

Table S1 - Hominin specimens included in the study and their contextual information

ID	Specimen	OTU	Included in Homo sapiens lineage	Included in Homo neanderthalensis lineage	Included in Face analyses	Percentage of Missing Landmarks in Face	Included in Neurocranium analyses	Percentage of Missing Landmarks in Neurocranium	Chronology	Reference
HHBRDU002HA	KNM ER 1470	Early <i>Homo</i>	Yes	Yes	Yes	17.39	Yes	19.05	1.9MA	LEAKEY, R. Nature 242, 447–450 (1973). https://doi.org/10.1038/242447a0 ; Hillhouse, J., Ndombi, J., Cox, A. et al. Nature 265, 411–415 (1977). https://doi.org/10.1038/265411a0 ; Gleadow, Nature 284, 225–230 (1980). https://doi.org/10.1038/284225a0 Leakey, R. Nature 248, 653–656 (1974). https://doi.org/10.1038/248653a0 Lordkipanidze et al. Science 342, 326–331(2013).DOI:10.1126/science.1238484 Lordkipanidze et al. Science 342, 326–331(2013).DOI:10.1126/science.1238484 Lepre, C.J., Kent, DV. Earth and Planetary Science Letters 290, 362–374 (2010). doi.org/10.1016/j.epsl.2009.12.032 . Leakey, R.E.F. and Walker, A.C. Am. J. Phys. Anthropol., 67: 135–163 (1985). https://doi-org.proxy.lib.ohio-state.edu/10.1002/ajpa.1330670209 Walker, A., Leakey, R., (Eds.) The Nariokotome Homo erectus Skeleton, Harvard University Press, Cambridge (1993), pp. 63–94 Antón, S.C. Am. J. Phys. Anthropol., 122: 126–170 (2003). https://doi-org.proxy.lib.ohio-state.edu/10.1002/ajpa.10399
HHBHB001HA	KNM ER 1813	Early <i>Homo</i>	Yes	Yes	Yes	8.7	Yes	0	1.9MA	
HMEDMU003HA	Dmanisi 2280	<i>H. erectus</i>	Yes	Yes	No		Yes	0	1.8MA	
HMEDMU008HA	Dmanisi 2282	<i>H. erectus</i>	Yes	Yes	Yes	21.74	Yes	9.52	1.8MA	
HMEERU004HA	KNM ER 3733	<i>H. erectus</i>	Yes	Yes	Yes	34.78	Yes	0	1.8MA	
HMEERU005HA	KNM ER 3883	<i>H. erectus</i>	Yes	Yes	No		Yes	0	1.6MA	
HMEERU002HS	KNM WT 15000	<i>H. erectus</i>	Yes	Yes	Yes	4.35	Yes	4.76	1.6MA	
HMEOHM007HA	OH9	<i>H. erectus</i>	Yes	Yes	No		Yes	4.76	1.4MA	
HMHARU011HA	Arago 21 ^a	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	0	No		600–350	de Lumley and de Lumley, 1973 - Yearb. Phys. Anthropol., 17 (1973), pp. 162–168; Cook et al., 1982 - Yearbk. Phys. Anthropol., 25 (1982), pp. 19–65; Falguères et al., 2004 - J. Archaeol. Sci., 31 (2004), pp. 941–952
HMHBDM006HA	Bodo	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	4.35	No		600	Clark, J. D., et al., Science 264, 1907–1910 (1994). http://www.jstor.org/stable/2883979
HMHKBM001HA	Broken Hill (Kabwe)	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	0	Yes	0	299+–25	Grün, R., Pike, A., McDermott, F. et al.. Nature 580, 372–375 (2020). https://doi.org/10.1038/s41586-020-2165-4
HMHDAU017HA	Dali	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	21.74	Yes	0	260+–20	Sun, X., et al. Quaternary International 434, 99–106 (2017). https://doi.org/10.1016/j.quaint.2015.05.027 .
HMHNDF007HA	Ndutu	<i>H. heidelbergensis</i> s.l.	Yes	Yes	No		Yes	4.76	600–400	Mturi, A., Nature 262, 484–485 (1976). https://doi.org/10.1038/262484a0 ; Rightmire, G.P. Am. J. Phys. Anthropol., 61: 245–254 (1983). https://doi-org.proxy.lib.ohio-state.edu/10.1002/ajpa.1330610214
HMHPHM002HA	Petralona	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	0	Yes	19.05	620–350	Papamarinopoulos, S., et al., Archaeometry, 29: 50–59 (2007). https://doi-org.proxy.lib.ohio-state.edu/10.1111/j.1475-4754.1987.tb00397.x
HMHSMM005HA	Sima Craneo 5	<i>H. heidelbergensis</i> s.l.	Yes	Yes	Yes	8.7	Yes	0	400–450	Demuro, M., et al., J Hum Evol 131, 76–95 (2019) https://doi.org/10.1016/j.jhevol.2018.12.003 ; Arsuaga J.L., et al., Science. 344:1358–63 (2014). doi: 10.1126/science.1253958.
Apidima 2	Apidima 2	early <i>H. neanderthalensis</i>	No	Yes	Yes	17.39	No		170	Harvati, K., Rösing, C., Bosman, A.M. et al. Nature 571, 500–504 (2019). https://doi.org/10.1038/s41586-019-1376-z
HMNEAF006HA	Krapina 3	early <i>H. neanderthalensis</i>	No	Yes	Yes	26.09	Yes	28.57	140–120	Rink, W., Schwarcz, H., Smith, F. et al. Nature 378, 24 (1995). https://doi.org/10.1038/378024a0

