting today idle on the archival shelves, will become the source of serious cultural studies.

Some General Issues of Study of Polyphonic traditions of National Minorities

In this part of the article several general topics, concerning polyphonic traditions of the national minorities will be discussed.

Distribution of Polyphony Among Indigenous National Minorities

If we have a look at the world distribution of traditional polyphony, it is easy to notice that a big part of polyphonic traditions, in general, is distributed among national minorities. As a rule, these are the indigenous populations, preserving their traditions in geographically isolated regions – mountains, islands, continental fringes, and large forest massifs. Let me mention several examples. Polyphonic traditions of Ainu in northern Japan, of Tibetan and 25 other national minorities in south-western China, of Nuristanis in Afghanistan, of Flores Island in Indonesia, of minorities living in Taiwanese mountains, of aboriginal tribes in Papua New Guinea, of indigenous American Indian tribes living in the mountains of North Argentina, are among them (for a more detailed discussion of such cultures see Jordania, 2006, 2015).

The fact of the distribution of polyphony among national minorities in many countries leads to unfavorable conditions of study of many polyphonic traditions of national minorities. Sometimes even the fact of the presence of interesting forms of polyphony is not mentioned when discussing their musical traditions,

even in the most prestigious professional publications. See, for example, the special article on Vietnamese national minorities in the *Garland Encyclopedia of World Music* (Nguyen, 1998), or an article on musical traditions of Basques (see Laborde, 2000).

Unfortunately, this neglect is more-or-less a general trend, although there are positive changes in the world during the last few decades. For example, Corsican polyphonic traditions were gradually disappearing, but with the change of France's cultural policy, the vocal polyphony in Corsica has been experiencing great recognition and resurgence during the last several decades.

Fortunately, there are also good exceptions when polyphonic traditions of national minorities get decent scholarly attention, scholarly research, with published scholarly articles, and even books. China is among such countries where the polyphonic traditions of national minorities received substantial attention from ethnomusicologists (see for example a monographic study of polyphonic traditions of Chinese peoples by Fan Zu Yin, 1994).

Stratification of Traditional Polyphony in the Light of the Origins of Polyphony

It is very important to remember, that the distribution of polyphony all over the World is very fragmental, and in most cases does not have a national (or tribal) character. On the contrary, in many regions, several polyphonic cultures create "international polyphonic clusters." Think of the number of polyphonic cultures of Caucasia (Georgians and North Caucasian peoples), or Balkans, or the minorities in South-West China. This peculiar geographic stratification can be explained by the origins of the phenomenon of vocal polyphony. In number of books (Jordania, 2006, 2011) I proposed that contrary to popular belief, polyphony is not a late cultural invention that was developed on the basis of the development of initial monophonic singing. All the existing information strongly supports the idea that polyphony is gradually disappearing all over the world.

According to the proposed model, polyphony was created by the forces of natural selection during the earliest period of the evolutionary development of our hominid ancestors, as a part of the human defense system from predators. Loud, rhythmically united sound, full of dissonant harmonies, accompanied by the group synchronic body movements was putting our ancestors in an altered state of consciousness, which I call the "Battle Trance." In this state, participants did not feel fear and even pain, group interests, and saving their family and tribe members were becoming more important than their own survival (Jordania, 2011). The psychological state of the battle trance was a crucial tool for our ancestors to defend themselves from predators and obtain food. This is the reason why participation in ritual dancing and singing sessions before the

military and hunting sessions is universally spread in traditional societies. A tradition of the ritual dances before military sessions has such deep roots, that it is well alive today among the most contemporary, well equipped western combat forces as well. As an example, we can mention here the tradition of American soldiers, who often engage in a vigorous group singing and dancing sessions before their military missions. You can read about this interesting phenomenon in the insightful book by Jonathan Pieslak “Sound Targets: Music in Iraq War” (Pieslak, 2009).

I am happy that despite the slow start, this new theory of the origins of polyphony in the context of human evolution gradually received international recognition in the form of the highest international award in ethnomusicology, the Fumio Koizumi prize in 2009 (see also Nettl, 2015a).

So, to explain the correlation between the distribution of polyphony and national minorities, let us recall one more time that vocal polyphony is gradually disappearing all over the world. This idea naturally leads us to the fact that vocal polyphony is mostly surviving in the most geographically isolated regions of the world. This is the most natural feature for the oldest layers of cultural traditions, ancient languages, or the relict biological species of plants and animals. Such ancient survivals are found in the most inaccessible, isolated places, often geographically very far from each other, but stylistically still close to each other. On the importance of geographic isolation that helps the older population and their musical traditions to survive for a longer period of the time wrote, for example, Nettl, 2015: 324, and Sachs, 1940: 63-64.

A prime example of this thesis in ethnomusicology is the great number of vocal polyphonic traditions from very different regions of the world (Balkans, Baltic region, Polesie, Caucasia, Nuristan, North Japan, some islands of Indonesia, Melanesia, North Vietnam and south-west China, Taiwan) based on dissonant seconds and the use of drones (Jordania, 2006, 2011). The famous confusion of Jaap Kunst, that led the scholar proposing the unlikely migration of Balkan peoples to faraway Indonesia (Kunst, 1954) would become something bigger and probably different if Kunst was aware of so many isolated regions of the world harbouring very similar specific drone-dissonant type vocal polyphony (see Jordania: 2015).

Polyphony, Indigenous National Minorities and State Borders

Here is one more general issue affecting many aboriginal peoples of the world. While living in the pockets of hard-to-access territories, indigenous carriers of polyphonic traditions are gradually isolated from other related groups and many of them lose their languages, but they often retain longer their singing

traditions, as music shows greater stability in such situations of isolation and admixture than language (Jordania, 2015:243-251).

Later, with the process of formation of contemporary nation-states, a new complex and sometimes painful process takes place: drawing state borders. All nation-states need stable and well-defined borders. The most natural places of putting such borders between the nations naturally are the hard-to-access and isolated regions between the countries. These are the regions, as we remember, that are often populated by the descendants of the older, indigenous populations, often carriers of polyphonic traditions. So, as state borders run on the top of the mountain ranges and the middle of the major forest massifs, the older, culturally and ethnically related populations that live in such isolated regions, find suddenly themselves divided and belonging to different states.

For example, when France and Spain put a border between these two states, the border went through the Pyrenees, the natural living space of the pre-Info-European Basques. As a result, today Basques live both in France and in Spain. The same processes were active in the Alps. Neighbouring Germany, Italy, Austria, and France divided the mountainous range, and the once ethnically and culturally related populations found themselves divided in different countries. For this reason, populations of southern Germany and northern Italy are culturally and ethnically closer to each other, than the populations of northern and southern Italy, or the northern and southern Germany. Similar processes were in place in the Caucasus as well. The same has happened in the largest forest region of Europe, Polesie, which is today divided between the Ukraine, Belarus, Poland, and Russia.

Conclusions

What does this all mean for the study of the polyphonic traditions of indigenous Peoples? Promoting national interest and supporting the idea of unique features of the national culture is a natural desire of national scholars and artists. Vocal polyphony has been more than once at the center of such sentiments of uniqueness. Vasil Stoin, for example, was considering Bulgarian polyphony a unique phenomenon (Stoin, 1925), although later it became apparent that similar polyphony was present among most of the peoples of the Balkan Peninsula (and not only). Georgian musicology for decades was also championing the idea that Georgia was a polyphonic island in the sea of monophonic traditions (see, for example, Javakhishvili, 1938/1998). It turned out that virtually all the peoples of North Caucasus, (including Turkic language speaker Balkarians and Karachaevis, as well as Indo-Iranian language speaker Ossetians) have vocal polyphonic traditions that are stylistically similar to Georgian polyphony.

From a contemporary perspective, it is relatively easy to see that the distribution of vocal polyphony often crosses boundaries between the states and represents a wider international and regional phenomenon. Therefore, if we want to study deeper the vocal polyphony of a certain culture, we should not restrict ourselves with the research of traditional polyphony of one region or even one country.

Ideally, we need to check the neighboring countries, check the possibility of the presence of vocal polyphony in these countries, and incorporate the study of other neighboring traditions of vocal polyphony of the whole region, despite the existing state borders, and possible linguistic differences. A collaboration of scholars from various countries would be very fruitful.

And finally, after a discussion of this complex issue, here are three simple practical conclusions-suggestions about the study of vocal polyphonic traditions of indigenous national minorities:

(1) To bolster the adequate study of musical traditions of national minorities, probably the most fruitful long-run strategy is to educate young musicians from these minorities, and encourage them to research their own musical traditions;

(2) To go on a higher level of study of the polyphonic musical traditions of indigenous national minorities scholars should try to look at the musical traditions of these minorities wider, not only as a single culture on its own, but in the context of neighboring (and particularly stylistically similar) musical traditions.

(3) Therefore, I propose cooperation between the ethnomusicologists representing various national minorities should be encouraged, and this trend might become a fruitful strategy of the ethnomusicology of the 21st century.

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Essay Eight

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Can there be an Alternative Evolutionary Reason Behind the Peacock's Impressive Train?

Few propositions are believed in biology as strongly as Charles Darwin's theory of evolutionary reasons behind the amazing beauty of the peacock's tail (the professional term for this impressive creation of nature is "train," and the official name for the species is peafowl, *Pavo cristatus*). The peacock's visual features were always considered so cumbersome and harmful for survival that it was believed that the only reason for the peacock's sporting the huge tail was to entice female peahens with their beauty.

According to this model, championed by Darwin and followed by generations of scholars, for a big and colourful peacock, it is more difficult to stay unnoticed, and therefore to survive predators, but this negative factor is overcompensated by another, positive factor: a more impressive tail enhances its bearer's chances of having more mating opportunities and many offspring. Amotz Zahavi furthered Darwin's initial idea by proposing the "handicap principle," in which he argued that for the display of fitness to be honest, it should be a serious handicap to its bearer (Zahavi et al, 1997).

Scholars were so sure about the sexual selection reason behind the attractiveness of a peacock's dazzling display that they did not even consider it necessary to test this idea and to support it with an experiment or a field study until quite recently.

Only at the beginning of the 1990s, more than a century after the publication of Darwin's work on sexual selection (1871), did Marion Petrie, Tim Halliday, and Carolyn Sanders finally publish the results of their study on peacocks' mating behaviour. According to their results, as expected, females chose males with bigger trains and with the largest number of eyespots (Petrie et al., 1991). Thus, the study confirmed what was already believed.

Unfortunately, the study was very limited, as researchers studied only one lek (a congregation of males) of 10 males for a very limited time (one mating season, or more precisely, a bit over a month), and the method employed did not convince everyone – researchers disfigured some of the males' tail feathers and covered several eyespots to observe the results. A bigger study was needed.

A few years later a much larger study was conducted. It was expected to confirm the Petrie et al. 1991 findings with solid field results. During seven long mating seasons

(from 1995 to 2001), researchers from the Graduate School of Arts and Sciences at the University of Tokyo, under the leadership of Mariko Takahashi, studied the free-ranging population of Indian peafowl at Izu Cactus Park in Shizuoka, Japan (Takahashi et al., 2008). Very unexpectedly for them, the researchers came to the conclusion, that the peahens were totally indifferent to the peacocks' tail beauty and eyespot numbers, and that generally the tail condition did not correlate with the reproductive success of their bearers.

It is difficult to know the reasons for the huge delay between the end of study and the appearance of the publication (possibly they were analysing field results? Or they had doubts whether it was worth publishing unexpected and negative results?). Whatever the reasons, the publication of the results took another seven years (Takahashi et al., 2008). Discovery News presented the results as sensational: "The feather train on male peacocks is among the most striking and beautiful physical attributes in nature, but it fails to excite, much less interest, females, according to new research. The determination throws a wrench in the long-held belief that male peacock feathers evolved in response to female mate choice. It could also indicate that certain other elaborate features in galliformes, a group that includes turkeys, chickens, grouse, quails, and pheasants, as well as peacocks, are not necessarily linked to fitness and mating success" (Viegas, 2008).

As we can see, instead of confirming the results of Petrie and her colleagues, the Japanese study actually provided falsification of the initial hypothesis.

As expected, proponents of the sexual selection theory did not take the unwelcome news without a fight. Petrie and her French colleagues immediately wrote a rebuttal of the Japanese study (Loyau et al., 2008). Without rejecting the diligent Japanese study, they proposed that a phenomenon of "plasticity of female choice" might be involved. In plain English this term means that peahens might change their taste in choosing males very much as humans do, and that contemporary peahens are possibly not as interested in the size and beauty of the peacock tail as their grandmothers were. Theoretically possible, this explanation does not seem very convincing, as it seems hard to believe that, after hundreds of thousands (possibly even millions) of years of female excitement for their male counterparts' trains, suddenly, during the 1990s (between the studies of Marion Petrie and Mariko Takahashi) peahens for some unknown reason lost interest in the peacock's dazzling display.

Still in the 1990s, a modified sexual selection model was suggested by Merle Jacobs, author of the "food-courtship theory" (1999). The theory suggests that peahens are attracted to peacocks for the resemblance of their eyespots to blueberries. Creationists also benefited from this unexpected result and confusion among biologists after Takahashi's results were published. If sexual selection was not behind the

peacock's tail, they mused, then what else could be the reason for this "unnecessary beauty" if not the will and aesthetic sense of the Creator?

So, let me ask the central question for this article: can there be an alternative explanation to sexual selection for the evolutionary reason behind the peacock's dazzling train?

We are often so blinded by the visual factor that we fail to notice other elements of morphology and behaviour. Have you ever seen a discussion of peacock's voice or behaviour, together with their visual appearance? Most likely never! And as soon as we pay attention to these details, it becomes clear that the peacock's dazzling tail might be just one, the visual element, of the so-called "aposematic display."

But what does this unusual term mean? "Aposematism" is one of the two very important opposing strategies of survival, another much better-known strategy being "crypsis." The differences between them are easy to understand: Cryptic species (both predator and particularly prey species) try to survive predators by staying unnoticed. They are usually camouflaged, are mostly silent, try not to have a body odour, and as soon as they are noticed by a predator, they try to escape as fast as possible. Cryptic species are very good runners. Cats of various sizes and rabbits are examples of classic cryptic species among predator and prey species.

Aposematic species (both predator and particularly prey species) do not try to conceal themselves. On the contrary, they try to "announce" their presence by all the possible modalities: they are often very visible by their contrastive body colours; they often make constant sounds as they walk; and they as a rule have a constant body odour and can produce stronger smell if threatened. Finally, when confronted by a potential predator, instead of running away, they try to intimidate the predator by their suddenly increased body size, threatening sounds, gestures, and fearless behaviour. Aposematic species are, as a rule, bad at running. Skunks and porcupine are examples of classic aposematic species. Aposematic species are more usual among prey species, as the predators that announce their presence are understandably less successful.

Aposematism, for many biologists, is merely a "warning coloration," but it is much more than coloration. For a species that uses aposematism as a survival strategy, it pays **to use aposematic signals in every possible modality – not only visual signals**. That is the reason that a skunk, when facing a predator, starts an elaborate display of various intimidating behaviours: it raises tail and even stands upright on its front legs, trying to look as tall and impressive as possible (visual signal), makes threatening growling sounds (audio signal), intensifies the body odour (still before using his deadly olfactory defence as the ultimate weapon), and to prove it is not scared, keeps its ground without moving away from a predator.

Now let us look at peacocks. Do they display any of these aposematic signals? Yes, it seems to me they do, and they display most of these signals. Apart from their already renowned huge and colourful tail with plenty of eyespots (used often as an aposematic or deymatic signal), they have many other elements of classic aposematic species as well: the peacock has a very strong, piercing voice (audio signal), secretes very smelly droppings if handled against its will (olfactory signal), and often does not go away even if a potential danger, for example, a tiger or a leopard, is nearby. And finally, against of Darwin's predictions, male peacocks with their cumbersome trains survive predators much better, than females (Takahashi, 2008).

What about peahens – do they use any elements of aposematic display, or do only males behave aposematically? Yes, it is quite well known that peahens actively use their much smaller feathers when they need to defend their chicks from intruders and predators. We probably also need to discuss specifically whether peacocks' strategy to avoid attacks from tigers (*Panthera tigris*) and leopards (*Panthera pardus*) is a viable one, as these predators might gradually learn to disregard peacock's size and fearless behaviour and start attacking them.

This element of peacocks' behaviour can be only studied in the natural habitat of the peafowl, not in the feral populations living in the UK (where Petrie's study was conducted) or in Japan (where Takahashi's study was conducted). Unfortunately, no study of peafowl was ever conducted in India, where they naturally live. But fortunately for us, there is plenty of evidence that peacocks are not generally scared of big cats. George Schaller was probably the first scholar who noted that peacocks are not alarmed by tigers' close proximity (1984:279). Also, the interested reader can easily see plenty of photos on the internet, taken in the wild, where peacocks are photographed in close proximity to tigers and leopards. Of course, it is also true that in some cases peacocks can be attacked and killed by these predators, but we need to remember that there is no aposematic animal that is guaranteed survival from predator attacks, including the legendary skunk, who is still sometimes killed by predators. As Ruxton et al. wrote, the only guaranteed defence from predators is to kill the predator (Ruxton et al. 2004). I tried also to attach a few photos to this article to demonstrate peacock's general disdain for the proximity of tigers and leopards (I am grateful to Samuel Singh, a member of Jim Corbett International Research Group member, who took most of these photos and provided them for my research. Photos were taken in Pilibhit tiger reserve in May 2019).

Therefore, my suggestion is that the peacock's amazingly big and beautiful train evolved primarily (or at least partly) under the forces of natural selection, and its evolutionary function was, and still is, to scare away predators (and rival males). By the way, the function of the peacock's train to scare away the rival males has been long known to the proponents of sexual selection as well, and was discussed in Petrie et al. 1991 publication. Even earlier, in the 1930s, R. W. G. Hingston (1933) and J. Huxley

(1938) pointed out that male adornment is instrumental in establishing dominance relationships among males. The ideas of sexual selection via female choice, and aposematism display to scare predators are not mutually exclusive, on the contrary, the same feature that might attract females (like a big muscle body, or a colorful tail of enormous size) can be both attractive to females, and intimidating both for rivals and predators.

