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The Descent of Man. Homage to Charles Darwin

Instrument: violin solo. Duration: ca 20'. Date: 2009

Structure

1. The nothingness
2. Diqinesh (scream sentences)
3. Homo habilis (simple rhythms)
4. Homo ergaster (symmetrical complex rhythms)
5. Homo erectus (melody sentences)
6. Homo antecessor (dialogue)

Description

The D(escent of) M(an) is a sonic poem depicting the emergence of human language and its evolution. It focuses on the Phonetic and Acoustic aspects of natural language. It is composed as a simulation of the sounds we assume could have been used as language by fossil species of hominids. DM centers on the world of sounds of 5 species: Australopithecus afarensis (4,2-2,6 mill.), Homo habilis (2,5-1,6 mill.), Homo ergaster (1,9-1,4 mill.), Homo erectus (1 mill.-100.000), Homo antecessor (800.000).

Australopithecus afarensis uses barks, pant hoots, screaming vocalizations to express his emotions and to communicate with fellows. The syntax is holistic and the sentences are not articulated in simple units. The sentences express different types of emotions: whispers, growls, complaints, pleasure, acceptance, power, fear, danger alarm. The scream sentences have 2 peaks of frequencies of ca. 2 or 3 octaves.

Homo habilis invents tools and develops a technique of hard percussion. We represent this specie by simple rhythms.

Homo ergaster discovers symmetry and develops a technique for carving stone (Achealense Culture). We represent him by percussive sound with complex symmetric rhythms.

Homo erectus lives in groups of hunter-gatherers. He discovers melody, and is capable of identifying intermediate points between the extreme frequency peaks of the scream-Sentences. He utters melody sentences within a range of 1-2 octaves. Those sentences are not yet articulated in syllables. They are uttered as hum-sentences.

Homo antecessor lives in groups of hunter-gatherer. They burry the dead. They develop a more complex melodic-tonal language, and are capable of holding dialogues and narrating stories.

The research underlying DM

The research for DM, written at Max Planck Institute for Evolutionary Anthropology, was kindly supported by a grant from Xunta de Galicia. The DM is based on Charles Darwin's proposal about the musical origin of human language:

“Language owns its origin to the imitation and modification of various natural sounds...It is probable that imitation of musical cries by articulated sounds may have given rise to words expressive of various complex emotions.” (*The Descent of Man* 1871 chap. 3)

What could have been the repertoire of sounds produced by our ancestors?

In our sonic simulation we use two types of data: (a) studies on the voicing of chimpanzees and (b) studies on the auditory capacity of early hominids.

a) Chimpanzees voicing. We follow the research done by Crockford and Boesch on barks (Crockford and Boesch 2003), and pant hoots (Crockford and Boesch 2004).

Barks are context-specific calls, which are functionally referential. They convey information to fellows about objects and events in the external world. They are uttered in the

following contexts: predator alarm calls, hunting, travel, aggression. Crockford and Boesch conclude that chimps learn from experience.

Pant hoots are long distant calls. A pant hoot comprises to up to 4 phases, with a fixed order: (1) the introduction phase (1 or more tonal elements with a fundamental of 300-600 Hz.) (2) The build-up phase with up to 25 shorter tonal exhaled elements inter-dispersed with broadband, noisy inhaled elements of similar duration. The phrase has a rapid, rhythmic quality. The fundamental frequency is between 200-500 Hz. It rises towards the end. (3) The climax contains 1 or several screams, with a high freq 800-2000 Hz, and many harmonics. All elements are inter-dispersed with low frequency voiced inhaled elements. (4) The let-down phase, similar to the built-up but with fewer elements and with decreasing, rather than a rising pitch.

b) Auditory capacities of fossil hominids and chimpanzees

There was an increase of the auditory capacities of hominids for intermediate frequencies in the Pleistocene. Moggi-Cecchi & Collard (2002) propose that *Australopithecus afarensis* and *Homo habilis* probably had an enhanced ability to detect higher frequencies compared to modern humans (similar to non-human primates). Martinez et al. (2004) (Pleistocene Hearing): chimpanzee audiograms show a W-shaped pattern characterized by 2 peaks of high sensibility at ca. 1000 Hz and at 8000 Hz. They have a relative loss of sensitivity in the midrange freq. between 2000 and 4000 Hz. Species-specific pant-hoots of wild chimps, for communicating with co-species over long distant, concentrates the acoustic information at ca. 1000 Hz. From the skeletal data analysis, Martinez et al. conclude that human audiograms show a high sensibility at ca. 1000 Hz, but they maintain high sensitivity within the frequency range of 2000 to 4000 Hz.

Our proposal

We propose the following stages in the origin and evolution of human language:

Screaming, rumbling>rhythmic compositionality>melodic quantization> dialogue

The discovery of rhythm

Rhythmic compositionality could have emerged influenced by tool making activities. Rhythm could have originated as imitation and modification of the sounds heard from the working activity while making stone tools, or using stones to smash plants. First, as hard percussion when striking the stone, after, as periodic recurrent patters while flaking the stone core into symmetrical biface tools. Rhythmic Complexity would have come from: (a) Rhythmic recursion. From reiterated hitting, which produced recursive rhythms. (b) Polyphonic rhythmic patters. From simultaneous no synchronized percussive voices coming from the stone work of many people.

The discovery of Melody: From screams to micro-intervals

We suggest that the faculty for melody could have emerged from a stage of tonal shift of the intermediate intervals between 2 peaks of a scream: (a) Screams (2 peaks of 3-octaves interval range). (b) Tone shifting (glissandi): up, down, complex. (c) Vibrato (periodic fluctuation of 1/2 tone of 1/4 tone).