HMNEAF009HA	Saccopastore 1	early <i>H. neanderthalensis</i>	No	Yes	Yes	30.43	Yes	14.29	295-220	Marra, F., et al, PLoS One e0170434 (2017). https://doi.org/10.1371/journal.pone.0170434
HMNNEF013HA	Tabun C1	early <i>H. neanderthalensis</i>	No	Yes	Yes	30.43	Yes	0	130-100 ka	Grün, R., Stringe, C., J Hum. Evol. 39, 601-612 (2000). https://doi.org/10.1006/jhev.2000.0443 ;
HMNNEM001HA	Amud 1	<i>H. neanderthalensis</i>	No	Yes	Yes	17.39	Yes	0	55-60	Valladas, H., et al., J. Arch. Sci. 26 259-268 (1999). https://doi.org/10.1006/jasc.1998.0334 .
HMNWEF004HA	Gibraltar 1	<i>H. neanderthalensis</i>	No	Yes	Yes	8.7	Yes	0	50	Oakley, K.P., et al. Catalogue of Fossil Hominids Part II: Europe. Br. Mus. Nat. Hist., London.
HMNWEM005HA	Guattari 1	<i>H. neanderthalensis</i>	No	Yes	Yes	8.7	Yes	0	50-60	Grün, R., Stringer, C. B., Archaeometry 33, 153:199 (1991) https://doi.org/10.1111/j.1475-4754.1991.tb00696.x ;Schwarcz H. P., et al., Cur Anthropolol 32, 313-316 (1991). https://doi.org/10.1086/203959
HMNWEM002HA	La Chapelle aux Saints	<i>H. neanderthalensis</i>	No	Yes	Yes	17.39	Yes	0	56-47	Grün, R., Stringer, C. B., Archaeometry 33, 153:199 (1991) https://doi.org/10.1111/j.1475-4754.1991.tb00696.x
HMNWEM003HA	La Ferrassie 1	<i>H. neanderthalensis</i>	No	Yes	Yes	0	Yes	0	43-45	Guérin, G., et al., J Arch Sci 58, 147-166 (2015). https://doi.org/10.1016/j.jas.2015.01.019 .
HMNWEF008HA	Quina 5	<i>H. neanderthalensis</i>	No	Yes	No		Yes	0	>48 (MIS 3-4)	Debénath, A., Jelinek, A. Gallia Prehist. 40, 29-74 (1998)
HMNNEM010HA	Shanidar 1	<i>H. neanderthalensis</i>	No	Yes	Yes	0	Yes	0	46-50	Vogel, J.C. , Waterbolk, H.T., Radiocarbon 5 163-2502 (1963)
HMNWEU018HA	Shanidar 5	<i>H. neanderthalensis</i>	No	Yes	Yes	4.35	No		Uncalibrated 46-50	Vogel, J.C. , Waterbolk, H.T., Radiocarbon 5 163-2502 (1963)
HMSAMU011HA	Das Es Soltane 5	early <i>H. sapiens</i>	Yes	No	Yes	21.74	Yes	28.57		Hublin, J.-J. Philosophical Transactions: Biological Sciences 337, 185–191 (1992). http://www.jstor.org/stable/57106
HMHIRU004HA	Jebel Irhoud 1	early <i>H. sapiens</i>	Yes	No	Yes	8.7	Yes	0	315+-34	Richter D., et al., Nature 546, 293-296 (2017). doi: 10.1038/nature22335.
HMHIRU010HA	Jebel Irhoud 2	early <i>H. sapiens</i>	Yes	No	No		Yes	0	315+-34	Richter D., et al., Nature 546, 293-296 (2017). doi: 10.1038/nature22335.
HMHLHU008HA	LH18	early <i>H. sapiens</i>	Yes	No	No		Yes	0	120	Magori, C.C., Day, M.H. J Hum Evol 12, 747-753. https://doi.org/10.1016/S0047-2484(83)80130-4 .
HMSOMU001HA	Omo 1	early <i>H. sapiens</i>	Yes	No	No		Yes	4.76	195+-5	McDougall, I., Brown, F. & Fleagle, J. . Nature 433, 733–736 (2005). https://doi.org/10.1038/nature03258
HMSAMM001HA	Qafzeh 6	early <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	135-100	Grün, R., et al. J Hum Evol 49, 316-334 (2005). https://doi.org/10.1016/j.jhevol.2005.04.006 .
HMSAMF002HA	Qafzeh 9	early <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	135-100	Grün, R., et al. J Hum Evol 49, 316-334 (2005). https://doi.org/10.1016/j.jhevol.2005.04.006 .
HMSAMM004HA	Skhul 5	early <i>H. sapiens</i>	Yes	No	Yes	30.43	Yes	0	135-100	Grün, R., et al. J Hum Evol 49, 316-334 (2005). https://doi.org/10.1016/j.jhevol.2005.04.006 .
HMSUPF010HA	Abri Pataud	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	28-26 (22 uncalibrated) 23.7	Douka, K., et al. J Hum Evol 141, 102730 (2020). https://doi.org/10.1016/j.jhevol.2019.102730 .
HMSUPU036HA	Brno 2	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	9.52	uncalibrated (ca. 28.5 cal BP)	Pettitt, P., Trinkaus, E., Anthropologie, 38: 149-150 (2000)
HMSUPU011HA	Chancelade	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	8.7	Yes	0	18	Barshay-Szmidt, C., et al., J Arch Sci: Reports 17: 809-838 (2016). https://doi.org/10.1016/j.jasrep.2017.09.003 .
HMSUPU015HA	Cioclovina	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	0	ca33	Harvati, K., et al. J Hum Evol 2007, 732-746 (2007). https://doi.org/10.1016/j.jhevol.2007.09.009 .
HMSUPM001HA	Cro Magnon 1	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	13.04	Yes	0	ca 30	Movius, H.L., Anuario Estudios Atlanticos 15, 323-344 (1969); Henry-Gambier, D., et al., Paleo 24, 121-138 (2002). https://doi.org/10.4000/paleo.2859