How do things stand at the moment? The ground-breaking Japanese study of Takahashi sometimes gets simply neglected, and, for many, the sexual selection model is still the only explanation for the peacock's dazzling tail (see, for example, a 2012 article by Patricia Brennan from the Department of Ecology and Evolutionary Biology, Yale University: no mention of the conflicting study results at all). It is difficult to understand why, after the publication of two similar experimental studies with very different results (Petrie et al., 1991 and Takahashi et al., 2008) no other studies were conducted during the last 15 years, although such clearly conflicting results should have naturally prompted the appearance of more studies.

And closer to the end, I have to mention as well that the theory of sexual selection always had critics, including even Alfred Wallace, the co-discoverer of the theory of natural selection, and discoverer of the idea of “warning flags” that gave rise to the idea of aposematism. Unfortunately, Wallace himself never proposed the idea of “warning flags” to account for the peacock's train size and beauty, although he was critical of the idea of that sexual selection accounted for the peacock's amazing display. If we consider that to look bigger (and more colourful) is one of natural selection's favourite strategies to scare away predators and competitors and avoid unnecessary physical confrontations, the idea that the peacock's train was primarily aposematic seems very plausible.

By the way, such strategies thrive not only among aposematic species, who use warning signals constantly, virtually every moment of their lives, and in every modality but also occur among most non-aposematic species (including the perfect predators – cats of all sizes), who use aposematic (or, more precisely, startling, Dematic) “go away” signals occasionally to avoid unnecessary and potentially dangerous physical confrontations, and substitute ritualized non-violent aposematic displays for costly fights (see for example, Eibl-Eibesfeldt, 1979).

Therefore, I propose to check the possibility that peacocks' morphology and behaviour evolved primarily as an aposematic strategy of defence from predators and intimidation rivals. In 2016 (in the UK) and 2017 (in Portugal) I gave related presentations at two international meetings of behavioural ecologists, and I can say that, apart from rare exceptions, the reaction was that of suspicious distrust. Of course, we should not forget that the idea of sexual selection being behind the peacock's dazzling train is one of the most trusted, and even the most loved theories in biology,

and it will take time and more evidence to put even a slight doubt in the minds of proponents of sexual selection theory. At least, it is encouraging for me, that in 2020, a study that puts serious doubt in the handicap principle hypothesis, was published (Penn, and Számadó, 2020).

So, I do not hope to prove wrong the theory of sexual selection behind the peacock's train with this small article. My aim is only to propose to the behavioural ecologists that in a wider discussion of the possible evolutionary reasons behind the beauty of peacock's train, a discussion that seems long overdue, the forces of natural selection in general, and aposematic strategies in particular, be considered as well.

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Essay Nine

Here is an “introduction” of the book *Charles Darwin and Jim Corbett: Parallel Biographies*, Logos, 2023

Introduction of the book “Charles Darwin and Jim Corbett”

Isn't it amazing how little we change from our childhood? During all my life, from my teenage years, I had two great role models, indicated in the title of this book, and that has not changed! But frankly, one thing has changed — I never thought I would ever be writing their biographies. Although I have written a few books, I was always sure that I was not the kind of person who would write someone's biography. To be a biographer is a totally different style of activity. So, I am starting this book a little bit unaware of where it takes me.

To avoid any misunderstanding, let me reveal from the very beginning that this book is not written as a ‘classic biography.’ There are already a number of biographies about both Charles Darwin and Jim Corbett. This book is more of an attempt to display the psychological profiles of Darwin and Corbett, both seen from the very personal point of view of their lifelong admirer. A bit like their enhanced and colorized photos on the book cover (coloured photography was not available during their lifetimes), this book is the result of my deeply personal view on these two remarkable humans and self-taught naturalists. Therefore, the text that follows this introduction will concentrate on their private lives and various major or minor circumstances (sometimes completely neglected in their more academically written biographies) that shaped them into the kindest and humblest human beings, great naturalists, and intensely adventurous and originally-thinking scholars.

An important factor that might have given me an impetus and inspiration to start penning this unusual book was writing my most recent book, *The Human Story Behind Scientific Discovery*, that I sent to the editor in the beginning of January 2020, only days before starting this double biography. In the recently finished book (July 2020, Logos), I was looking at the usually neglected aspects of scholars' lives, such as how they were treated in their own family; how they were encouraged or discouraged; how they were educated; what they did for a living; what kind of stresses they had to cope with; what sort of personalities they were; how they dealt with their followers or detractors; and how they managed to think out of the bounds of the established norms of the scholarly beliefs of their time, etc. Both Corbett and Darwin, the latter in particular, are not only the focus of this book, but also, they

both equally share a big part of my heart. So, I was constantly comparing them in my mind with whatever aspect of a scholar's life I was discussing.

An unusual element of this present book is that it looks not only into the biographies of Charles Darwin and Jim Corbett, but at their life stories side by side, comparing them and finding numerous, and sometimes surprising, commonalities together with the obvious differences.

This genre of 'parallel biographies,' or 'parallel lives,' comes from Plutarch, Greek historian and philosopher of the first century AD (46 AD – 119 AD). In his highly acclaimed series of writings about remarkable Greek and Roman historical figures, Plutarch tried to show the character and personality of his heroes, but not necessarily the chronological line of events. This interesting type of investigative biography can be very productive, as, instead of concentrating on a single person, a constant comparison with another person gives the reader (and the writer) a fresher perspective to discern features that are otherwise hard to notice when focusing on a single person.

Sadly, this potentially prosperous genre of 'parallel biographies', entailing looking at two comparable lives, did not generate the successful following it could have had in subsequent centuries. I know few examples of such comparisons. Some exceptions that I am aware of are books usually dedicated to the leaders of nations, and mostly contemporaries, like *Attlee and Churchill: Allies in War, Adversaries in Peace* by Leo McKinstry, looking at two British prime ministers of the same epoch, or *Hitler and Hiro Hito* by Geoffrey Barraclough, looking at two infamous allies during the second World War. I also remember a couple of pages' long list of interesting parallels between Adolf Hitler and Joseph Stalin by Victor Suvorov in the introduction of the insightful book *The Chief Culprit*. And of course, there is a monumental 1000+ page *Hitler and Stalin: Parallel Lives* by Alan Bullock. The Second World War heroes dominate such works.

Perhaps I should address another issue as well from the very beginning of this book. At least for some readers, the very aim of this book, a comparison of Charles Darwin and Jim Corbett, might seem totally inappropriate. "How on earth can someone compare such different humans, with such different lifestyles, values, and life goals – an iconic scholar, the symbol of scholarly brilliance on one hand, and a brave tiger hunter on the other hand?" I can imagine at least some readers would ask this question politely, in genuine confusion. For good reason, many readers would consider it more appropriate if I had coupled Charles Darwin with Alfred Russel Wallace, the co-discoverer of the principle of natural selection, and on the other

hand, compared Jim Corbett with another British hunter and author of popular books on similar topic, Kenneth Anderson. But Charles Darwin compared with Jim Corbett?...

It is true that the name and fame of Jim Corbett cannot be compared with Charles Darwin for general popularity and the size of their scholarly legacy, but labelling Corbett "a brave hunter" is a huge understatement for this multitalented personality.

Corbett was primarily a great self-taught naturalist who developed an encyclopaedic knowledge of the flora and fauna of Northern India, if not of the whole of Indian subcontinent, with a keen eye and brilliant analytical mind that left a scholarly legacy miles ahead of its time (and as I will argue, probably even ahead of contemporary 21st-century scholarship in some cases). He was a pioneer conservationist whose work was acknowledged by the greater and lesser authorities of the British Empire and whose name was given to the first national park of India, the "Corbett National Park," and later to a newly categorised tiger subspecies. He was also a dedicated filmmaker who was arguably the first to film tigers in their natural habitat (according to the letter from Trubee Davison, former director of the American Museum of Natural History, to Jim Corbett. See: Maggie Corbett, "Notes and Biographical Sketches," in !@# *Behind Jim Corbett's Stories*, vol. 2, p. 281). He was also a talented author of best-selling classics that captivated millions of readers all over the world and were published in the Oxford World Classic series; and finally, he was a great humanitarian who was respected, admired, and even adored by everyone from simple Indian villagers to the Viceroy of India and even the Queen.

Certainly, there can be no questions about the big **differences** between the two heroes of our book, as their characters and lifestyles exhibited tremendous contrasts. To start with:

➤ Their family backgrounds were very different – Darwin came from a family of upper middle-class English intellectuals and free-thinkers; Corbett was Anglo-Indian by birth, whose family had settled in India from Britain, at least two generations earlier, and despite all the reverence and love shown towards him, he was still sometimes looked down on socially by the British-born residents.

➤ Their working lives were also a world apart – Darwin never worked for a living, as his family inheritance, coupled with his own modest personal needs provided more than enough for a comfortable living; Corbett, on the contrary, worked almost all his active life. He had to quit school to start working while still a teenager to support his large dependent family's needs

and wants. He would later further substantiate his income through the acquisition of a business, and when he retired, he was still actively looking after a newly acquired plantation in Tanzania.

➤ In terms of relationships, family, and descendants they also were very different – Corbett never married and any alleged relationship he had or tried to have, have yet to be proven, whereas Darwin and his wife Emma had ten children, seven of whom lived to maturity, often achieving great professional success in their lives. Having children provided Charles with great joy, as well as the greatest tragedy of his life, when his first daughter, beloved Annie, died at the age of 10.

➤ For the special interest of this author, they were very different according to their musicality despite the interesting fact that they both had professionally educated pianists as their closest female family members. Darwin complained that he could not receive pleasure from music (at least in the last part of his life). Corbett, on the contrary, was explicitly musical, had a nice tenor voice, loved singing, and played guitar and flute. He certainly used his musical talent and brilliant ear for identifying countless bird and animal species calls and was a great master of mimicking animal calls.

➤ In terms of character, they had many similarities (see below), but they also exhibited marked differences: Darwin was in a constant need of someone to take care of him and his requirements; Corbett, conversely, being independent by nature since a young age, took care of himself - when alone, could sleep in the jungle or through a night in the trees, and live off nature's bounty, eating whatever fruit he found or any commodity he was given, and would wash himself and his clothes in cold water from a natural source.

➤ Their physical constitutions were also very different – Darwin was of relatively fragile health and suffered from many (and often mysterious) symptoms of ill-health most of his life; Corbett, on the contrary, was known for his unfailing health and iron constitution, enabling him to walk tirelessly for tens of miles a day in rough country and sometimes endure days of inhumanly strenuous life-endangering work without food or sleep.

And now, after these few differences, here is a much longer, and probably sometimes surprising, list of the **common characteristics** that unite these two heroes:

➤ Both Darwin and Corbett were born naturalists of the highest standard, and they left legacies that have withstood the test of time. They both had a keen observant eye and were confident in the power of good observation. Nature was their most important teacher.

➤ In a certain sense, both Darwin and Corbett were amateurs, as neither finished the formal academic education required to be known as ‘certified scholars’: Darwin was a mere Bachelor of Arts, without finishing his medical degree, and without Ph.D., and Corbett did not even finish school and hadn’t been awarded a certificate of education. They both hated the stifling atmosphere of the existing formal education of their times.

➤ They both had a keen mind able to reconstruct past events – Darwin was a master of finding evolutionary forces behind the slow, hard-to-notice changes and slightest mutations in life organisms, and Corbett was a master of reconstructing dramatic scenes from jungle tragedies from the faintest of signs observed and detected on the ground and the immediate environment, very much like a Sherlock Holmes of the jungle.

➤ They both were very passionate about animals and were outspoken advocates of animal rights; both wrote moving pleas for a wiser and humane, wider society, calling for treating animals kindly, miles ahead of the ethics of the society in their times.

➤ They both loved nature in its simplest form from their early years, and possibly surprisingly for some readers, both enjoyed fishing and hunting , and both were skilled taxidermists.

➤ Both came from sizeable families with many siblings – Charles had five siblings, and Jim had ten siblings (two of them half-siblings).

➤ Both of them lost one parents in their early years (Darwin, his mother, and Corbett, his father).

➤ Both were the second-last-born children of their parents.

➤ Both of their youngest siblings (Mary Ann Darwin, and Archibald Corbett) died young, leaving Charles and Jim the last surviving child in their families.

➤ Despite the phenomenal success of their writings, they both were extremely humble, and were initially afraid that their writings would not be well received and would be perceived as uninteresting and unaccepted by others. They both waited many years to finally publish their most important writings to a wider public.

➤ They both became, I would say, adored, and in a certain way, wrongly idolised by their followers and admirers, who were unable to grasp the complexity of their interests and life goals. Darwin for some became a symbol of militant atheism, though he never rejected the idea of a higher

intelligence that could answer the questions beyond human perception. Similarly, the name of Jim Corbett, for some, became a symbol of a “brave tiger hunter,” missing the cardinal points of Corbett’s life, materialised in spending years on educating the younger generation about wildlife and its conservation; and his efforts to preserve the fauna and flora ultimately led to the creation of the first national park in India.

➤ They both were dedicated to their families, and interestingly, for both of them their most dedicated partners were their closest female relatives: Charles married his first cousin Emma, and Jim spent his entire bachelor life with his maiden sister Maggie.

➤ Additionally, both of their female homemakers, Emma Darwin and Maggie Corbett, were very skilled piano players, were older than their famous men, yet survived their companions, living to a very ripe age (Emma Darwin lived till 88, and Maggie Corbett lived till 89).

➤ Both Darwin and Corbett had troubling and not fully understood (even today) health conditions. Darwin suffered most of his life after his great trip on the *Beagle* from an array of symptoms, and Corbett, despite his iron constitution, had occasional mysterious and frightening experiences at night.

➤ Neither made a living from the activities they became famous for; Darwin never worked as a scholar and was never known as “Prof. Darwin,” or “Dr. Darwin,” and Corbett steadfastly refused governmental financial rewards for risking his life hunting man-eating tigers and leopards.

➤ Both of them were very kind and compassionate people, caring for the lives and welfare of slaves (Darwin); and risking his life for the simple hill inhabitants of the Himalayan foothills (Corbett).

➤ They both opposed the reigning ethnicity and creed prejudices of their time. Darwin, based on his own experience, praised people of African origin, and Corbett, also based on his own life experiences, sincerely praised representatives of the lowest castes of India.

➤ Both were utterly sincere and frank, openly admitting their weaknesses, and were humble about their strengths.

➤ Both Corbett and Darwin were prolific writers and left a number of still popular books that have remained in print.

➤ Although millions have read their writings with admiration, both were slow writers, struggling over every sentence, and never knew their work would have reached such a vast audience.

➤ Despite the fact that they were acknowledged and loved during their lifetimes, much wider acknowledgment came after their death. Characteristically, the British prime minister and the Queen did not attend

Darwin's funeral, and Corbett's ideas as a naturalist were not adequately acknowledged in the scholarly world.

➤ As both were basically self-taught naturalists without any official academic credentials, they never had students, although they both had ardent followers.

➤ They both left a large and quickly growing legacy: numerous books, films and documentaries made about them; animal species and places, named after them; and active fan clubs with ongoing internet discussions, following them.

➤ And a final and chilling parallel: as if the connections between the lives of these two remarkable humans and self-educated naturalists were conceived somewhere on a higher level, both Charles Darwin and Jim Corbett left this world on the same day, April 19th.

* * * * *

All these details, whether they exhibited closeness or marked differences, may lead us to better understand the forming of the personalities of these two remarkable humans. We will follow their most important life events, their family backgrounds, their inborn or developed interests, their education and character formation, effects of later life events on their personality, and the legacy they left behind.

The book will have many sections, some very small and some larger. In these sections we will discuss their families, parents, childhood, education, friends, character, health, stresses they endured, and ideals they stood for.

On the subsequent pages, I will argue that the central reason for the universal appeal of Darwin's and Corbett's legacy, instead of their encyclopaedic knowledge, influential ideas, and still popular books, is primarily their utterly human and lovable character, their gentle, compassionate, humble nature, their love for voiceless humans and animals, and their profound sincerity and self-criticism.

And finally, if a single reader, who took up this strange small book from being a lifelong fan of one on its heroes becomes a fan of both after reading it, I would be able to say happily that I have achieved my goal. Czech biologist, celebrated paleoanthropologists and zoologist Vratislav Mazák, to whose memory this book is dedicated, was exactly such a scholar who, I am sure, would have loved to read this book. He made a great contribution to palaeoanthropology by describing *Homo ergaster*, and to zoology by describing a new subspecies of Indochinese tiger, naming it after his favourite naturalist Jim Corbett.

References of the chapters 9, 10 and 11, see at the end of chapter 11.

Essay Ten

A chapter from the book *Charles Darwin and Jim Corbett: Parallel Biographies*, Logos, 2023.

Mystery of Charles Darwin's Illness

We are now probably at the crucial section of life both heroes of this book. They had amazing life adventures, but there were big differences between them as well. Let us discuss Charles Darwin's share of travels and adventures first, particularly as I believe this fascinating topic can reveal important insights into Charles' personality and health.

Most of his life, Darwin lived in the UK without travel, as an armchair scholar. Darwin's travel and physical adventures were over by the time he turned 28. But of course, before settling to an armchair life for good, Darwin took a very special trip, and boy, what a trip that was! Probably one of the best known in humanity's history, the epic five-year-round-the-world-voyage on the *Beagle*, the trip that changed not only his life, but irreversibly altered our understanding of the life around us. A lot has been written on this subject, so I will not bother with another description of the places he visited and the discoveries he made. Instead, I want to pay attention to another detail and will attempt to make a far-ranging suggestion.

The crux of my suggestion is, that in my opinion, by natural disposition, Charles Darwin was never an armchair scholar. Instead, he was more of an active adventurer, thriving while he was visiting various countries, riding horses, shooting animal and bird species for his collection, and generally having a life full of active physical not just intellectual adventures. And I propose that Darwin's getting a mysterious disease that plagued his health after the trip should be attributed to the fact, that settling into the sedentary life of an academic was against his natural character. In other words, I suggest that for most of his life Charles was psychologically suffering from his physical inactivity.

"Wait a minute," an informed reader might ask, "this simply cannot be true, as we know very well what Darwin wrote about activities and excitement in his life. Here are Darwin's own words: 'I have long found it impossible to visit anywhere; the novelty and excitement would annihilate me.' So how do these words go with this sensational claim that Darwin thrived on travel and adventures?"

Well, we must remember that these words were used by Charles to decline invitations to social gatherings in latter part of his life. What I propose is that he hated conventional social gatherings, but loved true physical activities and even danger. Let me remind readers of three small examples from his life.

