

THE DESCENT OF MAN^{*†}

Homage to Darwin

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Abstract: The DM is a sonic simulation of the origin and evolution of human language inspired in Darwin's "The Descent of Man" (1871) and his conjectures on the evolution of hominid species descendant of ancestral homo. It focuses on the sounds allegedly uttered by 5 species: Australopithecus afarensis (4,2-2,6 mill.), Homo habilis (2,5-1,6 mill.), Homo erectus (1 mill.-100.000), Homo antecesor (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 type 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 articulated in phonemes. They are uttered as mmm-sentences. Homo antecesor live in groups of hunter-gatherer. They burry the dead . They develop a more complex melodic-tonal language. Are capable of holding dialogues and narrating stories.

Instruments: violin soloist. **Duration:** ca. 20'

Structure

- | | |
|----------------------------------|------------------------------------|
| 1. The nothingness | 4. Homo ergaster.(complex rhythms) |
| 2. Diqinesh (scream sentences) | 5. Homo erectus (melody sentences) |
| 3. Homo habilis (simple rhythms) | 6. Homo antecesor (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 lan-

guage. 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

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(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 bury the dead. They develop a more complex melodic-tonal language, and are capable of holding dialogues and narrating stories.

The research underlying DM

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.” [3, 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 [1] on barks, and pant hoots [2].

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 broad-band, 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. [5] 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). [4] (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. [4] 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: see table 1

- (1) 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).

Table 1: Stages in the language of hominids

	Afarensis	Habilis	Ergaster	Erectus	Antecesor
technique		Olduwan culture	Achealean culture		
hearing capacity	2 peaks 1 kHz, 8 kHz	hard percussion	complex percussion patterns		2-4 kHz
what they heard	predator's voices	striking stone	carving stone		
language		simple rhythm	complex rhythm	discovery of melody	development of melody
rhythmic patterns		> (+ resonance)	trochaic, yambic		
articulated sounds	r-sound; growl sound			vibrato, glissando	

References

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- [4] Martínez, Ignacio, Rosa, Manuel, Arsuaga, J-L, Jarabo, Pilar, Quam, Rolf, Lorenzo, Carlos, Gracia, Ana, Carretero, J-M, de Castro, J-M Bermúdez, & Carbonell, Eudald. 2004. Auditory capacities in Middle Pleistocene humans from the Sierra de Atapuerca in Spain. *Proceedings of the National Academy of Sciences of the United States of America*, **101**(27), 9976–9981.
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For Florian Vlasi

The Descent of Man

Homage to Charles Darwin

The Nothingness

Helena Palma

duration: ca. 15'

♩ = ca. 70

sonidos muy indefinidos y lejanos

Violin

frecuencias resonantes del pedal electrónico

tremolo

normal

8 un arco muy lento

Vln.

incremento de presión de arco oscilante

oscilación de cuerda (como la lahuta)

aumentar presión del arco

presión normal

15 (imitar el rugido/gruñido de un oso)

Vln.

subarmónicos

aumentar presión del arco

disminuir presión del arco

presión normal

sonido-r (similar a la risa de una r-velar)

la nota más grave posible

arco muy lento y oscilante

sobresale el 2 armónico

Australopithecus afarensis

23 ♩ = ca. 100

Vln.

f

fff

(grito: socorro!)

3

29

Vln.

no glissato

mp

eco (uuy, uuy!)

mf

mp

(huhuhuuur!)

34

Vln.

f — *ffff* (grito) *mf* *f* — *ffff* (grito) *mf*

sfz *sfz* *sfz* *sfz* *sfz*

40

Vln.

gettato gettato ricochet ricochet ricochet

(cuenta lo que le ha pasado) *sf 3* *sf 3* *sf 3*

(sonido-r) (risa)

45

Vln.

50

Vln.

gettato

56

Vln.

arco normal

(sonido-r) (gemidos suaves) (gemidos algo más fuertes)

aumentar la presión del arco

63

Vln.

(grito: peligro en tierra)

(preámbulo de grito)

68

Vln.

(sol-3) (ca.200Hz) (sol-2) (97Hz) (fa-4) (fa-6) (1397Hz)

fff *fff* *sfz*

scordatura (sonido-r) (grito: peligro en el aire)

Homo habilis

Homo descubre la utilidad de la piedra como herramienta y elabora una técnica percusiva rudimentaria para afilar el canto de la piedra y convertirlo en un instrumento cortante.