HMSUPF002HA	Cro-Magnon 2	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	8.7	Yes	9.52	ca 30	Movius, H.L., Anuario Estudios Atlanticos 15, 323-344 (1969); Henry-Gambier, D., et al., Paleo 24, 121-138 (2002). https://doi.org/10.4000/paleo.2859
HMSUPM030HA	Dolni Vestonice 13	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	ca. 31	Fewlass, H., et al., J Arch Sci 27: 102000 (2019). https://doi.org/10.1016/j.jasrep.2019.102000 .
HMSUPM032HA	Dolni Vestonice 15	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	4.35	Yes	0	ca. 31	Fewlass, H., et al., J Arch Sci 27: 102000 (2019). https://doi.org/10.1016/j.jasrep.2019.102000 .
HMSUPM033HA	Dolni Vestonice 16	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	ca. 30	Fewlass, H., et al., J Arch Sci 27: 102000 (2019). https://doi.org/10.1016/j.jasrep.2019.102000 .
HMSUPF028HA	Dolni Vestonice 3	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	undated	Fewlass, H., et al., J Arch Sci 27: 102000 (2019). https://doi.org/10.1016/j.jasrep.2019.102000 .
HMSUPU025HA	Grimaldi	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	25 uncal (ca. 29.5 cal BP)	Formicola, V., et al., Curr. Anthropol., 45, 114-118 (2004). https://doi.org/10.1086/381008
HMSHOU017HA	Hofmeyr	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	8.7	Yes	14.29	36	Grine, F.E., et al., Science 315,226-229 (2007). DOI:10.1126/science.1136294
HMSIEU001HA	Iwo Eleru	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	0	13	Harvati K., et al., PLoS One 6, e24024 (2011). doi: 10.1371/journal.pone.0024024.
HMSKLM043HA	Kanalda	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	9.52	10	Storm, P. (1995). The evolutionary significance of the Wajak skulls. Scripta Geologica, 110, 1–248.
HMSUPU041HS	Lau bassa	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	9.52	10	
HMSUPF003HA	Mladec 1	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	9.52	35-36.5	Wild, E., et al. . Nature 435, 332–335 (2005). https://doi.org/10.1038/nature03585
HMSUPF004HA	Mladec 2	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	13.04	Yes	4.76		Wild, E., et al. . Nature 435, 332–335 (2005). https://doi.org/10.1038/nature03585
HMSUPM008HA	Mladec 5	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	0	31	Wild, E., et al. . Nature 435, 332–335 (2005). https://doi.org/10.1038/nature03585
HMSUPM009HA	Mladec 6	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	19.05	31	Wild, E., et al. . Nature 435, 332–335 (2005). https://doi.org/10.1038/nature03585
HMSUPF039HA	Muierii 1	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	No		ca. 35	Soficar, A., Dobos, A, Trinkaus E., Proc. Natl. Acad. Sci. U.S.A. 103, 17196-17201 (2006), https://doi.org/10.1073/pnas.0608443103
HMSUPF037HA	Oase 2	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	ca. 40,5	Rougier, H., Proc. Natl. Acad. Sci. U.S.A. 104, 1165-1170 (2007). https://doi.org/10.1073/pnas.0610538104
HMSUPU026HA	Ohalo II	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	19	Hershkovitz I., et al., Am J Phys Anthropol. 96, 215-34 (1995). doi: 10.1002/ajpa.1330960302.
HMSUPM034HA	Pavlov 1	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	0	25-26	Fewlass, H., et al., J Arch Sci 27: 102000 (2019). https://doi.org/10.1016/j.jasrep.2019.102000 .
HMSUPM005HA	Predmost 3	Upper Paleolithic <i>H. sapiens</i>	Yes	No	No		Yes	0	27-29	Svoboda, J. A., J Hum Evol 54, 15-33 (2008). https://doi.org/10.1016/j.jhevol.2007.05.016 .
HMSUPF006HA	Predmost 4	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	27-29	Svoboda, J. A., J Hum Evol 54, 15-33 (2008). https://doi.org/10.1016/j.jhevol.2007.05.016 .
HMSUPM014HA	Upper Cave 101	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	24-29	Harvati, K., Röding, C., Bosman, A.M. et al. Nature 571, 500–504 (2019). https://doi.org/10.1038/s41586-019-1376-z
HMSUPF016HA	Upper Cave 103	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	4.35	Yes	9.52	24-29	Harvati, K., Röding, C., Bosman, A.M. et al. Nature 571, 500–504 (2019). https://doi.org/10.1038/s41586-019-1376-z
HMSUPU027HA	Wadi Kubbania	Upper Paleolithic <i>H. sapiens</i>	Yes	No	Yes	0	No		20	Wendorf F, Schild R. The Wadi Kubbania Skeleton: A Late Paleolithic Burial from Southern Egypt (1986).
HMSAUF029HA	Australian19	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1	
HMSAUM003HA	Australian21	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1	
HMSCHF001HA	Chinese01	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1	