Example 1. It is 1853, Charles is 44, well into the years of dreadful bouts of sickness, and the time of avoiding social gatherings. There are still six more years to go before, prompted by Wallace's letter, Darwin decides to published the most important book of his life. This year was marked by rising political tension between two world empires, Britain and Russia. Russia's ambitions to obtain new lands from struggling Turkey and strengthen its position in the Balkans and around Mediterranean-Black Sea regions prompted Britain to flex her muscles and start preparing for war against Russia. In 1853 Britain organized massive military manoeuvres in Surrey in Chobham Camp. These were the first large-scale manoeuvres in Britain since the Napoleonic Wars. For almost the entire summer of 1853, from 14 June to 25 August, 8,000 men, 1,500 horses and 24 guns were involved in field operations and parades under the command of Lieutenant-General Sir John Colborne, 1st Baron Seaton. These activities attracted large crowds of spectators, including royalty and foreign dignitaries, and were recorded in numerous paintings and prints. *The Illustrated London News* published a diary of each day's events.

Darwin's family also went to watch the manoeuvres for three days. There were twelve small cousins in the party, eight of them boys. According to the records, when Darwin's arrived, the

"Battle had already commenced, with the bloodcurdling shouts and thundering mounts of over 10.000 men the grandest war games yet staged by a peacetime British army. For a moment, in fact, it became all too real. The Darwin-Wedgewood contingent found themselves being charged by the 13th Light Dragoons and had to flee for their lives." (Desmond & Moore, 2009:417).

And how did Charles feel about these vigorous physical activities and excitement? Charles, quoted above as reluctant to attend any gatherings and excitement, apparently loved the experience! According to Desmond and Moore, arguably the best Darwin's biographers, "It was part of the thrill that made these three happy days unforgettable. And the one who enjoyed them most was Charles." (Desmond & Moore, 2009:417. By the way, this information was taken from Darwin's health diary).

Example 2. Another indication of Charles loving the active life and adventures, comes from the historic trip on the *Beagle*. While Fitzroy was busy with measuring various features of east coast of South America, Charles, accompanied by several local gauchos, crossed the continent from East to the West, including crossing the Andes and reaching the Pacific Ocean. And it is telling how much he enjoyed the rough trip. Darwin's biographers tell us, that "Darwin was becoming quite a gaucho himself. The rough-riding suited him perfectly. At night, crouched around the fire, eating roasted game, he wrote: "I ... drink my Mattee & smoke my cigar, & then lie down & sleep as comfortably with the Heaven for a Canopy as in a featherbed..." (Desmond & Moore, 2009:141). Everyone who appreciates and loves travel and adventure, would envy Charles...

Example 3. Still another story is connected to the *Beagle's* being in South America. In July of 1932, when the *Beagle* arrived in Montevideo, there was unrest among local Black troops, so the local police chief asked the *Beagle's* captain Fitzroy to assist the police with his crew members before the armed forces arrived. So, Darwin, together with sailors and other crew members, with his two personal pistols dangling from his belt, was walking around during the unrest. Sometime later, when the troops arrived, shooting started. So, what was Darwin's reaction to this strictly non-academic activity? "Admittedly, he derived 'a great deal of pleasure in the excitement of this sort of work,'" (Desmond & Moore, 2009:127).

Of course, sceptics might note that two of these three stories occurred in Charles' early to mid-20s, when he was a different man, and this is probably correct, but in 1853, when Darwin was already settled down, and long suffering from his mysterious and debilitating sickness, he showed a great joy to a similar kind of action-related excitement. So, to my mind, in the later part of his life Charles dreaded conventional social gatherings, but was secretly craving real, physical adventures and excitement. I would even go as far as to declare that Dr. Gully's water treatment, by far the most effective for his condition, had a positive effect because they included invigorating physical activities, like showering with freezing cold water and vigorously rubbing his body with wet towels.

Let us ask another question: why on earth did Charles Darwin condemn himself to suffering from physical inactivity, if his character was naturally craving for travel and physical adventure? To answer this difficult question, I suggest looking at

Charles' earlier life and the dreaded negative attitude of his father concerning Charles' lifestyle. I suggest that Robert Darwin's bitter words that Charles remembered painfully clearly for life, had a profound effect, turning Charles from the active adventurer (that he naturally was) into an armchair, "serious" scholar.

It is impossible to be sure about the real reasons behind Charles Darwin's mysterious illness that plagued a big part of his life. There are lots of various theories, conference papers, and serious discussions about his condition, without a single dominating reason behind it (for example, see "Health of Charles Darwin" on Wikipedia). In my opinion, we should not exclude the possibility that the "mortifying" negativity of Robert Darwin's attitude towards Charles was central to his condition. I propose that Robert's negative attitude toward his son worked simultaneously in two very different, almost opposing, ways:

(1) On one hand, Robert's critique made Charles abandon the physically active life he loved and condemned him to suffering from an array of psychosomatic symptoms.

(2) On the other hand, probably the same devastating critique from Robert made Charles so religiously dedicated to the purely intellectual "serious" activity he became famous for.

Stressful memories can work both ways simultaneously – they can cause both pain and negative consequences, and contribute to a person's psychological growth person as well.

Well, we will never know "what might have happened" if Robert Darwin had not been so critical of young Charles: would Charles ever want to become serious from his passions for adventurous life, like hunting and horse-riding? Or would he still become a revolutionary scholar, but manage to maintain a healthy balance between active physical and intellectual lives, thus avoiding the debilitating mysterious sickness that plagued him?

References see at the end of Chapter 11.

Essay Eleven

A chapter from the book *Charles Darwin and Jim Corbett: Parallel Biographies*, Logos, 2023

Mystery of Jim Corbett's Sleeping Habits

We do not need to talk about Jim Corbett's experiences too much to come to an obvious agreement that led had an exciting life full of travels and adventures. It is true, that unlike Darwin, Jim never got to travel around the world, and never visited any such faraway places as America or Australia. But his travels to Europe, Africa, and, of course, Asia, were filled with exciting events that were distributed throughout his life. Unlike Darwin, who finished all his travels and adventures before he turned 30, Jim Corbett had particularly rich life filled with adventures after 30.

We are not going to go into the details of his thrilling adventures when he was tracking man-eating tigers and leopards in the mountainous terrain of the Indian-Nepalese border regions. We probably need only mention that when he went after his first man-eater, the notorious Champawat tigress, in 1907, Jim was 32, and when he went after his last man-eater, the Thak tigress, he was 63. There can be no doubt that Jim Corbett had a life full of travel and physical adventure. He was physically active all his life, and in an excellent shape until the very end.

But there was something that bothered him, something that remains mysterious in his life and health, very much like the mystery of Charles Darwin's health. So, let us discuss now Jim Corbett's health. Was anything really bothering him?

Corbett fans naturally become defensive as soon as they hear someone discussing any possible health troubles with their hero. I have experienced this defensive reaction first-hand. This is understandable. Talk to any of the Corbett readers, or read any of the existing Corbett biographies, and you will quickly be assured that Jim had an exceptionally strong constitution and nerves of steel. It was his health that permitted him inhumanly strenuous days and weeks of following man-eating tigers and leopards on foot, with long stretches of time without food and sleep.

But there is obscure detail, often neglected by his biographers and fans, that is still shrouded in mystery, and I would like to discuss this detail. More precisely, we are going to discuss Corbett's sleeping habits. I believe there are some particulars that warrant close attention.

Let me be direct and openly declare from the very beginning that Corbett himself never discussed any problems with his sleeping, as he generally never liked to talk about any problems he was facing. So, we need to search for information on this topic throughout his stories and sketchy bits of information from his biographies, and surviving memoirs about him. Such details are probably best described in his man-eating stories. In these fully documented stories Jim was trying to give a complete account of his thrilling hunts, packed with dramatic events and details, often with precise dates, names of places and people. So, the time and place of many of his sleeps (or sleepless nights) were among the essentials of the story, as he had to spend time in the villages or wilderness areas where the man-eater big cats were taking their victims. So, what can we say about his sleeping habits? Anything unusual?

In Corbett's man-eating stories, a careful reader will come across many instances when Jim preferred to spend the night in the open, outside houses, even in territory where man-eating tigers and leopards roamed. This was obviously very dangerous conduct and was rightfully considered by the local villagers "crazy" behaviour by a white "sadhu".

Symbolically, Corbett spend the very first night of his first man-eater hunting expedition in 1907, May 4th in the open. He was in a village called Pali, the place of the recent 435th kill by the infamous Champawat tigress (owner of the Guinness record of being the most prolific man-eating animal in recorded history). Corbett vividly described this night, his regret for his silly decision to stay outside the whole night, sitting on the ground with his back to a tree, and the terror he felt that night. For the next few nights, Corbett decided to go inside a village house, but he still left the door wide open, jamming it with thorn bushes. In short, he obviously hated sleeping in closed rooms.

This kind of behaviour is clear in all his man-eater stories. When following the deadly Rudraprayag leopard, arguably the most famous of all man-eating big cats, known to take its victims while asleep in the middle of the night, straight from their beds, Corbett still preferred to sleep in a tent, or, in one case, on an open veranda with a flimsy lantern light, although he knew the leopard had been following him for many miles and was still around, watching carefully, and waiting for him to fall asleep. All his servants wisely chose sleeping in the closed house with closed windows, as nothing else would guarantee their safety from the deadly leopard. Jim's legendary friend Ibbi (Sir William Ibbotson) stayed with him on the open veranda, and they both shared sleeping and vigilance, aided by a local stray dog, another typical food for leopards.

Apart from sleeping out in the open or in houses with open doors, Corbett also preferred staying in tents instead of houses. For many hunts Corbett used his famous 12lb. tent, although it could not provide a secure defence from hungry man-eater big cats.

Probably even more strangely, according to Maggie, his sister and closest lifetime friend, Jim preferred spending nights in the tent even when he was at his own home in Kaladhungi²². Now, that is truly strange. You do not have many humans staying in tents pitched next to their houses. In his summer house in Nainital, Jim would sleep inside but with the windows wide open, irrespective of the weather. And the nights can be very chilly in Nainital even in the hot months, I can testify myself...

These unusual habits of sleeping in the open or in tents hardly in themselves indicate the presence of major problems, but Corbett had many more unexplainable and troubling night-time habits as well. Some of these nights are mentioned in his published stories and several biographies. Let me discuss arguably the best known, recognized by Corbett fans as the “night in Champawat bungalow” from the first story of his first book, bestselling adventure classic *Man-Eaters of Kumaon*.

While hunting his first man-eating tiger, the Champawat tigress, Jim Corbett spent this particular night in a Champawat bungalow on May 10-11, 1907. During that day (May 10th), Corbett covered many miles to check a report of an alleged tiger kill, but found that it was actually a leopard that had killed and partly eaten the calf. Corbett returned to the bungalow where he was going to spend a night together with his men and with a Tehsildar (a local administrative officer in India):

“On returning to the bungalow I found the Tahsildar was back, and as we sat on the verandah I told him of my day's experience. Expressing regret at my having had to go so far on a wild-goose chase, he rose, saying that as he had a long way to go he must start at once. This announcement caused me no little surprise, for twice that day he had said he would stay the night with me. It was not the question of his staying the night that concerned me, but the risk he was taking; however, he was deaf to all my arguments and, as he stepped off the verandah into the dark night, with only one man following him carrying a smoky lantern which gave a mere glimmer of light, to do a walk of four miles in a locality in which men only moved in large parties in daylight, I took off my hat to a very brave man. Having watched him out of sight I turned and entered the bungalow. *I have a tale to tell of that bungalow but I will not tell*

²² See, for example: “When at Kaladhungi, he preferred to sleep in his tent rather than his bedroom and, in Naini Tal, he slept in the house but with the windows wide open regardless of the temperature outside” (Booth, *Carpet Sahib*, pg. 158).

it here, for this is a book of jungle stories, and tales 'beyond the laws of nature' do not consort well with such stories.” (Corbett, 1944, Champawat Man-Eater)

These intriguing last words are well known to all Corbett fans. Despite his promise, “I have a tale to tell of that bungalow,” Corbett never returned to the events of that night in later writings or even in private letters, leaving the interpretation of his words to his readers.

With Corbett’s immaculate reputation as a trusted observer of minute details and facts, and a certain mystery behind these words, this event has long caused hot debates among Corbett fans and researchers. Importantly, new information about the night’s events became public in the first decade of the 21st century. Let us discuss this new source of information.

According to Maurice Nestor, son of Ray Nestor, Corbett’s nephew, Corbett was not alone in the bungalow, for his faithful servant Bahadur Khan was there. Bahadur was in the front part of the bungalow, while Corbett was sleeping alone in the room. The other men from Corbett’s party were in the firewood store behind the building. According to Bahadur, the Tahsildar left because he knew that all would not be well in that bungalow, which was why he preferred to walk through the man-eater’s territory rather than stay at the bungalow. According to Maurice,

“Bahadur later reported to one of Corbett's sisters (either Ray's mother or Maggie) that he heard Corbett being very noisy in his room, and later opened the door suddenly and came running straight to the veranda. Upon joining his master, Bahadur found him shirtless, with heavy drops of sweat everywhere, his hair completely wet with sweat also, breathing heavily. That woke up the other men who came to attend their master and Corbett simply told them he'd rather spend the rest of the night outside with them instead of inside. According to Maurice’s words, the second night [the night before the killing of the man-eating tiger on May 12] was also spent by Corbett at the bungalow, but instead of sleeping inside the room, he slept on the veranda, with his men setting up camp with a nightlong fire to 'cast away' evil spirits. Bahadur, who was the only Muslim in the party, tried not to believe that something strange or unnatural happened, and did not report it as a supernatural experience to the family” (Gadhvi et al., 2016:105).

So, in this interesting memoir, we suddenly have many more important details of the night – Corbett was terrified by ‘something’ to the extent that a man with his steel nerves rushed from the room, after removing his shirt, and was covered in sweat.

Before we discuss these details, I want readers to know that this was not a single event in Jim Corbett's life. He had at least one more recorded similar experience. According to this information, provided by all of the major Corbett's biographers, Corbett was on war duty with another governmental officer when they spent the night in the Raja's house. Corbett was told to leave a particular room alone and locked, as it had a "bad reputation," but he insisted on sleeping in it. During the night his companion heard a ruckus in the room, and the next moment Corbett dashed in through the connecting door out of breath ("panting for breath," Kala, 2009:76) and sweating, and slept the remainder of the night in his companion's room. At breakfast next morning, he was asked what had happened, which made him very upset, and he abruptly left the table and asked never to be reminded of it again.

The sudden waking in the middle of the night, something causing an utter and unexplainable terror, accompanied by heavy breathing, heavy sweating, and no clue for the reason is apparent in both of these cases. Quite understandably, among Corbett fans, particularly in India, these events are often used as confirmation of the existence of unidentified evil forces witnessed firsthand by such a trusted man. Corbett himself wrote in one of his last books: "...though I claim I am not superstitious, I can give no explanation for the experience I met with at the bungalow while hunting the Champawat tiger, and the scream I heard coming from the deserted Thak village" (Jim Corbett, 1954, story "Temple Tiger").

As a lifelong Corbett fan and researcher, I was intrigued by this event like many others, although, interestingly, in the Georgian (and Russian) translations of the book that I initially read, the couple of lines about this event were missing – apparently strict Soviet censorship determined that such words, alluding to "non-material forces," should not be in a book for atheist Soviet readers. In 2018, while in India with a group of Corbett researchers, investigating Corbett-related sites, I even stayed a night in the very Champawat bungalow where Corbett had the experience described above experience, with two other friends. All three of us had an exciting, albeit a peaceful night. So, can any possible scholarly explanation be found?

In a special research chapter "Mystery of Champawat Bungalow," (published in a book "Behind Jim Corbett's Stories", 2016, pg. 104-114), dedicated to the events of the night, I proposed that throughout his life Jim Corbett probably suffered a closet claustrophobia, causing his troubles sleeping in closed rooms, and triggering sometimes vivid nightmares and panic attacks. His claustrophobia most likely was the result of a catastrophic event that took place in Jim's early childhood. On September 18, 1880, five-year-old Jim, together with all his family, witnessed a massive landslide that devastated Nainital and buried more than 150 people alive.

To make things worse, Corbett's family saw the disaster up close (they lived next to the devastated region and easily could have been buried as well), and many of the victims were their good friends. Crucially for our discussion, Corbett himself was not aware of this psychological condition, as the knowledge about claustrophobia was not a part of medical knowledge of the time.

Some of the symptoms of claustrophobic panic attacks commonly known today include:

- (1) fear of imminent death by suffocation,
- (2) desire to remove clothing in order to alleviate symptoms,
- (3) desire to be in the open space,
- (4) heavy sweating,
- (5) being out of breath

Now, if we read once more Maurice Nestor's (or Bahadur's) description of Corbett's behaviour on that night in the Champawat bungalow, we notice that it is very consistent with the symptoms of severe claustrophobic panic attacks: he was

- (1) very heavily sweating,
- (2) out of breath,
- (3) in a rush to get out of a closed room, and probably most importantly,

(4) he removed his clothing (his shirt) during the attack: "Upon joining his master, Bahadur found him shirtless, with heavy drops of sweat everywhere, his hair completely wet with sweat also, breathing heavily."

We do not know whether Corbett had a feeling of approaching death by suffocation, as he himself never spoke of his feelings and his experiences, but the symptoms he displayed strongly suggest that in bungalow (and in the Raja's house) he had a claustrophobic panic attack – a feeling of being unable to breathe and the fear of imminent suffocation.

Long discussions on the topic for many years, and also the behaviour of Corbett-related people gave birth to another idea among Corbett researchers: the strange experiences connected to Jim's sleep were possibly kept a deep secret inside the family, and that's why, when the above-mentioned description of the night's events (coming from Jim's servant, Bahadur, via Jim's nephew, Maurice Nestor) became public in 2009 on social media, the person who made this memoir public (and who

knew Maurice Nestor personally), was most likely asked (by a family member?) to remove the story from public media. So, a few days after publishing this description, the person in question removed the text from the Facebook site, and later denied ever making this description available, although the sensational description, available on a FB page for a few days, was copied by fans and later appeared in print as well.

As we can see, Corbett's general preference for staying outside even when in man-eater territory, sleeping in a tent while at home, and his well-known hatred for constraining cloths, all give indications that Corbett might have had deep claustrophobic fears since childhood after witnessing the catastrophic landslide in Nainital in 1880.