$\text{♩} = 80$

ricochet
vibrato (frecuencia ondulante que resulta del cambio de velocidad)

vibrato microtonal
ricochet

74 Pizz (m.s.)
+ arco

5 3

Vln.

fff *pp* *fff* *pp* *fff*

este sonido imita el ruido de fuerte golpe resonante las partículas que caen requebrajadas por el golpe

79 ricochet

5 3

Pizz (m.s.)
+ arco

ricochet

Vln.

pp *fff* golpes *mp* *ff*

84 ricochet

3 3

Vln.

mp *mp*

88 ricochet

3 3

Vln.

mp *mf*

93 $\text{♩} = 216$ muy resonante

5

Vln.

mf *mf* *ff* ritmo marcado *mf*

103 muy resonante

Vln.

fff *mf*

Homo ergaster

Ritmo producido al picar piedra.
Resonante pero fluido y ágil

Homo descubre el ritmo aditivo y aprende a contar.
La nueva destreza le permite tallar piedras simétricas de un grosor más fino,
que luego ensamblará para construir puntas de lanza.
El poblado resuena con la poliritmia del trabajo.

muy resonante

muy resonante

muy resonante

sf *fff*

fff *sf* *mf* *sf* *sf* *sf*

sf *sf* *sf* *glissando* *glissando* *sf* *sf*

15^{ma} *15^{ma}* *8^{va}* *8^{vb}* *8^{vb}*

5 *3* *5* *3*

5 *3* *5* *3*

♩ = 80

Pizz (m.s.) + arco *Pizz (m.s.) + arco*

vibrato *vibrato*

ff *fff* *mp* *fff*

El explorador

(Homo erectus)

sonido-r
scordatura (Opcionalmente, sonidos subarmónicos sin scordatura)
162 tiempo impreciso, titubeante

Vln.

172 Tiempo normal

Vln.

179

Vln.

185

Vln.

120
sonido-r:
el fuego conservado
scordatura 1 octava (Opción sin scordatura. subarmónicos)

193

Vln.

scordatura 2 octavas

tremolo
que imita la fricción del palito
al girar en frotamiento

202 encienden fuego (armónico) el fuego prende

Vln.

mf

211 arco-por-debajo de las cuerdas

Vln.

(armónico)

219

Vln.

grito energético gritos de entusiasmo

227

Vln.

8^{va} 8^{va} 8^{va}

sul sul
D A
(junto al puente)

232

Vln.

8^{va}

ricochet ricochet

(risas) (risas)

♩=100

(risas)

234

Vln.

ricochet

♩=70

El descubrimiento de la melodía
(trino > vibrato microtonal)

Trinos violentos que poco a poco se transforman en trinos suaves
(intervalos de tritono, 4, 3M, 3m, 2M, 2m, microtono, con/sin trémolo).
Progresivamente, *Homo erectus* es capaz de identificar puntos aislados (no glissando
más pequeños en el continuo del sonido).

237 $\text{♩} = 100$

Vln. *molto furioso*

244

Vln. (vibrato 1/4 tono muy lento)
(reflexionando) (idea)

251

Vln. *glissando no vibrato*

256

Vln. ricochet (risa) ricochet ricochet *gettato*

260

Vln. *tr tr tr tr* *8va*
(grito)

268

Vln. *8va*

275 *trm trm* *8va* *trm*
Vln. (grito) e-be be be m e

282 *ricochet*
Vln.

286 (vibrato-presión sobre cuerda como lahuta)
Vln. (sonido-"mmm". Todavía no se articulan sólabas) b-e

293
Vln. (sonido-"mmm")

300
Vln. 3

Homo antecesor

El pre-lenguaje

Un funeral

Violin

Pedal de "la nada"

15^{mb}

gliss. gliss.

gliss.

316

armonicos

eco eco

324

gliss. gliss.

armonicos gliss.

eco

331

gliss. gliss.

vibrato muy lento 1/4 tono

muy sutil

339

glissando con vibrato vibrato muy lento

346

gliss. gliss.

351

El diálogo de unos niños y el panel de miel

355 $\text{♩} = 100$
 Vln. *p* *v* ricochet

362 *8va* (sonido mágico)
 Vln. sul D arcos muy rápidos

368 (risa) ricochet (risa) ricochet (eco con electrónica) (no!)
 Vln. gliss

373 (no!) gliss (risa) ricochet $\text{♩} = 90$ sonido-r
 Vln. (pobre!)

(glissandos descendentes muy rápidos y sin vibrato de 3, de 5 y de 8)

378 (yo quiero!; yo!, yo!; yo!, yo!)
 Vln.

384
 Vln.

391
 Vln.

Palabras de amor

Violin $\text{♩} = 100$
 gliss A 6 glis vibrato muy lento flag percutir la cuerda (flag) tonos
 (llamada)

Vln. 401 vibrato muy lento

Poderoso.
 Pasos que se acercan
 (tema de *homo erectus*)
 Vln. 405 *fff* muy resonante *mf* mucho vibrato
 oscilación de arco. (habla la mujer)

Vln. 413 mucho vibrato armónicos

Vln. 418 mucho vibrato gliss.

Vln. 422 (el narrador describe la hermosura del hombre y de la mujer)

Vln. 427 (aparece el hombre) (habla el hombre) trino de armónico glissando

Vln. 433 glis

439 Vln. *trino de armónico*

446 Vln. *tono bajar-subir*

451 Vln. *(la mujer habla para sí)* *tono*
(ella se siente muy atraída) *(wauuu...)*

diálogo hombre-mujer
456 Vln. *(hombre)* *(le contesta la mujer)* *(hombre)*

463 Vln. *(mujer)* *(habla el narrador)* *trino misterioso*

469 Vln. *deslizamiento microtonal*

473 Vln. *(duo hombre-mujer)*

478 Vln.

482 Vln. *movimiento S.T. a S.P.* *trino de armónico* *8va* *Origen Especies*