HMSCHM002HA	Chinese12	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSEFF004HA	East African07	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSEFM005HA	East African09	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSSEF042HA	Eskimo (Inusguk)08	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSSEM046HA	Eskimo (Inusguk)13	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSNEM010HA	Europe02	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSNEF008HA	Europe14	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSGGF003HA	Grand Gulch1	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSGGM007HA	Grand Gulch12	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSSMF015HA	KhoiSan12	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSMM048HA	KhoiSan28	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSANF017HA	Melanesian07	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSANM025HA	Melanesian14	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSSRM016HA	Near Eastern08	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSSRF004HA	Near Eastern15	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSTSF003HA	Tasmania1	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSTSM002HA	Tasmania5	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSTHF016HA	Thai06	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSTHM018HA	Thai08	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSZUM001HA	Zulu01	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1
HMSZUF009HA	Zulu23	<i>H. sapiens</i>	Yes	No	Yes	0	Yes	0	<1

^a – landmarks for this fossil were collected on the reconstruction from Gunz, P., Mitteroecker, P., Neubauer, S., Weber, G. W. & Bookstein, F. L. J. *Hum. Evol.* 57, 48–62 (2009).

Table S2 - Neurocranial landmarks included in the analysis and percentage of missing values in each.

Landmarks in Neurocranium Dataset	Percentage of Missing Landmarks
Inion	7.02
Asterion R	1.75
Asterion L	1.75
Lambda	5.26
Stylomastoid For. R	10.53
Porion R	0
Auriculare R	0
Parietal Notch R	3.51
Mastoidiale R	5.26
Lat. Glenoid R	8.77
Stylomastoid For. L	10.53
Porion L	0
Auriculare L	0
Parietal Notch L	3.51
Mastoidiale L	5.26
Lat. Glenoid L	8.77
Bregma	1.75
Post-toral sulcus	1.75
Glabella	7.02
Stephanion R	1.75
Stephanion L	1.75

Table S3 - Facial landmarks included in the analysis and percentage of missing values in each.

Landmarks in Face Dataset	Percentage of Missing Landmarks
Canine-Premolar contact R	21.28
Canine-Premolar contact L	25.53
Distal M3 R	25.53
Distal M3 L	25.53
Nasion	6.38
Nasospinale	10.64
Prosthion	6.38
Mid-orbit torus superior R	2.13
Mid-orbit torus inferior R	2.13
Dacryon R	2.13
Zygoorbitale R	6.25
Frontomalare Orb R	2.13
Infraorbital for. R	6.38
Zygomaxillare R	8.51
Alare R	4.26
Mid-orbit torus superior L	2.13
Mid-orbit torus inferior L	2.13
Dacryon L	2.13
Zygoorbitale L	8.33
Frontomalare Orb L	2.13
Infraorbital for. L	6.38
Zygomaxillare L	8.51
Alare L	4.26

Table S4 - Eigenvalues and variance explained by the first four principal components for each of the four datasets analyzed

PC	eigenvalues	variance	cumulative eigenvalue	cumulative variance
Neurocranial Analysis - H. sapiens lineage				
1	0.0021177	27.585	0.0021177	27.585
2	0.0010838	14.118	0.0032015	41.703
3	0.0005632	7.336	0.0037647	49.039
4	0.0004855	6.325	0.0042502	55.364
Neurocranial Analysis - H. neanderthalensis lineage				
1	0.0028512	33.86	0.0028512	33.86
2	0.0011894	14.125	0.0040406	47.985
3	0.0007426	8.819	0.0047832	56.804
4	0.000705	8.372	0.0054882	65.176
Facial Analysis - H. sapiens lineage				
1	0.0023441	22.122	0.0023441	22.122
2	0.0012312	11.619	0.0035753	33.741
3	0.0011311	10.674	0.0047063	44.415
4	0.000703	6.634	0.0054093	51.049
Facial Analysis - H. neanderthalensis lineage				
1	0.0023441	22.122	0.0023441	22.122
2	0.0012312	11.619	0.0035753	33.741
3	0.0011311	10.674	0.0047063	44.415
4	0.000703	6.634	0.0054093	51.049

Table S5 - Model comparison results for the four Principal Components and centroid sizes tested in the four datasets analyzed.