It is widely believed that additional stress factors contribute to the possibility that a person will suffer a claustrophobic panic attack. In the Champawat bungalow Corbett definitely experienced a powerful stressor, as he was following the trail of a man-eater for the first time in his life. And let us remember a macabre detail (particularly sensitive for people with claustrophobic fears), that man-eating cats—tigers, leopards, and lions—kill their victims by suffocation (usually by holding tightly their victim's throat). Jim himself also indicated that a close encounter with tigers *affected his normal breathing*. Here are his words: "I do not know how the close proximity of a tiger reacts on others, but me it always leaves with a breathless feeling due possibly as much to fear as to excitement and a desire for a little rest" (Corbett, 1944: 136, story of Mohan Man-eater).

So, I suggest that it was mostly because of this traumatic childhood experience that Jim Corbett developed a closet claustrophobic fear of suffocation, a condition that would manifest rarely, only under high levels of stress and in closed rooms. Most likely Corbett himself was unaware of his condition, and that's why his love of outdoor sleeping on one hand, and his dislike of formal tight neckwear, was usually attributed only to his love of nature and outdoor living.

With the recognition of this condition that probably troubled Jim Corbett on occasion, we can gain a fresh insight why he preferred sleeping in a tent even at his own house in Kaladhungi.

Of course, on rare occasion Corbett had to wear claustrophobic clothing, including the much-hated tie and suit. This was a natural requirement when James Edward Corbett met members of British high society, and he did meet very high-ranking people, including members of the British royal family. Despite that, his love of outdoor living and free casual clothing was obvious.

By the way, Corbett fans might also remember that Jim did not actually sleep inside the Treetops Hotel rooms, either when he accompanied the royal couple in Kenya on 5-6 February 1952. Instead of sleeping inside the hotel, the 76-year-old preferred to spend the night outside, sitting on a staircase, watching over the safety of the 25-year-old Elizabeth. As we know, this was the historical night when the young princess became the Queen of the British Empire, Elizabeth II, with Corbett guarding her sleep. Corbett must have provided a good beginning to Her Majesty, the longest serving British Monarch, who is still happy to be reminded about her 1952 meeting with the legendary hunter and author.

Corbett's traumatic childhood experience and psychological state possibly also explain why he was so dedicated to hunting man-eating tigers and leopards. On one hand, it was a psychological remedy for his own condition, as man-eating cats kill their victims by suffocation, and Corbett was facing his biggest subconscious fear by eliminating these powerful animals in direct confrontation.

On the other hand, as a deeply compassionate person, Corbett wanted to do all in his power to end the human suffering and death brought by the man-eaters: death in the form of suffocation, his biggest personal fear. And still, with all the conscious and subconscious fear of the man-eating big cats, Corbett's stories are very clear about his overpowering love for tigers and leopards, and compassionate feelings even towards these dangerous man-eating cats, who often started attacking humans after human-inflicted disabling wounds.

Apart from claustrophobia, there may be another probable cause for Corbett's mysterious night-time experiences. This reason is also related to the same catastrophic childhood event of 1880. The alternative suggestion is that after witnessing the landslide, for most of his life Jim suffered Post-Traumatic Stress Disorder (PTSD). This idea came from a member of Jim Corbett International Research FB discussion group, Australian Wayne Welch, a professional soldier and sufferer of PTSD for over 40 years, who recognized PTSD symptoms in Corbett's writings and the description of the event at Champawat bungalow. This idea needs more research, but it is clear that both of these suggestions connect Corbett's state with the early childhood trauma. The possibility of both conditions co-existing is highly probable.

Let us now make a general conclusion on the importance of stressful events in life of Charles Darwin and Jim Corbett. We can say, that just as Darwin was probably

affected by the overwhelmingly negative attitude from his dominating father and managed to channel his stress into religious dedication to academic work, Corbett also managed to channel his traumatic childhood experience into positive energy, becoming a dedicated defender of all living organisms in need of defence and care, both humans and animals.

As humans, we all have various physical and emotional stresses during our lives. The main difference between us is how we react to trauma – becoming bitter and overwhelmingly self-absorbed, even narcissistic, or, conversely, becoming more compassionate towards others who need help, trying to make this world a better place. Both Charles Darwin and Jim Corbett provide great examples of channelling their trauma into positive energy.

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Essay Twelve

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Asking or Answering Questions: Musing over the Educational Strategy for the Future

Abstract

Mainstream education systems are largely heavily based on checking students' knowledge by asking them questions and checking their answers. This is the complete reversal of the natural way of developing children's brains from early age—through asking questions themselves. This article discusses the evolutionary importance of the ability of asking questions for human intelligence and its potential for creating a new strategy of education, based on encouraging students' natural curiosity, and encouraging their natural ability to search for knowledge. The article proposes that the most natural way to develop young human brains is through asking questions to adults from a very young age, the strategy developed and honed during the evolution of *Homo sapiens* through natural selection. The article concludes with some concrete classroom strategies and play suggestions that can be used to encourage young learners to ask questions freely in both child-centered education (CCE) and more traditional teacher-centered education models.

Introduction

Asking questions of students, and their answering the teacher's questions, is the central element of educational systems all over the world. Everything in current educational systems is based on answering questions. In textbooks “control questions” check the students' knowledge; “questions” are to be answered during most tests. This educational strategy inadvertently works in a very undesired direction: to keep children passive and obedient, rendering them only passive learners of existing knowledge instead of encouraging them to become thinking, creative human beings.

These problems have been long addressed in the new, progressive educational strategy, which gradually received the name “Child-Centered Education” (CCE), or “Learner-Centered Education” (LCE). Most of the world’s prominent educators during the last few centuries took part in the movement towards the gradual creation of CCE, including Jean-Jacques Rousseau, Johann Heinrich Pestolozzi, Friedrich Froebel, Maria Montessori, John Dewey, to name a few (Lee, 2018). Their educational ideas received validation from cognitive scholars as well. Developmental psychologist Piaget’s stages of cognitive development theory influenced teachers’ understanding of how children develop and learn in classroom settings (Piaget, 1936/1952), and Vygotsky’s sociocultural cognitive development theory (Vygotsky, 1978) helped shift pedagogical practice in classrooms to facilitate children’s learning and development (Matthews, 2003:54; Stone, 1996:11-12). Scholars claimed that children naturally have an inductive scientific thinking; they formulate and test hypotheses, learn from statistics and learn from interactions with the people around them the same way scientists do (Gopnik, 2012).

As a result of these findings, during recent decades proponents of CCE gradually changed the mainstream educational strategies, primarily in Western countries, concentrating on the needs and abilities of students. From the 1980s and particularly 1990s, CCE has been legitimized by government policies to be promoted in educational reforms in many developing countries as well (Brodie et al., 2002, O’Sullivan, 2003). Educators proposed new ways of classroom organization (Stacey, 2018; Jones, 2007), which led to inevitable changes, particularly teaching science in curricula and turning teachers into facilitators (Khalick et al., 2015). Primary attention was given to bringing more creativity in science classes (Cremin et al., 2015; Dejonckheere et al., 2016; Minner et al., 2009). Experiential and hands-on activities have been emphasized (MacDonald, 2016). Another study explored young children's literacy meaning-making experiences before and after tablets were introduced into classes (Harwood et al., 2015). The new strategy assumed that both teachers and students have different roles than those typical in a traditional classroom (Chichekian & Shore, 2016). CCE proponents concluded that experiential learning is primarily self-initiated learning as people have a natural inclination to learn (Rodgers, 2002). Governmental education bodies also stressed the importance of creating a class atmosphere that fosters creativity (National Research Council, 2000).

The response to CCE has not been unequivocally positive, though. It created controversies for several reasons. The major part (but not all) of the critique of CCE

strategies came, understandably, from educators in the developing world, favoring traditional methods of teacher-based strategies. Many countries of the developing world were not ready to shift to CCE due to traditional values and cultural practices, and other objective reasons, like the size of classes, limited availability of resources and qualified teachers, etc. (Guthrie, 1990; O'Donoghue, 1994).

Several educators noted that CCE enhances a stereotypic masculine image among students, and early childhood education settings are 'feminized' as a result of the predominance of female teachers (Walkerline, 1985, 1990; Skelton, 2002). Critics allege that many institutions or educators claim to be putting CCE into practice, but in reality are not (Lea et al. 2003:322). Others propose that CCE is a "White-Centered" discourse (Norquay, 1999); among other critical issues is the criticism of Rousseau for taking for granted that the child's self-development is driven by immediate interests, not by instruction (Oelkers, 2002). Others describe how teachers disturb children playing and solve conflicts between children rather than helping them work together and develop strong social relationships, and generally, there is insufficient pedagogical support, particularly for those children deemed at risk (Singer, 2005). These individual children appeared invisible in the teachers' understanding of CCE (Simon, 1981; Graue, 2005). Finally, there is an important claim that contemporary Western countries use economic and political pressure to force developing countries to teach Western values in their classrooms (Tabulawa, 2003; Shah, 2019).

In this article I will only indirectly discuss the arguments and counterarguments for and against CCE. Instead, I want to concentrate on a specific element of educational systems actively used in both CCE and traditional educational strategy—the questions children ask.

So, in this article for the first time in educational and developmental cognitivist literature I want to propose that *the most natural way to develop young humans' brains is through asking questions* from a very young age. This ingenious strategy was developed and honed during the evolution of *Homo sapiens* through natural selection. Asking questions in young age is indispensable for developing human intelligence and self-confidence. Currently children stop asking questions as soon as they go to school, as our current educational strategy purposefully trains them to answer question, discouraging them from continuing to ask questions. This gradually leads to low self-reliance and a non-justified dependance among the future citizens of democratic countries. In the last part of the article the author recommends a few class strategies and games to encourage young students to continue to ask

questions. Implementation of these games and strategies is relatively easy both in CCE education as well as more traditional teacher-centered educational models.

I want initially to discuss briefly the importance of this ability to ask questions in children's (and generally human) development of cognition. As a hypothesis I propose that the ability to ask questions was the revolutionary cognitive development in human evolution, and, therefore, this element of human cognition deserves special attention from cognitivist and educationist perspectives. In the central part of the article, I discuss the proposed hypothesis after the literature review, and later I discuss the contrasting educational practices that encourage (or discourage) asking questions of teachers, both their pros and cons.

Questions about Questioning: Cognitive Revolution?

One of the central problems that cognitivists (and cognitive educationists) try to answer is how human intelligence starts to develop and when is it favorable to start formal education. The general approach to this question is divided: governmental bodies are mostly arguing for the need for the early start of formal education, and at least part of professional educators propose we should not rush to formal educational process (e.g., see Smith, 2013; McDougall, 2014).

I belong to those educationists who believe there is no need for an early and heavy-handed intervention from educators to develop a child's intelligence in the same way we do not need to teach a child her/his native language. Nature, more precisely natural selection, has provided every normal human baby with the best possible tool for their independent intellectual development, including the acquisition of native language systems. The name of this evolutionary tool is the ability to ask questions.

Charles Darwin famously used close observations of his own children to understand the young human's intellectual development, including questioning, as curiosity expressed in an information-seeking communication, and he also paid attention to the shrug as a universal expression of curiosity and lack of knowledge (Darwin, 1972). One of the earliest works of English psychologist and philosopher James Sully was dedicated to the motifs behind the deep questions children sometimes ask (Sully, 2000/1896). Another early work in this sphere was the 4-page article published in 1924 by Lou H. Thompson from Fairwood Elementary School, "Children's Questions." In the article the author asks reasons for the neglect of such an interesting and important topic (Thompson, 1924). Among other works on the topic are the 1932 article by Edith Davis, "The Form and Function of Children's

Questions,” in which she cited the percentage of children’s questions in their communication (Davis, 1932).

In 1936 Piaget proposed that children’s questions come from their assumption that everything was created to suit humans’ needs (Piaget, 1936). In 1930, in a work dedicated to the intellectual growth of the children, Isaacs expressed the view (partly criticizing Piaget) that children asked questions when the reality was not anticipated by them (Isaacs, 1930). In the 1968 article “The Development of Grammatical structures by Formulating Wh Questions in Child Speech,” Roger Brown concluded that there is evidence that children in the preschool years do develop a grammatical structure underlying Wh questions that is much like the structure described in current transformational grammars (Brown, 1968). Barbara Tizard and Martin Hedges, in a book dedicated to children’s learning, found that in a question-and-answer dialogic form children are gathering information about the world around them, encouraging their cognitive development. As a result, children asked more questions of caregivers than of their friends at pre-schools (Tizard & Hedges, 1984). The need for dialogical communication in education was stressed in Paulo Freire’s *Pedagogy of the Oppressed* (1970). In his 2006 monograph *Who Asked the First Question?* Joseph Jordania proposed that the ability to ask questions was a cognitive revolution for human intelligence and language (Jordania, 2006). Another special monograph from around the same time (2007) by Michelle Chouinard, *Children's Questions: A Mechanism for Cognitive Development*, concentrated on information-seeking questions. It examined the role children's questions play in their cognitive development. The studies presented here indicate that children ask information-seeking questions that are related in topic and structure to their cognitive development. If parents do not provide the answers to these questions, children persist in asking for the information, which suggests that the goal of this behavior is to recruit needed information, including the pre-speech stage of development (Chouinard, 2007).

The last few years were particularly prolific for the research of children’s questions. Among them is study called “Question, Explanation, Follow-Up: A Mechanism for Learning from Others?” (Kurkul & Corriveau, 2017). A 2020 collection of articles on the subject, titled “The Questioning Child: Insights from Psychology and Education” is a multidimensional collection on this important topic (Butler et al, 2020). And finally, a very recent article by Paul Harris “Young Children Share Imagined Possibilities: Evidence for an Early-emerging Human Competence” comparatively discussed the children’s and apes’ cognitive abilities (Bronowski &

Bellugi, 1980; Greenfield & Savage-Rumbaugh, 1990, 1993; Harris, 2022; McNeill, 1980; Premack & Premack, 1972, 1983; Terrace, 1980), a topic very close to the interests of this author.

The crucial topic for the current discussion on education here is that the ability to ask questions naturally appears in every child's intellectual development, without any visible and conscious effort from their elders. For about a year after birth, every normal human baby begins to ask questions. This happens much earlier than the ability to acquire syntactic structures, and even earlier than the correct pronunciation of words (Crystal, 1987, p. 235, 243, 248; Ferguson, 1977; Moskowitz, 1991, p. 147). Young babies ask questions by simply using a rising intonation, and ask one-word questions like "dada?" ("Dad, are you there?"), or "kaka?" ("Can I have another piece of cake?"). The ability to ask questions is a part of human genetic makeup, or in other words, is hardwired in our genes.

An important question is how this ability comes alive after babies are born. Is this an instinctive ability, like swimming skills among ducklings, or does it need a "triggering" from the social surroundings? This question is difficult to answer at the current level of knowledge, but if we use the only (so far) currently available well-documented case when a human baby was put in complete isolation for years, we can get the preliminary answer. Let us look at the tragic story of a Californian girl, known to the scientific community as "Genie." Genie was kept by her abusive father in a cellar for 13 years. She was finally rescued by her mother, herself a blind and sick woman. After her rescue, Genie received plenty of attention, care, and training from foster homes and scholars. Thanks to these caregivers, Genie, who appeared to have a normal intelligence, was able to develop some language skills, but unfortunately was unable to develop full language. Among the skills she failed to develop was the ability to ask questions (Wills, 1993, p. 288).

This fact strongly (although still preliminarily) suggests that, while questioning is obviously a genetic ability of every normal human mind, it needs a social environment to trigger its development (Jordania, 2006, p. 342-343). A most likely mechanism for triggering children's genetic ability is parents' asking questions by talking to children in a specific "musical" way, known in the scholarly literature as "motherese." Other names for this phenomenon include "infant-directed speech," "child-directed speech," "caretaker speech," and a few other informal terms. Most importantly, motherese consists predominantly of questions and cuddly play-words, pronounced with wide musical modulations of the voice. Infants love hearing this kind of speech and respond excitedly. As questions and phrases with

rising question intonation constitute a large part of “motherese,” it is logical to conclude that it is critical for teaching young children the crucially important art of asking questions. Caregivers basically teach children this essential cognitive ability (how to ask questions) without even realizing what they are doing this through “infant-directed speech.”

In 2006 Jordania proposed that the ability to ask questions was a crucial step in our species’ cognitive evolutionary history (Jordania, 2006). As linguists suggest, human language has three functions: declarations, commands, and questions (e.g., De Laguna, 1963; Revesz, 1956). With the emergence of the last—the ability to ask questions—Jordania proposed that the communication of our ancestors became a dialogic, human language.

Theory of Mind and the Ability to Ask Questions

A very interesting logical puzzle regarding the ability to ask questions is the Theory of Mind (TOM), the ability of individuals to understand the mental state of others. A specific “Sally-Anne Test,” designed to check the presence of TOM in young children, establishes that young children are unable to realize that other children around them may not have the same knowledge they possess (Wimmer & Perner, 1983). During the test, children are introduced to two dolls, Sally and Anne. Sally takes a marble and hides it in her basket. Then she leaves the room, and the Anne doll shifts the marble from Sally’s to her own basket. When Sally returns, the child is asked: “Where will Sally look for the marble?” If a child is able to take Sally’s perspective, knowing that Sally was not present when the marble was shifted, the child will answer correctly, but if the child cannot take the perspective, the child will be sure that Sally knows as much as the child knows. Based on this popular test, it is believed that children develop TOM at about 4.5 years (Astington & Gopnik, 1991; Roessler, 2013).

For a long time, it was believed that humans were the only species able to understand the mental states of others. This is hardly surprising. Attribution of any complex mental abilities to our species as “uniquely human” has a long history. Plenty of our mental abilities, from “designing features of a language,” displacement, the duality of patterning, traditional transmission, openness, arbitrariness, and productivity (e.g., Hockett, 1959; Hockett & Archer, 1964), to the TOM have been considered at different times “uniquely human.” All such “uniquely human” mental abilities were gradually found in the animal kingdom as well (and

not only among the apes). Today, scholars agree (e.g., Savage-Rumbaugh & Lewin, 1994) that apes can learn successful communication with virtually all these features.

Even the lions have TOM: “After having killed, a lion either begins to eat immediately or else moves the carcass to another location. On several occasions, the prey was caught in high grass by a lion which then sat down and looked around casually for as long as 5 minutes, as if its hunt had been unsuccessful. It gave the impression of trying to conceal the presence of the carcass from the others that had taken part in the hunt, for as soon as these lay down or moved away it began to eat.” (Schaller, 1972, p. 268).

