Annali dell'Università degli Studi di Ferrara
Museologia Scientifica e Naturalistica

ISSN 1824-2707
volume speciale 2008

Comparative study of african and euroasian Hominids: *Homo ergaster – Homo georgicus*

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Abstract

The present work is an initial study to the physical anthropology, restricting to anatomical descriptive analysis that we applied to the anatomy of crania selected among Dmanisi fossils and earlier hominids from eastern Africa. From then, we aim to test the hypothesis that affiliate Georgian crania to *Homo ergaster*.

Le present travail est plutot préparatoire à nos études d'anthropologie physique, limitée ici aux descriptions anatomiques que nous appliquons également à l'anatomie des cranes choisis parmi des fossiles du site de Dmanisi et de premiers Hominidés selectionnés en Afrique orientale. Il s'agira pour nous de tester l'hypothèse qui affilie les cranes georgien à *Homo ergaster*.

Keywords: Comparison, earlier hominids, anatomical description, *H. ergaster* , *H. georgicus*.

Introduction

Our idea of earlier *Homo* comparison between them, lie in the whole complexity to explain and to cleary understand origins and evolutive processes that drove to an exodus from Africa, and giving rise to non African human: Eurasians.

We touch here the controversial identity of the Dmanisi "population". The creation of a new species *Homo georgicus* (Gabunia *et al.*, 2002) somewhat unique in its kind did not clear all the doubts about the real identity of these fossils.

Methods and Materiels

Data from Dmanisi fossils and earlier eastern African *Homo* were basically recorded from a large set of articles and works available in Wood (1991), Rightmire (1991, 1993), Walker and Leakey (1994), Gabunia and Vekua (1995), Gabunia *et al.* (2000, 2002), Vekua *et al.* (2002), Rightmire *et al.* (2005), de Lumley *et al.* (2006), M.-A. de Lumley *et al.* (2006) and Lordkipanizde *et al.* (2006).

We have identified four Dmanisi crania so far uncovered as a sample: D2280 cranium, D2282 cranium, D2700 cranium, D3444 cranium (Fig. 1).

As a comparison material, we selected representative earlier *Homo* from eastern Africa, Koobi Fora (Kenya): *Homo habilis:* KNM-ER 1813, *Homo rudolfensis:* KNM-ER 1470, and *Homo ergaster:* KNM-ER 3883, KNM-ER 3733, KNM-WT 15000. These specimen samples should be less fragmentary and could provide enough information about vault form and cranial structures.

Our concern consisted in descriptive anatomical assessments and linear measurements.

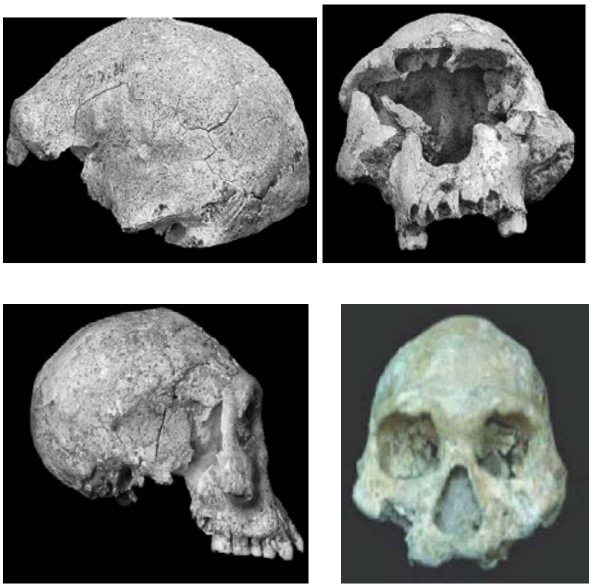

Fig. 1. the four Dmanisi crania; in order D2280, D2282, D2700, D3444.