	Neurocranial Analysis - Homo sapiens lineage					Neurocranial Analysis - Homo neanderthalensis lineage					Facial Analysis - Homo sapiens lineage					Facial Analysis - Homo neanderthalensis lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1					Principal Component 1					Principal Component 1				
General Random Walk Unbiased Random Walk	-1.63673	3	21.27347	6.5694	0.036	2.278425	3	25.44315	7.339272	0.024	-4.43241	3	26.86482	5.248694	0.041	-2.39373	3	34.78746	26.2833	0
	-3.35203	2	14.70407	0	0.961	-4.05194	2	18.10388	0	0.931	-7.19796	2	22.39592	0.7798	0.387	-2.61518	2	15.23037	6.726206	0.032
Stasis	-9.07623	2	26.15245	11.44838	0.003	-7.08233	2	24.16466	6.060783	0.045	-6.80806	2	21.61612	0	0.571	-2.58542	2	15.17085	6.666685	0.033
Strict Stasis	-265.323	1	533.6465	518.9424	0	-46.7621	1	96.85759	78.75372	0	-16.3714	1	35.74281	14.12669	0	-2.58541	1	8.50416	0	0.934
Punctuated Equilibrium	-3.29176	4	54.58352	39.87945	0	-1.23495	4	Inf	Inf	0	-3.11084	4	54.22167	32.60555	0	-2.40174	4	Inf	Inf	0
Ornstein-Uhlenbeck	-1.64051	4	51.28102	36.57695	0	2.366775	4	Inf	Inf	0	-5.62501	4	59.25001	37.63389	0	-2.36427	4	Inf	Inf	0
	Principal Component 2					Principal Component 2					Principal Component 2					Principal Component 2				
General Random Walk Unbiased Random Walk	-6.05763	3	30.11525	9.779557	0.003	-6.01475	3	42.02949	26.89221	0	-4.51059	3	27.02118	13.17621	0.001	1.177631	3	27.64474	10.08866	0.006
	-6.16785	2	20.3357	0	0.416	-6.03013	2	22.06027	6.922987	0.026	-5.45858	2	18.91717	5.072188	0.062	-3.77804	2	17.55607	0	0.951
Stasis	-6.68028	2	21.36056	1.024864	0.249	-4.27204	2	18.54407	3.406793	0.15	-4.59018	2	17.18037	3.335387	0.149	-6.88401	2	23.76802	6.211948	0.043
Strict Stasis	-8.89694	1	20.79389	0.458189	0.331	-5.90197	1	15.13728	0	0.824	-5.42249	1	13.84498	0	0.788	-23.636	1	50.60539	33.04931	0
Punctuated Equilibrium	-5.13993	4	58.27985	37.94415	0	-3.79446	4	Inf	Inf	0	-4.11922	4	56.23844	42.39346	0	0.016659	4	Inf	Inf	0
Ornstein-Uhlenbeck	-3.89726	4	55.79453	35.45883	0	-3.99458	4	Inf	Inf	0	-2.69619	4	53.39237	39.5474	0	1.243202	4	Inf	Inf	0
	Principal Component 3					Principal Component 3					Principal Component 3					Principal Component 3				
General Random Walk Unbiased Random Walk	-5.60964	3	29.21929	15.30798	0	-2.60428	3	35.20856	26.8309	0	-7.30407	3	32.60815	9.517902	0.005	-4.39305	3	38.78609	26.58426	0
	-5.66264	2	19.32528	5.413973	0.059	-2.6101	2	15.22019	6.842529	0.03	-7.8033	2	23.6066	0.516353	0.434	-4.45427	2	18.90853	6.706697	0.032
Stasis	-2.95566	2	13.91131	0	0.889	-2.02818	2	14.05636	5.678697	0.054	-7.54512	2	23.09024	0	0.561	-3.94709	2	17.89419	5.692352	0.053
Strict Stasis	-8.30902	1	19.61805	5.706736	0.051	-2.52216	1	8.377661	0	0.916	-66.169	1	135.3381	112.2478	0	-4.43425	1	12.20184	0	0.915
Punctuated Equilibrium	-1.85683	4	51.71367	37.80235	0	-1.94158	4	Inf	Inf	0	-1.4987	4	50.99739	27.90715	0	-3.03882	4	Inf	Inf	0
Ornstein-Uhlenbeck	-2.55725	4	53.11449	39.20318	0	-1.76813	4	Inf	Inf	0	-6.81041	4	61.62083	38.53058	0	-3.83964	4	Inf	Inf	0