I suggest that we pay a special attention to the correlation of the presence of TOM and the ability to ask questions among humans. At first sight, it might seem obvious that asking a question *requires* TOM, as one needs to understand that others have different knowledge about which one might inquire. So, the idea that someone might have an ability to ask a question without having a TOM might seem absurd, but the facts are against this sensible proposition:

- 1) In normal children’s development, the ability to understand that others have a different knowledge from them, or TOM, appears at about age 4.5 years (Astington & Gopnik, 1991, p. 12; Roessler, 2013);
- 2) In the development of the same normal children, the ability to ask questions appears in the form of a correctly pronounced question intonation much earlier—before a child’s first birthday (Crystal, 1987, p. 143, 241).

If there is a close link between the ability to ask questions and TOM (which seems likely), the controversy over the earlier onset of questioning ability might have two explanations. First, the ability to ask questions might be the primary cognitive function in the evolution of our mental abilities, and TOM came later, possibly even partially based on the ability to ask questions. A second explanation might be that, in this case, children’s intellectual development does not represent the evolutionary sequence of forming human cognitive abilities.

- 1) The first explanation cannot be true, at least if we believe that we are evolutionarily closely related to apes. Apes, as discussed, have TOM, but no ability to ask questions. Therefore, TOM was most likely present in the common chimpanzee-human ancestor, but the ability to ask questions was not. This fact strongly opposes the possibility that the ability to ask questions appeared among human ancestors earlier than TOM.

2) What about the second explanation? How to deal with the “ontogeny recapitulates phylogeny” argument, also known as the recapitulation theory? The “ontogeny recapitulates phylogeny” argument has become at least partially discredited and is now often referred as “biological mythology” (e.g., Kalinka & Tomancak, 2012). This brings us to the possible conclusion that the earlier onset of the ability to ask questions in children most likely does not represent an evolutionary chronology. So, it is possible that the ability to ask questions is phylogenetically late, but in ontogeny, it starts developing earlier because of its immense importance for the intellectual development of every member of the human species.

Beginning of the Formal Education: Asking Questions at School

Let us now return to the existing educational strategy. Natural selection provided every human baby with the best possible way to develop intelligence and creativity. By asking myriad questions, young children *independently* (this is important!) develop their intellectual abilities. Basically, every young child’s brain is a powerful *self-developing system*. All those who have had to answer thousands of questions from their children and grandchildren know the strength of this ability. This powerful process of self-education continues until children go to school. And as soon as formal education starts, children stop asking questions (e.g., Shah et al. 2018). This is a natural result of currently widespread teaching strategy, as at school children are gradually taught several all-important lessons:

- 1) When it comes to school, if they want to be considered good students, children need to learn how to *answer questions, not how to ask questions*,
- 2) At school, it is teachers who ask questions,
- 3) Good students are those who are the first to answer the questions,
- 4) So, in order to be loved and appreciated at school and by parents, children should forget about their insatiable urge to ask questions and concentrate on answering them.

Of course, at school, children are not banned from asking questions, but still, there are important limitations. As a rule, children are allowed to ask questions after a teacher gives permission with the words: “Does anyone have questions?” Teachers see such questions as a welcome expression of interest from students. By the way,

this does not occur in every educational system, as will be discussed below. Governmental schools with relatively rigid curricula enforce the unitary schedule of what should go into the pupils' heads and when. So, instead of the joy of self-discovery (what our brains are best at, and what they are naturally designed to do), all the knowledge is presented to children in the form of ready-made facts. Students just need to remember these facts to be considered good students, doing well at the tests and exams of various levels.

Regarding the problem of early childhood education from another point of view, perhaps children are better off with human-designed systematic education than the chaotic process of acquiring information in the form of their own haphazard questions and the even more haphazard answers from adults (or as they are known in educational philosophy, MKO – “more knowledgeable other”)? Is not it better to gradually explain to children all the basic knowledge that humanity has managed to obtain over its history, instead of answering thousands of their silly questions? Well, the proponents of CCE will agree that the passion for the search, the process of the search, and the joy of discovery are inherently more important for human intellectual development than the passive acquisition of existing knowledge. The most important function of our brain is the ability to search, receive and organize (or construct) knowledge in a unique and creative way, and our brains are already designed to do this. It is crucial for educators to remember that children naturally have the skills to think and to learn.

According to Piaget: “The goal of education is not to increase the amount of knowledge but to create the possibilities for a child to invent and discover, to create men who are capable of doing new things” (Piaget, Quotes). And Einstein said, “The important thing is to not stop questioning” (Einstein, Quotes). Many things have changed during the past centuries and decades (not everywhere, sadly). Child Centered Education has made a big step forward. For example, most contemporary schools have stopped physical punishment, but the fight against the natural curiosity of students still rages on, from primary to tertiary education. Should we be surprised then that there are complaints about adults' lack of interest when compared with young children's inquisitive minds? “What a distressing contrast there is between the radiant intelligence of the child and the feeble mentality of the average adult” (Freud, Quotes). “Men are born ignorant, not stupid; they are made stupid by education” (Russel, Quotes).

Let us now ask: if many prominent humans are critical of the existing strict system of education, why it is still so popular? The most probable answer to the

question of why schools are so rigid and restrictive is probably found in the so-called “domestication theory” (e.g., Simler & Hanson, 2018, p. 238-240). The center of the theory is that schools, with their strict rules of obedience, prepare children for their future life as adults who will have to spend most of their lives working day jobs from 9 to 5. And there is a more direct financial reason as well. Stephen R. Donaldson, a contemporary American author, pointed out probably the most attractive side of the existing system of education, together with the ugly side of it: “Whatever the explanation, it's perfectly obvious that our educational system has nothing to do with education: it's a babysitting service designed to replicate the worst qualities of the parents” (Donaldson, Quotes). Our rigid schooling system is just too convenient for many families (and employers) to discard. But even if we need to take children to school for several hours five days a week, schools do not have to be rigid and conservative to the point they close off children’s curiosity.

A Case of Chinese Education

The achievements of Chinese students have understandably created a loud buzz in the world of education, and for good reason. In the educational ranking system of countries according to mathematics, science and reading tests, China and other East Asian countries boast the greatest achievements in school test scores. They dominate the Program of International Student Assessment (PISA) reports (Pisa Reports by Country). Shanghai (China), Singapore, and Hong Kong are usually the top three on the list. Other East Asian entries follow, only debating the top places among themselves. From other countries, the first appearance of the Western World is Finland, coming in at the fifth place in science and sixth in reading tests (see. Finland remains...). The United States ranks number 36, 28, and 24 on the three tests, Germany at 16-12-19, the United Kingdom at 26-20-23, and France at 25-26-21. The home country of arguably the largest number of Nobel Laureates, Israel, can be found at a low and unexpected rank of 41-41-34. The success of Chinese students is quite well known to the circles of educators. A number of international educators (e.g., Jensen, et al., 2012) suggest that East Asian students have much better literacy and mathematical skills than European and American students because their system of education is simply better.

One of the great aspects of the Chinese educational system is that teachers are more respected in China than in any other country. For a Chinese student, her or his teacher is almost a god-like figure. According to cultural expectations, a Chinese

teacher should have a ready answer to every question from students. A student who tries to challenge or question the teacher would be perceived as arrogant and a social outcast, a threat to the class, educational system, and society at large. Total respect for teachers and past generations invariably leads to an atmosphere where experience and the existing order become an overriding force in life, education, and science. This is the direct road toward overall mental and intellectual stasis. Sustaining the status quo becomes the most important driving force in many fields of life, and new ideas are viewed as a threat to the social health and well-being of the already balanced community. As a result, coming up with new ideas is very alien to students in the Chinese educational system. This is not surprising, given that the legendary Confucius himself made a similar claim. According to Confucius's own words, he was seeking knowledge in the past, without trying to create any new knowledge himself: "I am not one who was born in the possession of knowledge; I am one who is fond of antiquity, and earnest in seeking it there" ... "I transmit [knowledge] but I do not create" (Chan, 1963, p. 18-48).

Deep respect and reverence for teachers create another feature of the Chinese educational system that is hard to understand from the Western point of view. This points to students asking questions to teachers, which is the article's main topic. While it was emphasized at the beginning of this article that Western schools forcefully discourage children's natural urge to ask questions, this prohibition is never too strict or absolute. Students can ask questions (mostly at designated times, with the teacher's permission), and most important, students who do ask questions are usually seen as the *most enthusiastic learners*.

It is very different in Chinese and other Confucian cultures. It is fair to say students are never explicitly banned from asking questions, but doing so is considered a negative phenomenon. According to an article on the Chinese educational system (Starr, 2012), a question asked by a student at Chinese schools might mean one of the following two things: (1) the student is silly and did not understand what the teacher already explained (and what everybody else understood), or (2) the student is too ambitious and wants to show a teacher in a bad light — that the teacher cannot answer a new question. Both of these possible reasons are viewed as *extremely undesirable behavior*. Besides, virtually every Chinese student believes that questions asked by students waste valuable lesson time. Therefore, we can conclude, at least for our discussion, that Chinese students are discouraged from asking questions (e.g., Starr, 2012).

At the same time, the Chinese educational system achieves excellent results in raising generations of hard-working and law-abiding citizens, who have a deep respect for their teachers and are very knowledgeable in the existing set of educational requirements. Their domination of the world ranking education systems is well deserved, and Chinese and other East Asian students also excel in the USA and many European countries with very different systems of education. They are sometimes referred to as the “model minority” (e.g., Chen, 2012; Chen 1995; Kao, 1995; Kao & Thomson, 2003). Amy Chua, Chinese-American lawyer and author of the bestselling 2011 book *Battle Hymn of the Tiger Mother*, formulated eloquently the above-mentioned principles that are held high in the Chinese traditional attitude towards education. They are so different from Western principles that the editor of the *Financial Times* Isabel Berwick called the “tiger mother” approach to parenting “the exact opposite of everything that the Western liberal holds dear” (Berwick, 2011).

I am suggesting that the striving towards the brilliance of the Confucian educational system in exams and tests might have negative implications as well, severely limiting students’ creativity and ambition from an early age. Deep reverence for the past, teachers, and existing rules is a great method for maintaining a stable and easy-to-govern society, but it is probably not the best strategy for the development of a free, open society. The big, exciting question for future educators is whether it is possible to have the best of both educational systems—hardworking and law-abiding citizens on one side and creative scholars and freely thinking citizens on the other. And on a more practical note, what type of education should we prefer for our children?

There is no easy answer to this question. Probably the best option is to *give children and their parents a choice*, so the presence of various school systems in a society and a wider knowledge of these systems in the general population would be helpful. I can only suggest a very rough guide to assist parents and teachers. Possibly it would be beneficial for some children, good and successful students, who try to get high marks in every subject and are highly motivated to be at the top of the class, to be taken into a school with a stricter approach, where their higher learning abilities are tested against stricter curricula requirements and against other high-achieving fellow students. As for the other, more self-motivated, and passionate learners, who clearly distinguish among school subjects their favorite and least favorite classes, the creative atmosphere and freedom of alternative schools with a free educational

system (CCE) would be more beneficial. In many countries, such an option with schools with various educational systems already exists.

The problem starts when we try to “classify” children according to their natural tendencies. Although a small number of children are relatively easy to “classify” into these two rigid groups, who decides which child should attend which type of school? In China, students take their education extremely seriously, and their reverence for their teacher’s words has no limits. But these two ostensibly wonderful things for a good education might become enemies for the development of creative thinking. In total contrast to Confucian teaching philosophy, Leonardo Da Vinci once said: “Poor is a pupil who does not surpass his master” (Da Vinci, quotes). It is not a matter of which is better. It depends on the educational aim. For responsible, hardworking citizens who do their best in following existing rules, a stricter education is more effective. The downside of the strict educational strategy is reduced creativity. On the other hand, a more open and egalitarian teaching strategy, based on CCE, in which teachers are not considered untouchable and their knowledge and authority can be questioned by students, boosts creativity and self-reliance, but on the negative side, citizens who undergo such a democratic educational strategy are not as obedient in following existing rules and regulations. It is up to us, educators, scholars, governmental bodies, parents, and citizens, to make a choice.

Conclusion

Developing a more creative educational method that would not be child indoctrination has been a dream for many thinkers who gradually built a new strategy of CCE. At the same time, stopping students from asking questions might be an educational “crime against human nature” that we are still committing. If we do not deal with this problem, if we prohibit our children to continue their natural cognitive development by asking questions, forcing them instead to concentrate on answering our questions, our efforts of raising them as free, creative individuals might be mostly wasted.

Plutarch said, “The mind is not a vessel to be filled, but a fire to be kindled” some 25 centuries ago (Serrant, 2020). Malcolm S. Forbes, the publisher of *Forbes* magazine, agreed: “Education's purpose is to replace an empty mind with an open one” (Forbes, Quotes). This idea would find plenty of supporters among educators and parents, but it is the opposite of what we are often doing at our schools,

particularly our schools for gifted children. We mostly use their minds exactly as vessels of various capacity, and we are filling them as fast as we can. Unlike computers with a huge memory, the most valuable part of every child is their creative thinking, the ability to see and organize things in their own unique way. Above all, we should treasure a student's emotional life.

We should not forget that gifted students can be very different from one other. I suggest dividing students with extraordinary intellectual capacities roughly into two categories: (1) students who need external stimulation and challenge in order to stay alert and interested, and (2) students who are happy to be left alone, as they are constantly motivated to follow their own interests. We can call the first category of students "prodigious learners" and the second category "autonomous learners." Both are gifted and can be extremely successful at school, but they are quite different.

The first category might be eager to go to the most prestigious schools and institutions where their gifts will allow them to learn an exceptional amount of information and shine among peers. These students might be moved by their ambition more than their love for the subject of study; they often try to get the highest marks in every subject. If this is the case, despite my critical view of the policy of exploiting children's memory, I would suggest giving such students a chance to go to a special school with overloaded programs. Ambition can be a driving force as purposeful and passionate as any other life-long human passion or desire. This category of gifted students might become bored without sufficient challenge to keep their extraordinary intellectual capacities up and running. There is an internal cognitive conflict in this category of students: their ability to learn is higher than their motivation to learn. Schools with extremely busy curricula will most likely be beneficial for such students. If such students are left at ordinary schools, they might abandon learning (as "too easy" and "not challenging") and get into unwanted activities, from using various substances to save them from boredom to criminal activities to get some excitement.

The second category of gifted students, "autonomous learners," as a rule consists of avid readers, who can keep busy and interested without any external pressure. They are happy to use their free time for various activities, are highly motivated, and do not seem to be bored with extra free time. They actually do not seem to have any free time! They often have their favorite subjects at school and might neglect other subjects. Such children should be allowed some independence in their development. They should not be taken to special schools but provided with more books, libraries, bookshops, and various scholarly exhibitions. They also

benefit from seeing different countries and meeting people from various cultures. For such a self-developing or an “autonomous learner” student, going to a special school with overloaded programs might become a major source of discomfort and anxiety.

Pressure for students in special schools is understandably very high, and it comes at a price. For example, the rate of student suicide at Harvard is about double than at any other university (Hatoff, 2012). There are other negative results as well. Harvard is very highly rated because some of the best scholars and teachers are invited to work there and because a large number of brilliant students completed their doctoral degrees there. Most such scholars, however, were educated as undergraduates at different, more “ordinary” universities. Of course, Harvard graduates are brilliantly represented in the world of politics, but the undergraduate students did not make the great impact in science as expected (Bero, 2021). For example, arguably the most difficult math teaching program, the year-long “Math 55” course from Harvard, is so difficult that only about half of the most talented and dedicated of the initial group complete it (Yefremova, 2023). And how are those who successfully managed to complete this legendary course represented among the world’s best scholars, inventors, Nobel Prize winners? Apart from very few distinguished professors, no other major scholars came out of this Harvard course, and no Nobel Prize winners. Tellingly, the two most famous students from this course are Bill Gates and Richard Stallman, two computer geniuses who both dropped out of Harvard.

In summary:

- 1) A child’s brain is a powerful self-developing system, and early and heavy-handed intervention in the natural intellectual development of a young child is highly undesirable;
- 2) By stopping children from asking questions, our existing system of education goes against the most natural way of the development of human intelligence;
- 3) The most prestigious schools use the greater learning ability of their students' primarily as hard drives of extraordinary capacity to store a vast amount of information;
- 4) To raise independent and creative thinkers from gifted children, particularly from the “autonomous learners,” we should give them more independence, and allow them to have a hand in their own education;

5) We can briefly summarize that there does not exist a universal pedagogy which works with equal effectiveness irrespective of the context (Holliday, 1994).

These conclusions bring us to a perennial question about the need for a new and better educational strategy with a variety of possibilities of implications.

Implications

Probably the best thing about the suggested model of educational strategy that it is extremely flexible. We can easily adapt this strategy from the rare “questioning classes” and “questioning games” in existing educational systems, both governmental and private, both CCE based, or traditional strategies, to the completely new educational system, based on encouraging students to ask questions. In a paper dedicated to the subject delivered at an educational congress in Delhi in January of 2011, I proposed a list of various techniques and strategies to encourage students to ask questions at different educational levels (Jordania, 2011). The central idea is that we need to design different ways to encourage students to ask questions, and therefore, to be more critical, independent, and creative. Following are a few practical suggestions of how to organize special lessons, games, and tests.

Since asking questions is a natural state of children’s early intellectual development, we do not really need to “*teach*” children how to ask questions in primary school. We just need not to stop them from asking questions. Importantly, we need to take into account that there always will be a few children who are naturally good and confident in asking questions, but also students who are shy to ask questions, as they are afraid of speaking in front of the class, or that their question will be considered silly. To overcome this, I suggest to organize a special class (or classes): for example, a special “lesson of silly questions” devoted to asking any questions, particularly “silly,” funny questions. For example, teachers could provide situational pictures and ask students to ask any questions, including the silliest possible questions, about the picture, what the subjects in the picture might ask or say to each other, explaining that a question might be normal in itself, but can become silly when it is out of place. For example, “which school do you go to” is not a silly question by itself, but if this question is asked, for example, by a cloud to a train, it becomes silly. Or, in another example, a teacher would bring a box to the class, and say something is in the box, inviting students one by one to ask questions about the qualities of the hidden object to find out what is in the box, with the teacher

answering only “yes” or “no.” As the game progresses, children get closer and closer to the answer. Alternatively, a teacher (or students) could bring several pictures with a question and an answer connected to each picture, but written separately from the pictures. Students must choose (1) which question and answer goes with which picture most logically, or (2) which combinations of pictures and answers are the funniest.