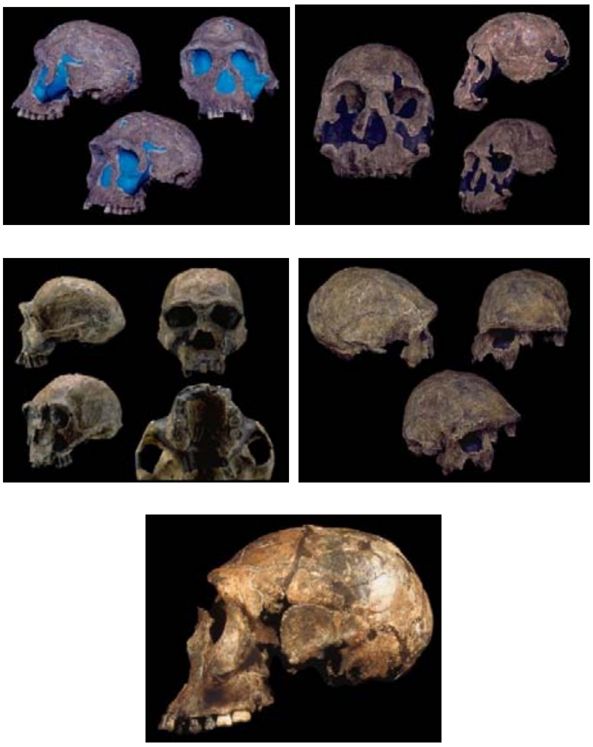

Fig. 2. the selected comparison material; in order: earlier *Homo* from eastern Africa, Koobi Fora (Kenya): *Homo habilis:* KNM-ER 1813, *Homo rudolfensis:* KNM-ER 1470, and *Homo ergaster:* KNM-ER 3883, KNM-ER 3733, KNM-WT 15000.

We based some of this anatomical descriptions on an examination (empiric observation) of cranial casts and photographs as we could not afford to access to original specimens. We recorded and confronted few measures from casts, using a sliding calliper (D2280 cast, KNM-ER 1813 cast and KNM-ER 3388 cast). We have selected metric data (quantitative or qualitative) and completed a database according to anatomic crania points of our interest. We have used the Excel program to elaborate the database and to perform the statistical calculations.

The null hypothesis is tested through a series of comparative interpretation. It consists from analysing our database to distinguish feature similarities or differences. In our case, we used mean of each measurement of Dmanisi crania to compare with others cranial specimen. The highest and the lowest metric values are taken into account. A recapitulative table is made to confirm or invalidate the analyses result.

Comparative study and results

Dmanisi crania whole vault, through his anatomical points, yield measurement variations. However, it clearly appears to us in general tendency, that all Dmanisi crania whole vault metric values are completely lower than the one of *H. ergaster* sample and interlace themselves with *H. habilis* and *H. rudolfensis* one. We have observed that in the major part of the whole vault features the Dmanisi fossils are close to *Homo habilis* KNM-ER 1813 and *H. rudolfensis* KNM-ER 1470, but in few ones (like the cranial breadth), are close to *H. ergaster*.

For the *parietotemporal region*, Dmanisi crania show a feature combination affiliable to *H. habilis* KNM-ER 1813 and *H. rudolfensis* KNM-ER 1470; but also to *H. ergaster* group.

About the *frontal bone* features, we found more affinities in size and shape to *H. habilis* KNM-ER 1813 and *H. rudolfensis* KNM-ER 1470 than *H. ergaster* (KNM-ER 3883, KNM-ER 3733, KNM-WT 15000); even thought some feature as biorbital chord seems to derive to *H. ergaster* group.

The *occipital bone* of Dmanisi fossils crania is closer in size, to the couple *H. habilis* KNM-ER 1813 – KNM-ER 1470 than *H. ergaster* crania.

The *facial skeleton* of Dmanisi crania also expose a series of features more close to *H. habilis*

Table I

	D2280	D2282	D2700	D3444	ER 1813	ER 1470	ER 3733	ER 3883	WT 15000
Whole vault									
Cranial length	177	—	155	163	145	168	182	182	—
Basion-nasion length	—	—	92	—	82?	—	107	102	—
Basion-prosthion length	—	—	100?	—	94?	—	118	—	—
Basion-bregma heigh	105	92	101	—	90	101	108	100	102
Max. cranial breadth	136	—	126	132	>113	138	142	140	131
Biauricular breadth	132	—	119	120	112	135	132	129	—
Index Lenght/Breadth	130.1	—	123.0	123.5	128.3	121.7	128.2	130.0	—
index Lenght/hight	169	—	153	—	161	166	169	182	—

Table II

	D2280	D2282	D2700	D3444	ER 1813	ER 1470	ER 3733	ER 3883	WT 15000
Parietotemporal region									
Max. biparietal breadth	119	116	117	122	100?	120	131	134	128?
Parietal sag. chord	91	82	87	98	74?	84	82	90	93
Parietal sag. arc	96	85	91	105	77?	89	85	95	107
Lambda-asterion	70	68	65	71	64	80	81	74	63
Lambda-asterion arc	75	72	70	74	69	88	88	79	76

Table III

	D2280	D2282	D2700	D3444	ER 1813	ER 1470	ER 3733	ER 3883	WT 15000
Frontal bone									
Supraorbital torus thickness	11	10	9	10	9	8	8.5	11	—
Min. frontal breadth	75	65	67	67.5	65	71	83	80	73
Max. frontal breadth	105	87?	85?	91	—	92	110	105	—
Biorbital chord	105	96	90	98	91	109	109	110	96
Postorbital constriction index	71.4	68.4	74.4	68.8	71.4	65.1	76.1	72.7	76
Frontal sag. chord	101	—	89	93	80	93	104	101	—
Frontal sag. arc	108	95	95	101	90	104	119	118	—
Frontal angle	149	—	150	148	139	140	139	140	—
Max /M. Fontal. breadth Index	140.0	133.8	126.9	134.8	—	129.5	132.5	131.3	—

KNM-ER 1813 than to *H. rudolfensis* or *H. ergaster* sample. *Homo rudolfensis* present a series of particular features like flat and very height face, higher cheeks.