	Principal Component 4					Principal Component 4					Principal Component 4					Principal Component 4				
General Random Walk	-2.33301	3	22.66602	7.546935	0.01	-5.74788	3	41.49576	25.40533	0	-6.96357	3	31.92713	9.925849	0.003	-3.46495	3	36.9299	16.32631	0
Unbiased Random Walk	-3.86126	2	15.72251	0.603422	0.312	-6.8743	2	23.74859	7.658158	0.017	-7.00064	2	22.00128	0	0.461	-5.70144	2	21.40288	0.799294	0.267
Stasis	-3.55954	2	15.11909	0	0.421	-4.51288	2	19.02575	2.935321	0.184	-7.04523	2	22.09046	0.089173	0.441	-5.30179	2	20.60359	0	0.398
Strict Stasis	-6.55205	1	16.1041	0.985012	0.257	-6.37855	1	16.09043	0	0.799	-11.0737	1	25.1475	3.146212	0.096	-8.80477	1	20.94288	0.339292	0.336
Punctuated Equilibrium	-1.78377	4	51.56755	36.44846	0	-3.6241	4	Inf	Inf	0	-4.4799	4	56.95981	34.95852	0	-4.30899	4	Inf	Inf	0
Ornstein-Uhlenbeck	-0.92118	4	49.84236	34.72328	0	-4.30731	4	Inf	Inf	0	-5.80773	4	59.61545	37.61417	0	-2.561	4	Inf	Inf	0
	Centroid size					Centroid size					Centroid size					Centroid size				
General Random Walk	-13.4288	3	44.85759	13.13519	0.001	-6.80556	3	43.61112	19.86591	0	-12.5039	3	43.00789	10.05333	0.003	-6.05424	3	42.10848	25.58286	0
Unbiased Random Walk	-13.4921	2	34.98429	3.261885	0.163	-9.50422	2	29.00843	5.263226	0.064	-12.5622	2	33.12442	0.169864	0.477	-6.60691	2	23.21381	6.688189	0.033
Stasis	-11.8612	2	31.7224	0	0.835	-9.68358	2	29.36717	5.621962	0.053	-12.4773	2	32.95456	0	0.519	-6.59615	2	23.19229	6.666671	0.033
Strict Stasis	-23.2279	1	49.45577	17.73337	0	-10.2059	1	23.7452	0	0.883	-52.5864	1	108.1728	75.21822	0	-6.59614	1	16.52562	0	0.934
Punctuated Equilibrium	-9.73319	4	67.46638	35.74398	0	-6.56901	4	Inf	Inf	0	-7.38	4	62.75999	29.80543	0	-5.74171	4	Inf	Inf	0
Ornstein-Uhlenbeck	-10.2967	4	68.59332	36.87092	0	-6.10603	4	Inf	Inf	0	-11.2979	4	70.59587	37.64131	0	-5.3996	4	Inf	Inf	0

Table S6 - Sample size of the OTUs for each of the datasets analyzed.

	Neurocranial analyses				Facial analyses			
OTU	Homo sapiens lineage	Homo neanderthalensis lineage	Minimum percentage of missing values	Maximum percentage of missing values	Homo sapiens lineage	Homo neanderthalensis lineage	Minimum percentage of missing values	Maximum percentage of missing values
early <i>Homo</i>	2	2	9.52	19.05	2	2	13.04	17.39
<i>H. erectus</i>	6	6	3.17	9.52	3	3	20.29	34.78
<i>H. heidelbergensis</i> s.l.	5	5	4.76	19.05	6	6	5.8	21.74
early <i>H. neanderthalensis</i>	0	3	14.29	28.57	0	4	26.09	30.43
<i>H. neanderthalensis</i>	0	7	0	0	0	7	8.07	17.39
early <i>H. sapiens</i>	8	0	4.17	28.57	5	0	12.17	30.43
Upper Paleolithic <i>H. sapiens</i>	26	0	3.66	19.05	20	0	3.04	13.04
<i>H. sapiens</i>	24	0	0	0	24	0	0	0

Table S7 - Model comparison results for the four Principal Components and centroid sizes tested in the four datasets analyzed for alternative Scenario A.