Teachers could also ask students to think of silly questions as homework. Children could bring their own pictures, or photos with their own silly questions. It is important that everyone participate in this exercise and that everyone be encouraged to engender confidence in shy students that might stay with them during their entire educational process. Another situation might be to ask children to think which questions they would ask different people, including real people or characters from books and movies, such as Santa Claus. Special “questioning lessons” might be also a good way to introduce the whole class to the natural cultural or environmental diversity of the children in their class. Still another possibility is to choose a child and encourage other children to ask questions about their family, ethnic origin, interests, favorite food, games, etc. If children are enthusiastic, every child might become the centre of such questions. Primary school teachers can design plenty of interesting and engaging games to involve children in fun, interesting question-asking games. It is crucial that students are encouraged for their inventiveness and creativity as early as possible.

I believe the traditional method (students answering questions) should still remain the centre of educational system, but I am recommending quality time during the educational process—classes, games, tests, and strategies—to encourage students to continue to ask questions as well. Such activities will make the educational process more creative, more open to suggestions, more interesting, more productive, and more fun. For secondary school, teachers could use different games and strategies, including well-known games totally based on asking questions. For example, somebody thinks of a person, and others ask this person indirect “yes/no” questions in order to find out who the person is. Different classes can use this game according to subject (for example, science students need to identify a scholar, media or arts students, a media or arts personality, etc.). For me the key factor should be the *student perspective in the educational process*. I am not alone in my preferences. “Education does not start in teachers’ words. It starts in students’ heads,” remarked Ignacio Estrada, director for grants administration at the Gordon and Betty Moore Foundation (Estrada, Quotes). This perspective is crucial for the CCE strategy.

Rousseau famously gave the foundations of a new system of education that was later labelled as “free education.” His ideas were used as a basis for several contemporary educational systems, including the Montessori, Regio Emilia, and Steiner (Waldorf) systems, probably the three most popular alternative systems in the Western world today. Instead of restraining children from asking questions, we should encourage them to do so, in different ways and by different strategies. And I suggest using this educational tool throughout most of the primary, secondary, and tertiary educational institutions to foster open creativity and to help form a society of open-minded and free-thinking citizens.

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Essay Thirteen

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Music as Aposematic Signal: Predator Defense Strategies in Early Human Evolution

Abstract

The article draws attention to a neglected key element of human evolutionary history—the defense strategies of hominins and early humans against predators. Possible reasons for this neglect are discussed, and the historical development of this field is outlined. Many human morphological and behavioral characteristics—musicality, sense of rhythm, use of dissonances, entrainment, bipedalism, long head hair, long legs, strong body odor, armpit hair, traditions of body painting and cannibalism—are explained as predator avoidance tactics of an aposematic (warning display) defense strategy. The article argues that the origins of human musical faculties should be studied in the wider context of an early, multimodal human defense strategy from predators.

Introduction

A valid defense strategy from predation is essential for the survival of any animal species. Consequently, articles and books dedicated to defense strategies in animal kingdom are plentiful (e.g., Ruxton, et al., 2004; Caro & Girling, 2005; Caro, 2009; Gursky & Nekaris, 2007). At the same time, studies on the defense strategies of early humans have so far been strangely neglected. I probably need to clarify from the beginning, that works on the resistance of human organism against the viruses and other causes of inner pathologies are widely discussed in scholarly literature (particularly by virologists), but works about the defenses of early humans from their natural predators are notably absent. Two articles of Dutch ethologist Adriaan Kortlandt (1965, 1980) represent rare exceptions. Only very recently, in June 2023, was a special interdisciplinary online conference “Defense Strategies in Early Human Evolution,” organized by the Jim Corbett International Research Centre at Grigol Robakidze University in Tbilisi, Georgia (Jordania & Wade, 2023) with the participation of evolutionary biologists, paleoanthropologists, evolutionary psychologists, primatologists, neuroscientists, cognitivists, evolutionary musicologists, and conservationists, fittingly dedicated to the memory of Adriaan Kortlandt.

Let me first briefly outline my vision of the reasons for the strange neglect of this important topic in evolutionary scholarship. The first evidence for neglecting antipredator defenses in human evolution occurs in Charles Darwin's book on human evolution (1871). When musing over the evolution on humans, Darwin abandoned his own greatest theoretical contribution to biological science—the theory of natural selection (Darwin, 1859). Instead, he proposed that an alternative theory, sexual selection, could better explain human evolution (Darwin, 1871). In his subsequent theory, tellingly, there was no place for natural predators of humans. According to Darwin, humans evolved in an environment lacking dangerous predators, an idea explicit in his book on human evolution by sexual selection:

“The early progenitors of man were, no doubt, inferior in intellect, and probably in social disposition, to the lowest existing savages; but it is quite conceivable to consider that they might have existed, or even flourished, if, while they lost their brute-like powers, such as climbing trees, etc., they at the same time advanced in intellect. But granting that the progenitors of the man were far more helpless and defenceless than any existing savages, if they inhabited some warm continent or large island, such as Australia or New Guinea, or Borneo (the latter island being now tenanted by the orang), they would not have been exposed to any special danger. In an area as large as one of these islands, the competition between tribe and tribe would have been sufficient, under favourable conditions, to have raised man, through the survival of the fittest, combined with the inherited effects of habit, to his present high position in the organic world.” (Darwin, 1871, p.173)

In the 1870s when Darwin wrote these words, there was no consensus about where humans had evolved, and all the major regions of the Old World (including Africa, Europe, and South-East Asia) represented potential candidates for “the cradle of humanity.” Today the scholarly community strongly agrees that humans evolved in Africa, which abounds in large predator species, including fierce competition among them. Therefore, Darwin's theory of human evolution via sexual selection in a predator-free environment now seems unsustainable. Nevertheless, although no one remembers the Australia-New Guinea-Borneo “cradle of humanity” hypothesis, Darwin's model of human evolution exclusively via sexual selection remains popular among many contemporary scholars, including evolutionary psychologists (e.g., Cronin, 1991; Richards, 2017; Miller, 2000).

A further discernible cause of the neglect of early human defense strategies emerged from the perspective of another great scholar of human evolution, Raymond Dart. Although initially Dart thought that hominins were small-time hunters and

scavengers (Dart, 1925), he later underwent a complete change of mind and declared that early humans required no defense strategies because they were the apex predators and ruthless killers in their ecosystem (Dart, 1949, 1953). This model, known as the “killer ape hypothesis,” proposed in 1949, was later popularized by Robert Ardrey (1961), and this image of our human ancestors as powerful big-game hunters had a commanding grip on the human psyche and still has an influential place in scholarship. The theory is particularly popular in explaining the apparently permanent human passion for warfare (e.g., Merker, 1984; Jones, 2008; Milam, 2019).

Critical reaction to the “killer ape hypothesis” came from two contrasting research paradigms. Authors of the first critical development, known as “man the hunted” hypothesis, argued that early humans were a weak prey species, whose best survival option was still to climb trees. This model was based on Charles Brain’s (1981) diligent study of hominin taphological remains (cf. Hart & Sussman, 2005). On the one hand, as a positive development, this model acknowledged the immense pressure of predators on early humans, but on the negative side, it could not explain how such a weak primate prey species without any serious means of defense managed to live and sleep on the open savannah, much less travel outside of Africa, gradually becoming the widest distributed mammalian species on the planet.

The second development critical of the “killer ape hypothesis” argued that our ancestors were not big-game hunters, but rather scavengers. This model developed within the 1980s “new archaeology” paradigm revolution (e.g., Binford, 1985; Shipman, 1986; Bunn & Kroll, 1986; Blumenschine, 1986; O’Connell et al., 1988, 1988a; Blumenschine & Cavallo, 1992; Dominguez-Rodrigo 2002; Lupo & O’Connell, 2002; Holden & Watson, 2019; O’Byrne et al., 2019). When discussing the “scavenging hypothesis,” it is necessary to distinguish two very different modes of scavenging, which differ radically in terms of the defense/attack capabilities available to early humans: (1) passive scavenging, in which the carcass is accessed only after the original killer has left, and (2) confrontational (aggressive) scavenging, in which the original killer is chased from the carcass. Current consensus favors confrontational scavenging in early human evolution, but how early humans managed to chase the original hunter away remains a major question (e.g. “...microscopic analyses indicate that cut marks on some bones overlay predators’ teeth marks, showing that the hominins arrived afterward. How they got meat away from scary scavengers is anyone’s guess.” Welker, 2017, p. 149). The generally negative attitude towards scavenging in downplaying its possible role in the evolutionary past of our ancestors remains noteworthy: people prefer to see themselves as the descendants of big game hunters, not scavengers (e.g., Ehrenreich, 1997 on people’s overinflated attitude towards hunting and war).

A further possible reason for neglecting the defense strategies in humans' evolutionary past might be the fact that it is very hard to distance ourselves from humanity's current towering position in the contemporary world and objectively imagine the ancient past when our ancestors had to confront powerful predators in order to save their lives.

Hypothesis: Warning Display, or Aposematism, as a Defense Strategy

The most recent early human defense strategy theory is aposematism. This new research paradigm naturally developed from the aggressive scavenging hypothesis, championed by "new archaeology" (Binford, 1985; Shipman, 1986), a line of development furthered here. Considering the relatively obscure knowledge of this phenomenon, the following briefly outlines characteristics of aposematic defense.

Warning display (aposematism) is an important, but often neglected defense strategy in the animal kingdom. Unlike crypsis, which is based on the strategy of remaining invisible, silent, odorless, and fleeing as quickly as possible if discovered by a predator, aposematism is the alternative defense strategy of intimidating predators by remaining visible, being noisy, presenting odor, and, rather than fleeing when confronted by a predator, actively approaching and threatening the predator with body size, loud sounds, odors, and fearless behavior (Ruxton, et al., 2004; Caro & Girling, 2005).

Species can be roughly divided into cryptic and aposematic categories, and these two different strategies fundamentally affect morphology and behavior. Cryptic species possess camouflaging body colors, try to stay put, move silently and generally remain silent, have no (or minimal) body odor, and flee as soon as they are discovered by a predator. Aposematic species, on the contrary, constantly try to be visible and noisy, have a stronger body odor, and if discovered by a predator, actively try to intimidate the potential predator with various body postures and colors, making aggressive sounds, emitting stronger body odor, and using threatening gestures and behaviors. As a result, aposematic species are more colorful, easier to see and hear, have more body odor, and do not run away when predators approach.

Aposematic signals serve two primary functions:

- (1) *To intimidate* or to *warn* the predator by the display of size, colors, ornaments, noises, fearless behavior, and
- (2) *To educate*, or make their visual, olfactory, audible, and behavioral signals *remembered by the predator*.

Some of these signals are naturally weapons in themselves, such as a large body, antlers, big canines, venomous spike, or an aggressive behavior, referred to as *intrinsic aposematic signals* (Alonso & Jordania, 2023). Other aposematic signals, such as body odor or colors, or loud noise, which are not themselves harmful, can be categorized as *semantic aposematic signals*. Although both categories qualify as aposematic signals, the latter is the true meaning of aposematism.

Warning signals generally are much wider distributed in the animal kingdom than aposematism. Any animal species may display warning signals when cornered or frightened, or when they must face the attacker. A cornered rat against a cat or a cornered cat against a dog does not become an aposematic species although they display warning signals (they try to seem bigger, make loud sounds, display canines, and behave aggressively; e.g., Song et al., 2020). This is not an aposematic display, but a *startle* (or *deimatic*) display (Rowe & Guilford, 1999). True aposematic animals do not display warning signals facultatively (sometimes, only when cornered), but constantly, such as skunks, porcupines, and venomous snakes (Ruxton et al., 2004; Caro & Girling, 2005; Caro, 2009).

Another very important feature of aposematic species is that all these audio, visual, olfactory, and behavioral signals just mentioned are, in fact, only bluff, the proverbial saber rattling, and they constitute merely the initial, primary, aposematic defense. In order to have a full, lasting, and sustainable aposematic defense, these animals must have some secondary, real defenses. So, in the case of a very hungry or uneducated predator still making an aggressive advance, aposematic animals need to hit the attacker with some kind of real weapon to inflict as much damage as possible. Aposematic secondary defense need not be fatal to the predator, but should be strong enough to be remembered as an unpleasant experience. Aposematic secondary defenses can involve various modalities, such as the venom of many snakes, spiders, and frogs, shock of the electric eel, unpalatable body of pufferfish, smelly spray of the skunk, or razor-sharp quills of the porcupine. Besides, aposematic animals can also simply escape predators by flying away (aposematic bird species) or by being overly aggressive (such as the honey badger), and of course, they can also employ the usual means of defense (teeth, antlers, body size) for secondary aposematic defenses.

Aposematism and Sexual Selection via Female Choice

Aposematism and sexual selection via male competition have in fact many common features, and can act as complementary to each other: the features that are useful to scare away predators, are useful to scare away a rival as well. It is very different in sexual selection via female choice, where the features that attract female attention, are usually considered detrimental to the survival of males (as was implied

by Darwin in 1871, and was explicitly suggested by Zahavi in his “handicap principle.” See Zahavi, 1975; but see Penn et al., 2019). It is important to remember that both sexual selection via female choice and aposematism utilize virtually the same signals: body colors, extra morphological additions to the body, loud vocalizations, and body odor. In both models it is crucial to impress the target audience (intraspecific females in sexual selection or extra-specific predators in aposematic display). Therefore, it is not accidental that aposematism was discovered by scholars in search of examples of sexual selection.

In 1867, while working on his book on sexual selection (1871), Darwin was struck by the colorful body of butterfly larvae. For Darwin only two kinds of colors were used in natural selection in the animal kingdom: defensive colors (camouflaging ones) and bright colors. Bright colors were automatically considered dangerous, and their existence was seen as justified only in the context of sexual selection. But Darwin could not explain why butterfly larvae, not yet sexually active, would advertise their bodies, rendering them easy for predators to see. Wallace, whom Darwin asked for help, explained the problem by proposing the mechanism of “warning flags” or “warning coloration.” Larvae that are unpalatable, explained Wallace, display warning flags to potential predators, so both the prey and predator species may escape harm. John Weir quickly organized experiments and proved Wallace’s idea right (Slotten, 2004, p. 263). Later Poulton (1890) came up with the term *aposematism* (“stay away sign” in Ancient Greek). Unfortunately, neither Darwin, Wallace, Weir, nor Poulton realized the true potential of the phenomenon of aposematism, which was at least a valid rival for the sexual selection theory, by explaining how bright colors could *help* some species survive by intimidating predators. So, for almost 150 years aposematism was considered a relatively rare phenomenon in the animal kingdom with hard-to-understand roots. Darwin was happy that Wallace helped explain the fact of colorful larvae without realizing that many cases of allegedly sexual selection could be cases of aposematic defense. Some recently published evolutionary encyclopedias still fail to include the term *aposematism* but have the term *warning coloration*, although color is only one of many modalities used by aposematic animals. At the same time, recent theorization indeed challenges (still a minority view I have to say) the sexual selection origins of such a widely known symbol of sexual selection, as the peacock’s train (Takahashi et al., 2008; Viegas, 2008; Jordania, 2011, 2021; cf. Petrie et al., 1991; Petrie, 1994, 2021).

Did Humans Use an Aposematic Strategy of Defense?

Two principal suggestions have been proposed for humans being an aposematic species. In 1967 paleoanthropologist Louis Leakey proposed that

humans are aposematic, in their being unpalatable to big cats, though he did not himself employ the term *aposematic*. Leakey used his personal experience to come to this conclusion, as he witnessed on more than one occasion an aversion to humans among lions. On one of his many lengthy field research visits to East Africa, lions entered the tent occupied by the scholar and his students (five lions on more than one occasion), and after sniffing human heads, left without attacking. Leakey believed that human smell somehow deterred lions:

“I seriously believe that one of things which protected many early primates, including early man, in the defenseless days before he had weapons or tools, and when he was living on the ground, was that he was unpalatable to the carnivores.... Whether man’s natural immunity to large carnivores is smell by itself—they certainly sniff at us—or whether it is a combination of smell plus knowledge of how flesh tastes, I do not know, but I am convinced that a major defense mechanism of the earlier stages of protoman and early man was neither weapons nor canine teeth, nor claws nor physical strength, but his nature-endowed characteristic of being unpalatable, of not being good food for large carnivores.” (Leakey, 1967, p. 5)

While suggesting an aposematic interpretation, Leakey’s argument is weakened by the fact that human flesh is not itself unpalatable to historical and contemporary predators (see, for example, Brain, 1981; Corbett, 1944). Leakey’s interesting suggestion was recently reviewed by Paul Weldon from the Smithsonian Conservation Biology Institute, who proposed that humans are possibly chemically aposematic:

“I propose that the body odor of humans and, historically, of hominins denotes chemical emitters that exhibit formidable defensive traits, including large body size, agility, vigilance, and the capabilities of deploying projectiles and other weapons and/or marshalling group defenses. This hypothesis maintains that selection acts against (1) offenders, including carnivores, that fail to avoid chemicals from hominins, and (2) hominins who fail to emit distinguishing chemicals, thereby give rise to a chemically mediated avoidance that is mutually beneficial, i.e. chemical aposematism.” (Weldon, 2018:1)

It is widely known among behavioral ecologists, that aposematic strategy can by no means guarantee that the animal will be immune from predators, as predators are known to eat aposematic animals with very powerful secondary defenses (for example, unlucky skunks are eaten sometimes by very hungry dogs. See Ruxton et al., 2004). Similarly, humans can be still eaten by disabled predators (Corbett, 1944).

In books dedicated chiefly to this problem (Jordania, 2014, 2017), I argued that humans demonstrate *all the characteristics of aposematic features in every possible modality*: audio, visual, olfactory, and behavioral (not only in body odor, as pointed out by Leakey in 1967 and Weldon in 2018). The following several sections discuss the most important human aposematic characteristics. Some are relatively researched and known, but others will be presented for the first time in the context of human aposematism.

Audio Signals, Singing in Humans, or Why Do Apes Not Sing?