Assigning each Dmanisi crania to the eastern African *Homo* samples, it led to a result that: D2280 could be assigned to *Homo ergaster* sample (KNM-ER 3883; KNM-ER 3733; KNM-WT 15000); D2282 could be affiliated to *Homo ergaster* sample. D2700 to *H. habilis* KNM-ER 1813 and D3444 is between *H. rudolfensis* KNM-ER 1470 and *H. ergaster* sample.

Table IV

	D2280	D2282	D2700	D3444	ER 1813	ER 1470	ER 3733	ER 3883	WT 15000
Occipital bone									
Biasterionic Breadth	104	103	105	104	93	108	119	115	106
Occipital sag. chord	76	—	70	79	78	86	88	75	69
Occipital sag. arc	97	—	87	95	96	105	118	101	93
Occipital angle	108	—	115.6	117	114	—	103	101	—
Lambda-inion chord	46	46?	45?	50	55?	60	57	48	38
Inion-opisthion chord	47?	—	39?	42.5	40	45?	53	51	50
Occipital scale index	102.1	—	86.6	85	72.7	75?	92.9	106.2	131.5
Foramen magnum breadth	—	—	30?	—	—	—	37	33	36
Foramen magnum length	—	—	28?	28	—	—	32?	26	27
Foramen magnum area (mm^2)	—	—	600?	—	—	—	930	674	763

Summary

In the light of our comparative interpretation, we draw to a result that anatomically with certain metrical characters, Dmanisi crania show a large amount of variation and each of these crania specimens distinctively expressed unique but also shared features confronted with our earlier *Homo* samples. We uphold about our short study that Dmanisi cranial bones, from the whole vault to the facial skeleton passing by the frontal, the parietotemporal region and the occipital, expose more proximity to the group *Homo habilis-rudolfensis* while they have also some features in common with *Homo ergaster*.

Table V

	D2280	D2282	D2700	D3444	ER 1813	ER 1470	ER 3733	ER 3883	WT 15000
Facial skeleton									
Nasion-prosthion length	—	—	69	—	64	90	81	—	77
Biorbital chord	105	96	90	98	91	109	109	110	96
Nasion angle	139	—	136	142	153	151	155	151	138
Nasal bridge width	—	—	18	21	—	—	22	22	32
Nasal bridge height	—	—	9.0	9	—	—	8	9	9.5
Nasal bridge index	—	—	50	42.8	—	—	36.3	40.9	29.6
Nasal bridge angle	—	—	90	98	—	—	108	101	119
Orbit breadth	—	40?	35	38	34	41	44	45	39
Orbit heigh	—	—	31	32	30	36	35	36	42
Midorbital chord	—	—	55	51	60	64?	73	—	70
Naso-orbital angle	—	—	129	130	—	136 ?	135	—	123
Nasal breadth	—	28	27	28	24	27	36	—	36.0
Nasal height	—	—	50	50	44	58	53	—	57
Clivus length	—	>28	20	—	24?	36?	30?	—	22
Bimaxillary chord	96	91	96	93	86	98	101	—	100
Subspinale angle	—	154 ?	143	140	144 ?	161 ?	143	—	133
Prosthion angle	—	107 ?	107	—	108 ?	112 ?	102 ?	—	103
Cheek height	—	30?	—	25	27	40?	34	—	30
Max. malar height	—	43.5	39	40	—	—	53?	> 58	53 ?
Palate breadth	—	39	37	—	35?	—	—	—	40.0
Palate length	—	54	55	—	54?	—	—	—	—

Table I, II, III, IV, V: Cranial measurements (mm) for the Dmanisi hominins and selected representatives of earlier African *Homo*. Measurements were made on the original fossils (After Wood, 1991; Gabunia *et al*., 2000; Vekua *et al*., 2002; Rightmire *et al*., 2005; M.-A. de Lumley *et al*. 2006; Lordkipanizde *et al*., 2006). Numbers with question mark indicate approximate values; dashes indicate unavailable data.

Acknowledgments

This work is the result of supports, guidances and encouragements extended to me: Supervisors, professors, researchers, students, parents, and institutions (European community, through the Erasmus Mundus program, University partners) etc,. In short, supports from a long list of various people at various stages, to whom I lack words to express my deep gratitude and indebtedness.

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Stampato presso
Cartografica Artigiana snc
Ferrara
Novembre 2008