	Neurocranial Analysis - Homo sapiens lineage					Neurocranial Analysis - Homo neanderthalensis lineage					Facial Analysis - Homo sapiens lineage					Facial Analysis - Homo neanderthalensis lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1					Principal Component 1					Principal Component 1				
General	-2.64586	3	35.29172	18.19455	0	1.311474	3	Inf	Inf	0	-3.81637	3	37.63274	16.61691	0	-1.91438	3	Inf	Inf	0
Random Walk Unbiased	-3.54859	2	17.09717	0	0.969	-2.75076	2	21.50152	56.1427	0	-5.53325	2	21.0665	0.050669	0.494	-4.40889	2	24.81778	53.01035	0
Random Walk																				
Stasis	-7.00893	2	24.01785	6.920681	0.03	-4.85681	2	25.71362	60.3548	0	-5.50792	2	21.01583	0	0.506	-3.8683	2	23.73659	51.92916	0
Strict Stasis	-91.8554	1	187.0441	169.9469	0	-29.3509	1	62.70171	97.34289	0	-17.7393	1	38.81191	17.79607	0	-4.86912	1	13.73825	41.93082	0
Punctuated	-1.53256	4	Inf	Inf	0	-3.07999	4	-25.84	8.801154	0.012	-2.11433	4	Inf	Inf	0	-3.00791	4	-25.9842	2.208385	0.249
Equilibrium																				
Ornstein-Uhlenbeck	-2.64714	4	Inf	Inf	0	1.320591	4	-34.6412	0	0.988	-2.78019	4	Inf	Inf	0	-1.90371	4	-28.1926	0	0.751
	Principal Component 2					Principal Component 2					Principal Component 2					Principal Component 2				
General	-3.07216	3	36.14432	19.3629	0	-4.08128	3	Inf	Inf	0	-2.67338	3	35.34676	25.54392	0	-2.00391	3	Inf	Inf	0
Random Walk Unbiased	-3.39071	2	16.78141	0	0.614	-4.09039	2	24.18078	51.90503	0	-3.29793	2	16.59585	6.793012	0.031	-3.77413	2	23.54825	56.24649	0
Random Walk																				
Stasis	-4.85673	2	19.71346	2.932049	0.142	-2.68715	2	21.3743	49.09855	0	-3.222	2	16.44401	6.641165	0.034	-4.75029	2	25.50057	58.19881	0
Strict Stasis	-7.64404	1	18.62142	1.840008	0.245	-3.44142	1	10.88283	38.60708	0	-3.23476	1	9.802843	0	0.935	-6.84168	1	17.68337	50.38161	0
Punctuated	-4.78487	4	Inf	Inf	0	-2.65248	4	-26.695	1.029213	0.374	-3.12853	4	Inf	Inf	0	-4.36389	4	-23.2722	9.426016	0.009
Equilibrium																				
Ornstein-Uhlenbeck	-0.78392	4	Inf	Inf	0	-2.13788	4	-27.7243	0	0.626	-2.11951	4	Inf	Inf	0	0.34912	4	-32.6982	0	0.991
	Principal Component 3					Principal Component 3					Principal Component 3					Principal Component 3				
General	-3.0511	3	36.1022	21.4553	0	-5.58204	3	Inf	Inf	0	-5.87561	3	41.75121	20.3157	0	NA				
Random Walk Unbiased	-4.49205	2	18.9841	4.337195	0.085	-5.58971	2	27.17942	53.32017	0	-6.07817	2	22.15634	0.720821	0.411	NA				
Random Walk																				
Stasis	-2.32345	2	14.6469	0	0.742	-3.59393	2	23.18786	49.32862	0	-5.71776	2	21.43552	0	0.589	NA				
Strict Stasis	-7.10883	1	17.55099	2.904086	0.174	-5.04535	1	14.0907	40.23146	0	-67.1122	1	137.5578	116.1223	0	NA				
Punctuated	-1.01718	4	Inf	Inf	0	-2.92962	4	-26.1408	0	0.547	-1.10172	4	Inf	Inf	0	NA				
Equilibrium																				
Ornstein-Uhlenbeck	-2.0672	4	Inf	Inf	0	-3.11944	4	-25.7611	0.37964	0.453	-4.46151	4	Inf	Inf	0	NA				

	Principal Component 4					Principal Component 4					Principal Component 4					Principal Component 4				
General Random Walk Unbiased	-1.97986	3	33.95972	26.7394	0	0.401528	3	Inf	Inf	0	-5.84885	3	41.69769	20.48805	0	-1.57593	3	Inf	Inf	0
Random Walk	-1.99549	2	13.99097	6.770649	0.031	-0.09249	2	16.18499	49.37129	0	-6.05193	2	22.10387	0.894222	0.26	-1.92877	2	19.85755	49.36066	0
Stasis	-1.57672	2	13.15343	5.933111	0.047	-0.0607	2	16.1214	49.30771	0	-5.60482	2	21.20964	0	0.407	-1.91799	2	19.83599	49.3391	0
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-1.9435	1	7.220324	0	0.921	-0.06068	1	4.121361	37.30767	0	-9.1387	1	21.61072	0.40108	0.333	-1.91799	1	7.835981	37.33909	0
	-0.91989	4	Inf	Inf	0	0.09144	4	-32.1829	1.003425	0.377	-4.18066	4	Inf	Inf	0	-1.24844	4	-29.5031	0	0.579
	-1.46635	4	Inf	Inf	0	0.593152	4	-33.1863	0	0.623	-3.6961	4	Inf	Inf	0	-1.56592	4	-28.8682	0.63496	0.421
	Centroid size					Centroid size					Centroid size					Centroid size				
General Random Walk Unbiased	-10.3902	3	50.78045	23.76248	0	-4.61141	3	Inf	Inf	0	-9.83554	3	49.67108	19.62283	0	-3.90667	3	Inf	Inf	0
Random Walk	-10.3957	2	30.79139	3.773427	0.132	-6.62723	2	29.25446	52.69325	0	-10.0241	2	30.04826	0	0.616	-3.92533	2	23.85066	48.64967	0
Stasis	-8.50898	2	27.01797	0	0.868	-6.18265	2	28.36529	51.80408	0	-10.4974	2	30.99482	0.946562	0.384	-3.91602	2	23.83204	48.63105	0
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-19.5785	1	42.49038	15.47241	0	-6.46319	1	16.92638	40.36517	0	-50.9135	1	105.1603	75.11207	0	-3.91602	1	11.83204	36.63105	0
	-8.19779	4	Inf	Inf	0	-6.04976	4	-19.9005	3.538296	0.146	-5.15977	4	Inf	Inf	0	-3.6005	4	-24.799	0	0.54
	-7.34895	4	Inf	Inf	0	-4.28061	4	-23.4388	0	0.854	-9.14866	4	Inf	Inf	0	-3.75997	4	-24.4801	0.31894	0.46

Table S8 - Model comparison results for the four Principal Components and centroid sizes tested in the four datasets analyzed for alternative Scenario B.