The popularity of the idea that human choral singing grew from animal choruses used to defend territory is growing (Hagen & Bryant, 2003; Geissmann, 2000; Bannan, 2012; Rice, 2014:108; Mehr et al., 2021; Jordania 2014; Harvey, 2017; Knight & Lewis, 2017; Savage et al., 2021; Leongómez et al., 2022; Nettle, 2022; Jordania & Wade, 2023). Singing is a behavior overwhelmingly distributed in arboreal and aerial ecosystems (among the tree-living and flying species). Humans are among the very rare terrestrial species that sing (Jordania, 2020), though arguably some carnivores (e.g., wolves and coyotes) can also sing, and sing in choruses (Harrington, 1989; Hagen & Hammerstein, 2009; Hagen & Bryant, 2003). Despite some interesting parallels, the (adaptive) capacity for matching controlled synchrony of all four dimensions of sound production—pitch, duration, amplitude and timbre—provides a varied armoury unmatched by any other species. The nature and the evolutionary reasons of the appearance of these abilities is still another little-discussed problem (for example, see Podlipniak, 2023). Here we need to remember, that another type of vocal signal, the *roar*, can be a very effective in deterring predators as well, particularly as startle signals (Raine et al., 2019; Kleisner et al., 2021). And although roaring is louder than singing and can communicate the strength better than any other audio signal (Raine et al., 2019; Kleisner et al. 2021), it requires much more energy, can damage the vocal chords if used excessively, and as a rule, is used only for the most critical situations (typically during the actual confrontation, as a *startle* signal, used by *both aposematic and non-aposematic animals*), not as a continuous vocal signal, such as singing, which can go on for hours by aposematic species (Knight & Lewis, 2017; Turnbull, 1961).

Early humans came down from the trees, and tree-living birds and primates (including a lesser ape, gibbons) are among the most ardent singers, so it would be logical to propose that our arboreal common (humans and apes) ancestor was a singer. The long-standing question that comes with this suggestion is why do

terrestrial apes not sing? I propose that the question should be different—why did early humans not stop singing, as virtually all the arboreal species do when they visit the ground? Many singing and noisy arboreal species (birds and monkeys) maintain silence whenever they visit the ground as a cryptic defense strategy from potential ground predators (Jordania, 2020; Catchpole & Slater, 1995). Most likely, the ancestors of chimpanzees, gorillas and bonobos stopped singing for the same reason—maintaining cryptic cover while on the ground. In the case of non-singing arboreal orangutans, the most likely reason for them to stop singing was their *solitary lifestyle* (they do not even engage in grooming. Teboekhorst, 1990; Galdikas, 2005). On the other hand, in a strategically different move, early humans continued singing, therefore changing their survival strategy from cryptic into aposematic. I propose that not stopping singing was probably the first and deciding move towards the new aposematic strategy of defense in the hominin lineage, followed by the other elements of aposematic display (Jordania, 2011a, 2014, 2017). This fact is crucial for our understanding of the human tree-to-ground transition, and for understanding subsequent continuation of the two-media (song and language) underpinning universally of human culture that exists throughout the world.

Regarding the evolutionary origins of music, scholars today have virtually reached consensus that the evolutionary function of music (much like language) must be connected to the establishing of social connections among group members (Aiello & Dunbar, 1993; Dunbar, 1996, 2010; Benzon, 2001; Bispham, 2006; Blacking, 1973; Butcher, 1919; Cross, 2006; Brown, 2000, 2003; Dissanayake, 2000; Fitch, 2006; Grauer, 2011; Hagen & Bryant, 2003; Hagen & Hammerstein, 2009; Hauser & McDermott, 2003; McDermott & Hauser, 2005; Hoeschele et al., 2015; Honing et al., 2015; Bannan, 2012; Knight & Lewis, 2017; Harvey, 2017; Savage, 2019; Savage et al., 2021; Leongómez et al., 2022; Mehr et al., 2021; Jan, 2022). Since the common human-ape ancestor was probably not only a capable individual singer but also sang in choruses, it is logical to suggest that the human tradition of choral singing started while they were still in an arboreal ecosystem. The next development of arboreal singing (and group singing) was greatly expanded with a new addition, that of a group unity, synchronicity (e.g., Bispham, 2006; Patel, 2008; Large, & Gray, 2015; Brown, 2023). But before treating the importance of rhythmic synchronicity, it is important to discuss another feature of human and animal choruses, often neglected: the use of dissonances in human cultures and the animal kingdom.

Singing in choruses can be based on consonances (nice sounding, “sweet,” non-tense) or dissonances (rough sounding, tense) combination of sounds or intervals. Scholars have mostly concentrated on the use of nice sounding consonances (e.g., Sugimoto et al., 2010; Crespo-Bojorque & Toro, 2016). I suggest

in the context of the defense *paying special attention to dissonances*. Singing in dissonant intervals greatly contributes to the creation of a more robust sound. In the light of behavioral ecology, dissonant intervals are the most potent vocal signal for creating (1) the loudest possible sound, (2) the most attention-grabbing sound, and (3) the most effective “Beau Geste” sound (when a small group wants to make an audio impression of a much larger group; Harrington, 1989; Tripovich, et al., 2008; Wren, 1924).

Another question arises: we know that dissonances comprise the intervals where maximal frictions between the overtones create a more robust sound, but are dissonances physically louder than consonances? In my opinion, dissonances *sound* louder, for several psychological reasons: (1) dissonances grab our attentions faster than consonances; (2) I suggest that those cultures who sing in dissonances, generally sing louder than the “consonant cultures”. So, all this might indicate, that dissonances are not objectively louder, but they *seem* louder. This remains to be experimentally tested and confirmed or rejected.

We also need to clarify the notion of “minor” and “major” seconds. As ethnomusicologists know very well, when we deal with traditional cultures, assumptions regarding “minor” or “major” seconds may lack precision, as the second in most cases is between the major and minor seconds. German ethnomusicologists even use a special term “schwebungsdiaphonie” (roughly translated as “roughness, beat two-part singing”) which is the interval smaller than major second, and larger than minor second—this interval is used in the most isolated singing traditions, particularly in isolated mountain regions (Jordania, 2006, 2011, 2015).

Thus, dissonant harmonies, particularly the sharpest dissonant intervals, seconds, should be historically most widespread when a group (potentially both animal and human) tries to warn/scare the opponent or a predator. However, although this function of music seems to me an original evolutionary factor, there is no reason to deny other kinds of musical sounds in human evolutionary history, including the sweet-sounding consonances and gentle humming for early humans (I discussed this dichotomy of musical functions in Jordania, 2009).

In biological scholarship this useful quality of dissonances was known earlier to animal experts. In works on wolves and coyotes, scholars paid attention to the specific dissonant coordination of the chorus participants that created a more effective Beau Geste defense (Harrington, 1989; Hagen & Hammerstein, 2009; Hagen & Bryant, 2003; Jordania, 2014, 2017). Singing in dissonant intervals occupies a unique place in human polyphonic singing cultures as well (Jordania, 2006, 2015). Singing in dissonant seconds is found in the most isolated cultures in

the most geographically isolated regions of the world, namely in the Himalayas among Tibetans, in North Japan among the Ainus, in mountain tribes of Papua New Guinea, in Afghanistan among Nuristanis, and among the mountain minorities of North Vietnam, the Caucasus, Balkans, Baltic, Central Africa, the Andes, etc. (for a full review of these cultures, with notated musical examples, see Jordania, 2006, 2015). Furthermore, some cultures (e.g., Aremai and Aba Tibetans, and Latvians), who demonstrate arguably the most dissonant singing, also have free rhythm. This suggests that *singing in dissonances might be an earlier element in human cultures than the development of rhythmic synchrony*. The fact that dissonances are used widely in animal choruses (at least by wolves and coyotes), and that rhythm is mostly absent among animal species and choruses, strengthens the argument.

The introduction of rhythmically united, synchronous singing was a revolutionary development in the choral singing of early humans (Bispham, 2006; Patel, 2008; Large, & Gray, 2015). With synchronous choral singing, particularly together with dancing, the effectiveness of the audio intimidating/warning system skyrocketed. There are no animal species that do not run from the loud “wall of sound” created by a group of humans. The actual effectiveness of singing against big cats in India (man-eating tigers) was first noted by Corbett (1944: Chowgarh tigers). Corbett does not specify if the singing was in dissonances, we only know that it was a group singing. Generally, the effectiveness of singing as a “tool for intimidation” increases from singing alone, to singing with more persons; and also, from singing without harmony, to singing with harmony, and even more to singing with dissonant harmony. Basically, all kinds of singing are effective, but group singing in dissonant harmonies is the most effective. African Pygmies also use singing when going through the jungle, or, when they believe there is a danger of the attack from leopards at night (Turnbull, 1961, p. 58; Knight & Lewis, 2017).

Apart from the strong direct, external effect on predators and competitors, rhythmic synchrony introduced a probably even more powerful *internal* effect on groups of singing humans through the *entrainment*, with the help of dancing or merely walking together in time (e.g., McNeill, 1995). Synchronous singing and synchronous physical exercise lead to a potent phenomenon called *battle trance*, an altered state of consciousness that still needs serious research (Jordania, 2011; Wade, 2016; Hedges, 2002; Junger, 2010; Kartomi, 2023). In this altered state, both men and women often experience (1) loss of fear (aphobia), (2) loss of pain (analgesia), (3) loss of memory (amnesia), (4) loss of ability to think rationally (irrationalism), (5) loss of the sense of individuality (deindividuation), while (6) gaining collective identity (when fighting as a group), and (7) gaining super-physical strength during the confrontation. In this state humans can behave extremely altruistically towards “own” group members, to the point of sacrificing their own lives, while behaving

extremely aggressively towards “others,” to the point of senselessly killing noncombatants (Jordania, 2011; Wade 2016). This state can be triggered suddenly by an unexpected attack on a loved one (e.g., when a child, accompanied by a mother, is attacked by an aggressive dog or by a criminal), or deliberately through special training sessions in which the most effective and trusted way for the professional military is the long rhythmic drill sessions of the new recruits (McNeill, 1995; Ehrenreich, 1997).

Therefore, the audio aposematic signals of human ancestors included singing, more precisely loud choral singing in dissonances, rhythmically synchronized, and augmented with foot stomping, hand-clapping, and hitting stones together (Fitch, 2006, 2023; Fitch & Zuberbühler, 2023; Jordania, 2014, 2023). Singing (with occasional roaring or shouting) in a low voice was another potent intimidating signal for opponents, as human males have an unexpectedly low range (octave lower than females; Morris, 2008; Jordania, 2017; Bannan, Bamford & Dunbar, 2022). Audio signals were augmented by a visual display of threatening body movements (the New Zealand Māori haka tradition is a good example). Probably most importantly, this synchrony was the key factor putting participants of such primordial choruses into the euphoric state of battle trance, in which participants lose the sense of fear and pain, obtain a common collective identity, and are religiously dedicated to their common goals. Contemporary Western combatants still use rhythmically precisely synchronized singing and dancing to achieve this state (Villarreal, 2010; Pieslak, 2009; Wade, 2016; Jordania, 2011; Hedges, 2002; Junger, 2010, Kartomi, 2023). Adding dance moves (initially as threat display movements), also in perfect synchrony, contributed an additional emotional power to the initial group singing, as the precise synchrony of a great number of individuals created the visual image of a single monstrously big creature impossible to confront.

Human Aposematic Visual Signals

Humans have evolved a variety of visual aposematic signals:

Bipedal Posture. Hardly any human morphological or behavioral trait has received so much attention from every possible perspective as bipedalism (e.g., Hewes, 1961; Lloyd Du Brul, 1962; Eickhoff, 1988; Fifer, 1987; Latimer & Lovejoy, 1989; Lovejoy, 1988; Hunt, 1996; Isbell & Young, 1996; Dunsworth et al., 2003; Carrier, 2011; Carsten, 2010; Kwang, 2015). Among many ideas was a suggestion that, since plenty of animal species use bipedal threat displays to look taller in order to intimidate antagonists, the effectiveness of a bipedal threat display could have led hominins gradually to adopt permanent bipedal posture. This is a relatively well-known hypothesis, initially expressed by Frank Livingstone (1962), Roger Wescott

(1967), and later by proponents Nina Jablonski and George Chaplin (2004), and Joseph Jordania (2014, pp. 99-101).

Long Legs. Humans have unusually long legs, one of the longest proportionally among the apes. With the obvious slow movement achieved with their long legs (Cartmill, 1983; Carsten, 2010; Heinrich, 2002), it is natural to propose that longer legs were gradually developed in order to be taller, since a higher body profile makes humans less vulnerable to predator attacks (e.g., Blake, 2023). All the major predators (including lions and tigers) display respect and clear aversion towards the human bipedal posture and human height.

Long Hair on Top of a Head. Nina Jablonski suggested that it was evolutionarily advantageous for hominins to retain the hair on their heads in order to protect the scalp as they walked upright under the intense African sun (Jablonski, 2008). Desmond Morris suggested that overgrown head hair was used as a species-specific morphological sign for hominins, visible from afar (Morris, 2008). To better understand the evolutionary function of human head hair, two significant facts are important to note: (1) if left alone, untrimmed human head hair grows about 1.5 meters long. After this, individual hairs fall out and are replaced (Morris, 2008); (2) most likely the initial style of hominin head hair was a tightly coiled bush on top and around the hominin head, very much like the contemporary untrimmed “Afro” style that all peoples of African origin (including pygmies and bushmen) grow naturally. I suggest the unusually long hominin hair on top of the head had the same purpose as long legs and bipedal posture—simply to look taller. An untrimmed “Afro” must have added about 20 cm to body height, as it is several times as big as the diameter of a human head. A survey of the tall military helmets of Napoleonic hussars, or the colorful headdresses of warriors of different indigenous tribes, reflects the perennial drive to look taller among human warriors. Later humans substituted high military helmets for the Afro-style bushy hair to fulfil the same function to look taller and visually more impressive to potential opponents and predators (Jordania, 2011, 2014).

Body Painting. Another potent visual signal comes from the use of color. Humans naturally change the color of their faces and upper body when offended or angry (blushing), and usually they turn red—the most aposematic color (Crozier, 2010; Harvey & Paxton, 1981). Apart from this legacy of biological evolution, humans also have a legacy of early cultural evolution for employing more drastic colors via body painting.

The beginnings of body painting go much deeper than any rock painting and most likely originated at least with the oldest use of various pigments (Mithen, 2006; Roebroeks, 2012). No human culture is known to be totally free of body painting.

For many tribes body painting is an important part of identity. Body painting in many traditional societies also signifies the status of a person or the moment of life they are experiencing; it also constitutes a very important part of initiation ceremonies in many parts of the world. Body painting was a significant ritual for men going into a hunting session or to war, even for achieving the coveted state of battle trance. Body painting is still widespread. Apart from permanent body painting, many temporary body paintings are in use. Using a lipstick or an eyeliner pencil is so widespread that hardly anyone would consider them in the same category as body painting. Hundreds of thousands of years before the estimated appearance of the first cave paintings, our ancestors were using coloring materials—such materials have been found at several archaeological sites, although scholars have never found cave paintings of such an ancient age. The most likely explanation is that the first paintings were in fact done on human bodies.

“Stone nodules containing mineral manganese dioxide, which has been scraped with stone tools, have been found at several Neanderthal sites... As the Neanderthals have left no traces of pigment on cave walls or artefacts, the most likely explanation is body painting.” (Mithen, 2005, p. 230)

As noted, striving to become more visually impressive became paramount to early humans for safety reasons, thus any physiological or behavioral changes that led hominins to acquire a more impressive look (e.g., bipedalism, long legs and long hair, blushing, or body painting) gave certain hominin groups better chances of survival by intimidating predators and competitors more effectively. This approach places *natural selection, not sexual selection via female choice*, as the driving force behind the tradition of body painting (Jordania, 2011a), but it is virtually impossible in this case to exclude the effect of sexual selection.

According to a 2012 article in the *Proceedings of the National Academy of Sciences of the United States of America*, the most popular and enduring coloring substance—red ochre—has been in use “minimally” for 200-250 kya (Roebroeks, et al., 2012; cf. Bednarik, 1997). The users in this case were European Neanderthals, locked behind the ice sheets of Ice Age Europe. The use of painting substances among Neanderthals was doubted by scholars for decades, but growing evidence suggests that painting was widely used in isolated Europe much earlier than the appearance of anatomically modern Cro-Magnons:

“Identification of the Maastricht-Belvédère finds as hematite pushes the use of red ochre by (early) Neanderthals back in time significantly, to minimally 200–250 kya (i.e., to the same time range as the early ochre use in the African record).” (Roebroeks et al., 2012, p. 1889)

Indications suggest that even *Homo heidelbergensis*, a much earlier, taller, and muscular ancestor of the *Homo neanderthalensis* who lived in Europe 600-300 kya, also used red ochre for about 400,000 years. This evidence, although not universally accepted, comes from the Terra Amata site (Roebroeks et al., 2012).

Is it possible that our ancestors used other substances before red ochre—temporary substances they could easily obtain and use to paint themselves before they started using durable substances like red ochre (red) and manganese dioxide (black)? The idea that coloring faces and bodies started long before the use of durable materials is not only plausible, but virtually unavoidable. Such readily available coloring substances would be colorful berries, clay, even earth, and above all, blood. Blood most likely was the earliest coloring substance that humans used, putting the timelines of the origins of human arts much earlier (e.g., Bunney, 1990).

In summary, human visual aposematic signals included bipedal locomotion, long legs, long tightly coiled hair on top of the head, colors given by earlier biological evolutionary processes (blushing) and by later cultural evolution—the use of body painting. In addition, there were other powerful elements of visual display connected to dance and visual synchrony, such as the already mentioned New Zealand Māori “Haka” example (Gibson, 2011; Brown, 2023).

Olfactory Signals and other Nighttime Defenses

The evolutionary function of olfactory signals was very different from the function of visual and audio signals. Visual and audio signals work during the actual confrontation with predators and competitors by intimidating them with threatening images and impressive sounds, but olfactory signals mostly served as a reminder of the fighting abilities of hominins and early humans in the state of battle trance. Olfactory signalling was badly needed when humans were asleep on the ground, without their powerful visual and auditory defense modalities, such as Leakey’s close encounters with lions at night in the Serengeti, when body odor became their only defender (Leakey, 1967). Only after achieving relative safety on the ground at night could our ancestors be able to move away from the trees and start their intercontinental travels, so this ability warrants considerable attention.

First, human body odor is considered one of the strongest among animal species (Viegas, 2011). This smell is achieved by overactive sweat glands. The prevailing theory for humans’ immense number of sweat glands holds that humans overactive sweat glands enabled them to stay cool under the African Sun (Jablonski, 2008; Aldea et al., 2021). But sweat does not have to be smelly to cool the body, and human sweat is extremely smelly, even for a species with such a poor sense of smell as ourselves. Since apart from recent historical times, human ancestors did not

shower or bathe for millions of years, the strength of hominin body odor becomes more overpowering. In this connection, I suggest that the patches of hair in armpits and groin were developed primarily for their hyper-effective smell-producing ability. Alternative suggestions for underarm hair (e.g., Hofer et al., 2018; Kohl & Francoeur 2002; see also Wedekind, 2007) as a sexual attraction tool, or as a friction-reducing tool do not seem very convincing, as most humans now diligently try to get rid of body odor, particularly when meeting the opposite sex, and humans who shave their armpits (including sportsmen) never report any complications from injuries. I would predict, that aposematic species in general would have more smell-producing glands.

Evening Concerts. Adriaan Kortlandt (1973) made a brilliant (and mostly neglected) suggestion that one way to secure nocturnal sleep was to organize loud evening “concerts” to scare away potential predators, citing the behavior of chimpanzee groups who sometimes produce loud concerts before they sleep, and also the behavior of African tribes living in the forests, who organize the same kind of loud evening displays. It is difficult to measure how long such concerts would have gone on: a perfect example is that when pygmies do not feel safe, they continue such concerts throughout the entire night (Turnbull, 1961, p. 58; Knight & Lewis, 2017). The long tradition of organizing most concerts in human societies in the evenings might be a legacy of the evolutionary strategy for nighttime security: we feel more secure after socializing with a group at a loud common display of unity.

Eyespots as Nighttime Defense. Eyespots (“false eyes”) are clearly visible marks on the body of an animal that resemble the shape of an eye. It is a popular aposematic (and startle, or deimatic) visual signal. They are extremely effective against predation and attacks from behind because most potential predators seek a certain moment for their attack, when their prey is not looking at them. Many predators (including lions and tigers), when they see that the intended prey has noticed them approaching, lose interest.

Contemporary humans learned the benefits of eyespots. For example, from the safety precautions often found in Australian parks against swooping birds are these two points: “Draw a pair of eyes and attach to the back of your hat or bike helmet,” and “Wear sunglasses on the back of your head.” The same safety mechanisms work effectively against man-eating tigers, and cheap plastic masks worn on the back of the head became effective in deterring the man-eating tigers of the Sundarbans national park from attacking humans (Waltl, 2016).

According to tacit agreement, humans do not have natural eyespots, and neither do apes. Eyespots are characteristic of much more primitive animal species, such as butterflies and many other insects, some reptiles and fish, and some birds. However, eyespots are also present on one of the most evolutionarily advanced

animal species—big cats (Leyhausen, 1960). Many big cats have eyespots on the back of their ears, and most important, since the big cats are humans' most common natural predators, they are also very sensitive in noticing eyespots on others. Humans, on the other hand, are very bad at noticing eyespots, and some struggle to see the eyespots on big cats even when told about them.

To elaborate, big cats' eyespots on the back of their ears are their defense from an attack from behind. These eyespots are also clearly seen from the frontal side when cats have their ears flat on their heads (Leyhausen, 1960). There is a possibility that, with this flattening of the ears on their head, cats show their eyespots to any antagonists in front of them. When viewing the face of an angry big cat with flattened ears, their false eyes (black eyespots on the back of their ears) are clearly displayed, and are bigger and spaced much wider than their real eyes. This display of bigger and widely set eyes may trick an antagonist into believing that the animal in front of them is bigger than it really is.

So far as I know, I was the first in the scholarly literature to propose that humans may have eyespots (Jordania, 2011) but fail to notice them because (1) humans are generally bad at noticing eyespots; and, more characteristically, (2) because we only have them when the eyes are closed (during sleep). A human's "sleeping" face features eyebrows, arched upwards, and the eyelashes, arched downwards, thus forming a pair of readily visible ovals, or eyespots. It is not easy for humans to notice the resemblance of human eyebrows and eyelashes to the eye because, not being by nature a predator species, we are generally bad at noticing eyespots. But eyespots on human faces were not designed by natural selection for other humans to notice: they were designed to be noticed by big African predators, particularly from the big cat family, and all the cats are particularly sensitive to recognizing eyespots.

I suggest that since hominins started sleeping on the open savannah, those individuals with longer and more arched eyebrows were less attacked by prowling big cats during sleep, since it seemed to predators that hominins were even in sleep looking at them. Generation after generation, individuals with longer and more arched eyebrows and long eyelashes survived. Of course, after humans stopped sleeping on the open savannah, the pressure to have nicely arched eyebrows and long eyelashes disappeared, but we still admire faces with clearly defined and arched eyebrows and long eyelashes (one more possible common point between the forces of natural and sexual selection).

According to the generally accepted view, the main function of the human eyebrow is to prevent moisture, mostly salty sweat and rain, from flowing into the eye. Desmond Morris (2008), discussing the possible function of the eyebrow in

human evolution, criticized this suggestion as non-effective, and suggested that the primary function of the eyebrows was to signal changing moods (Morris, 2008; cf. Godinho, 2018). No doubt eyebrows are excellent communicators of mood, but I suggest their primary function evolutionarily was as a defense at night. At night eyebrows simply saved lives from predator attacks, which served as a big evolutionary pressure to develop and maintain them. At the same time, it is possible, even likely, that eyebrows had more than one evolutionary function.

Therefore, olfactory signals, designed for securing the nocturnal sleep of our ancestors, gradually enabled them to move far from trees and start long journeys. Human body odor is powerful, and the patches of hair in the armpits and groin were the means to create more powerful body odor. The appearance of eyebrows (and eyelashes) provided another defense mechanism, eyespots on a sleeping face. Therefore, the combination of the evening loud concert with communal singing and dancing before sleep, strong body odor spread with the wind (hungry prowling predators usually move upwind), and eyespots all created an effective multilayered nocturnal defense strategy (Jordania, 2014, 2017).

Behavioral Signals

An aposematic strategy of defense requires that audio, visual and olfactory signals are reinforced by behavioral signals. Aposematic species are set to follow several behavioral strategies. The most important characteristic is that aposematic animals should not run away when confronted by a predator. Instead, aposematic animals stand their ground and try to intimidate the potential predator with the display of audio, visual, olfactory, and behavioral signs.

Freezing. “Do not run!” is first universal expert advice to everyone who suddenly finds themselves in dangerous proximity to a predator. Popular belief that it would take a lot of courage not to run away when seeing a deadly predator at close quarters is not correct. As a matter of fact, people in life-threatening situations usually freeze and cannot move, even if they want to. Although some still may try to run away in a state of panic, the more natural (and often life-saving) response, also instinctive, is to freeze.

The life-saving potential of the human freezing response is still unacknowledged by the scientific community, yet other versions of the freezing response are acknowledged, including such well-known facts as that some animals stand perfectly still so that predators will not see them, and some animals freeze or play dead when touched in hope that the predator will lose interest (Cannon, 1932; Jansen et al., 1995; Walker, 2013; Roelofs, 2017). So, these two types of freezing are acknowledged: one can be called “cryptic freezing,” aimed at remaining

unnoticed by a predator, and the other can be called “catatonic” or “passive” freezing. Humans also often react to imminent danger by freezing, which is sometimes is seen as a serious disorder:

Of the various action disorders, cognitive paralysis leading to “freezing” behavior or catatonia in the face of danger is the most serious, as it prevents any survival response during the impact phase of the incident ... Common speech describes such behavior in terms such as “struck dumb,” “petrified,” and “frozen stiff.” (Leach, 2016)

But of interest here, and what Corbett mentions in the final scene of the documental story “Robin,” is a very different type of freezing, neither cryptic nor catatonic (Corbett, 1944). In this documental story Corbett describes a reaction on a sudden attack of a leopard on him and his dog Robin, with the words:

Our reactions to the sudden and quite unexpected danger that had confronted us were typical of how a canine and a human being act in an emergency, when the danger that threatens is heard, and not seen. In Robin’s case it had impelled him to seek safety in silent and rapid retreat; whereas in my case it had the effect of gluing my feet to the ground and making retreat rapid or otherwise impossible. (Corbett, 1944:40)

This, third version of freezing I call “aggressive freezing” with a very different message to the predator. Passive freezing sends the message to the predator, “I am yours, I am not running away, and I am not fighting back, so there is no need for violence.” But “aggressive freezing” sends a very different message: “I am not running away because I am not afraid of you. I am warning you that if you come closer, I will fight you, and you will regret your decision to attack.” This, I suggest, is “aposematic freezing” or “aggressive freezing.” Such freezing is an important part of the defense strategies of aposematic animals (skunks, hedgehogs, porcupines, venomous snakes), who famously do not run away at the approach of predators.

Cannibalism as an Early Human Defense Strategy. An important addition to the behavioral characteristics of early humans is the widespread tradition of cannibalism in human history. William Arens rejected cannibalism as a gross lie and exaggeration, created by European colonizers (Arens, 1979), but this position became untenable in the light of increasing contemporary knowledge that cannibalism had been widely distributed throughout human history around the world as a ritual practice (White, 2001). In 2011 I suggested that cannibalism was a major element of early human defense strategy. Jim Corbett (1944: Author’s note) was arguably the first who noticed that when human corpses were left unburied after major epidemics, predator attacks on humans increased drastically. Even the slave

route across East Africa (with a high mortality involved) was connected to the appearance of the infamous Tsavo man-eaters at the end of the 19th century (Kerbis Peterhans & Gnoske, 2001; Walzl, 2016).

A fascinating but often overlooked fact of deep-seated human cannibalistic aspirations is the ubiquitous use of words describing cannibalistic behavior as the highest expression of love and affection. When we express excitement on seeing a cute puppy, kitten, or baby, we often declare we want to eat (or swallow) them. And as much as I have enquired of people from various cultures, I have found that such expressions, linking cannibalistic behavior with utmost love and affection, are virtually universal to all cultures and languages (no formal studies yet to confirm or reject this prediction). This accords with another fact: in some cultures where cannibalism was practiced, the act of consuming someone's flesh was considered an expression of great respect and love for the deceased (Conklin, 2011; Jordania, 2022). Cannibalizing worshipped figures (both human and animal deities) for religious reasons is also widespread. The Christian Eucharist (Holy Communion), in which congregants symbolically consume the flesh and blood of Jesus Christ, is one such example.

However, some cultures have another, opposite reason for cannibalism: hatred and the desire to fully annihilate an enemy. In many traditional societies where cannibalism was practiced, both reasons were valid. People ate their slain enemy with a different feeling than eating their own, much-loved tribe member. This is the natural difference between endocannibalism and exocannibalism (Dole, 1962; Dorn & Tenenbaum, 1996; Metcalf, 1987; Vilaca, 2000). At the same time, from the view of cannibalism as a defense strategy from predators via "predator education," both reasons are evolutionarily valid, as it is important not to leave *any* bodies available to predators after the battle, whether those of friends or foes. So, all the possible reasons—love for kin, hatred for the enemy, or a desire to acquire their strength by eating them—were beneficial to eliminate the available human bodies to predators. "There is no one satisfactory and all-inclusive explanation for cannibalism. Different peoples have practiced it for different reasons, and a group may practice cannibalism in one context and view it with horror in another" (Encyclopaedia Britannica, Cannibalism). I suggest, that although cannibalism was used for various reasons in different regions throughout human history, this practice came from a single powerful evolutionary reason and was favored by the forces of natural selection. The reason was eliminating the presence of hominin and human dead bodies in the environment, so that predators did not have ready access to corpses—a very potent reason, and the only available way to eliminate human corpses, accessible to our hominin ancestors.

Secondary Defenses

Many secondary defenses used by aposematic animals, such as venom, stings, spikes, horns, and canine teeth, are not applicable to human ancestors. Apart from these obvious means, aposematic secondary defenses could be a big body, oversized antlers, or simply the overaggressive character of the species (like badgers or Norwegian lemmings that are not shy to attack even approaching humans; Anderson, 1976). Paul Weldon's description of human secondary defenses is apt here: "large body size, agility, vigilance and the capabilities of deploying projectiles and other weapons and/or marshalling group defenses" (Weldon, 2018, pg. 1). I fully agree with Weldon's suggestion that the effective use of projectiles must have been the key factor of early human secondary defense strategy. The importance of the human ability to throw stones and other projectiles with a great force is widely known (e.g., Isaac, 1987; Fifer, 1987; Calvin, 1983), and it is rightfully acknowledged as the key evolutionary factor that formed the human body, particularly the male upper body (e.g., Longman et al., 2020). The only correction that I would like to make to this idea is to shift the initial aim of throwing from *hunting* to *defense* from predators.

A careful comparison between the *hunting throwing* and *defense throwing* strategies shows that defense throwing was for many reasons much more effective than hunting throwing for early humans:

- The distance is much closer in defense throwing. When an attacking animal (say, a lion) approaches, throwing the rock is a choice. The later the throw, the closer the target, the deadlier the mechanical result. When throwing for hunting, the target prey animal (say, an antelope) tries to stay clear of the hunter, and getting closer to the prey is not easy;
- It is much easier to aim accurately and hit a target in defense throwing, simply because the target is running towards the person. In hunting throwing, when the hunter is approaching the prey most likely from the back, the target might start running away. These two factors make hitting the target in hunting throwing much more challenging;
- Defense throwing is also more effective because it has a better chance of striking vulnerable parts of the body. When a target is approaching, the most likely place a thrown rock will hit is the head. In hunting throwing, when the prey is generally running away, the most likely place to strike is the hind quarters;
- The size and the weight of the thrown missiles can differ in defense and hunting throwing. Much larger rocks can be used in defense throwing, as the distance required to make an effective shot is much smaller, whereas in more distant hunting throwing, the best sized rock ideally should be less than 0.3 kilo;

- In defense throwing, when an attacking animal is coming close to the point of contact, a thrower can lift and hurl a much bigger single stone using both hands, greatly increasing the size and the weight of the missile. A close-range overhead throw of a much bigger rock increases the damaging force;

- In defense throwing, when a target is approaching, the speed of the running animal inadvertently augments that of the thrown rock, in the same way the collision of two oncoming cars is more forceful than a back-front collision. Similarly in hunting throwing where the target is usually running away, the impact of the thrown rock is less;

- The psychological factor is also important. A person would use their full bodily strength, and possibly even the hidden reserves of their “supernatural strength” in the moment when an attacking lion is running towards them. Hardly the same desperate supernatural force will come to their aid when trying to hit an antelope for dinner.

Therefore, I strongly suggest *shifting attention from hunting throwing to defense throwing*. Even today, defense among human armies is considered less costly than attack (Weisel, 2019). Early humans were most likely small-time hunters, but at the same time, they were the kings of scavengers, *apex scavengers*. On one hand, it was extremely difficult (and rare) for early humans to kill a decent sized prey for the whole group. At the same time, in the context of defense throwing, which would occur when early humans tried to chase away the prime hunters, they could obtain a more regular protein-rich diet from the specialized hunter species.

The throwing ability that initially started as a defense strategy against big predators in Africa was turned into an attacking strategy against the same predators (primarily lions), but this time in chasing away the predators from their kills. This was the major shift in the life strategy of early humans (Jordania, 2014, 2017; Somerville, 2019). Although early humans at first avoided lions, their natural predators, later, after finetuning their audio-visual-olfactory intimidating display (AVOID), they started attacking and chasing lions off after the kill was made. So, instead of avoiding lions, early humans started searching (and following) lions. Humans became active “vulture-searchers” in order to know about the scavenging opportunities on the open savannah. This must have been the final step away from the patches of trees to open terrain.

Conclusion and Implications

The evolution of human defense strategies started as soon as the human-chimpanzee common ancestor descended from the trees, initially, by adhering to an aposematic defense strategy, gradually developing a full set of aposematic signals in every modality:

Audio signals: Apart from singing in synchrony, using dissonant harmonies, clapping hands, and hitting stones, the message was enhanced by stomping, roaring, and yelling in low-range voice. Basically, human chorusing retains features shared with gibbon calls that have been lost by relatives genetically closer to humans (chimpanzees and gorillas lost singing probably because of relying on a cryptic defense system after they became terrestrial, and orangutans probably stopped singing because of their solitary lifestyle); Audio signals were possibly the first and most important aposematic signals, that gave general direction towards the appearance of other (visual, olfactory and behavioral) aposematic signals in human evolution;

Visual signals: Erect bipedal “threat display” became the permanent mode of locomotion; long legs and long tightly coiled head hair were developed; colors (natural color changes related to anger, and cultural use of color substances, first temporary, then durable) for body-painting were developed, plus threatening coordinated body movements (precursor of dance, primordial Haka).

Olfactory signals: Great number of sweat glands, resulting in the strength of body odor, with patches of hair in the underarms and groin to make the odor more effective, helped to educate predators, and particularly, ensure nocturnal sleep security in the open.

Behavioral signals: Going into battle trance, developing the freezing instinct in critical moments, not running from predators, slow and awkward movements, and ritual cannibalism to deny predators easy access to human corpses, were all designed as a part of effective predator education. After early humans developed effective defense strategies, they started gradually using their increased defense potential for aggressive scavenging sessions as well, becoming an apex scavenger of the African Savannah (O’Bryan, et al., 2019; Shipman, 1986).

On open savannah humans started following lion prides, registering their kills via vulture watching, and attacking feasting lions at their recent kills. The stratigraphy and timelines of human and lion distribution over the world suggests that early humans were following lions (Jordania, 2014; Barnett et al., 2006; Somerville, 2019; Willems & Van Schaik, 2017). Most likely, *Homo habilis* was already well equipped with the aposematic signals and crude projectiles. Quite

amazingly, the ancient tradition of stealing kills from hungry lions is still alive in East Africa by the Dorobo tribe, and was recently recorded by the BBC EARTH field team. The recording is available freely on YouTube. (See “Grasslands: Stealing meat from the mouth of lions. Human Planet.”)

Even today, humans retain many features of aposematic animals, from individual behavior to the behavior of various human groups, and even nation states, where aposematic (warning, threatening) tactics play a major, sometimes a leading, role in international politics. The aposematic nature of humans is a powerful legacy of our evolutionary history, and its serious study might become one of the promising directions of research of evolutionary biology and evolutionary psychology.

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