	Neurocranial Analysis - Homo sapiens lineage					Neurocranial Analysis - Homo neanderthalensis lineage					Facial Analysis - Homo sapiens lineage					Facial Analysis - Homo neanderthalensis lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1					Principal Component 1					Principal Component 1				
General Random Walk Unbiased Random Walk	-3.585481	3	25.17096	6.805233	0.032	-0.8823501	3	31.7647	11.377513	0.003	-4.764861	3	27.52972	4.042749	0.079	-7.909955	3	45.81991	24.545601	0
	-5.182865	2	18.36573	0	0.951	-5.1935935	2	20.38719	0	0.947	-7.743486	2	23.48697	0	0.593	-8.114694	2	26.22939	4.955079	0.068
Stasis	-9.201186	2	26.40237	8.036643	0.017	-8.1390755	2	26.27815	5.890964	0.05	-8.335998	2	24.672	1.185023	0.328	-7.560909	2	25.12182	3.847509	0.119
Strict Stasis Punctuated	-125.180262	1	253.36052	234.994794	0	62.2360006	1	127.80533	107.418148	0	19.286035	1	41.57207	18.085097	0	-8.970488	1	21.27431	0	0.813
Equilibrium Ornstein-Uhlenbeck	-3.113674	4	54.22735	35.861617	0	-3.5980693	4	Inf	Inf	0	-4.405536	4	56.81107	33.324098	0	-6.640697	4	Inf	Inf	0
	-3.589524	4	55.17905	36.813319	0	0.8606699	4	Inf	Inf	0	-5.189738	4	58.37948	34.892503	0	-1.128282	4	Inf	Inf	0
	Principal Component 2					Principal Component 2					Principal Component 2					Principal Component 2				
General Random Walk Unbiased Random Walk	-7.488687	3	32.97737	9.203625	0.009	-6.670858	3	43.34172	25.33726	0	-4.143415	3	26.28683	13.583372	0.001	-0.4602687	3	30.92054	11.003918	0.003
	-7.886875	2	23.77375	0	0.858	-6.685766	2	23.37153	5.367076	0.05	-4.922644	2	17.84529	5.141829	0.066	-4.9583096	2	19.91662	0	0.841
Stasis	-9.841408	2	27.68282	3.909067	0.121	-5.237511	2	20.47502	2.470567	0.214	-4.8376	2	17.6752	4.971742	0.072	-6.6593399	2	23.31868	3.402061	0.153
Strict Stasis Punctuated	-14.630611	1	32.26122	8.487471	0.012	-7.335561	1	18.00446	0	0.736	-4.851729	1	12.70346	0	0.861	14.1548149	1	31.64296	11.726344	0.002
Equilibrium Ornstein-Uhlenbeck	-7.072959	4	62.14592	38.372168	0	-4.903853	4	Inf	Inf	0	-3.67673	4	55.35346	42.650001	0	-1.8095586	4	Inf	Inf	0
	-3.168744	4	54.33749	30.563738	0	-3.75443	4	Inf	Inf	0	-4.062677	4	56.12535	43.421896	0	-0.4410469	4	Inf	Inf	0
	Principal Component 3					Principal Component 3					Principal Component 3					Principal Component 3				
General Random Walk Unbiased Random Walk	-4.447433	3	26.89487	12.419548	0.002	-4.643696	3	39.28739	26.418645	0	-9.582121	3	37.16424	10.4236478	0.003	-4.606814	3	39.21363	25.422721	0
	-5.832074	2	19.66415	5.188829	0.062	-4.855949	2	19.7119	6.843152	0.028	-9.614407	2	27.22881	0.4882206	0.438	-5.251781	2	20.50356	6.712655	0.031
Stasis	-3.237659	2	14.47532	0	0.824	-3.512377	2	17.02475	4.156008	0.108	-9.370297	2	26.74059	0	0.559	-4.324582	2	18.64916	4.858258	0.078
Strict Stasis Punctuated	-7.724409	1	18.44882	3.973499	0.113	-4.767706	1	12.86875	0	0.864	90.723506	1	184.44701	157.7064176	0	-5.228787	1	13.79091	0	0.89
Equilibrium Ornstein-Uhlenbeck	-1.970557	4	51.94111	37.465794	0	-3.496014	4	Inf	Inf	0	-8.780396	4	65.56079	38.8201984	0	-2.99939	4	Inf	Inf	0
	-3.183893	4	54.36779	39.892467	0	-2.134763	4	Inf	Inf	0	-5.914794	4	59.82959	33.0889946	0	-4.049781	4	Inf	Inf	0

	Principal Component 4					Principal Component 4					Principal Component 4					Principal Component 4				
General Random Walk Unbiased Random Walk	-3.592742	3	25.18548	15.071299	0	-4.486515	3	38.97303	25.25822	0	-7.443415	3	32.88683	11.439869	0.002	-3.529365	3	37.05873	25.234802	0
	-3.620619	2	15.24124	5.127053	0.064	-5.207422	2	20.41484	6.700033	0.032	-7.443499	2	22.887	1.440038	0.24	-4.273853	2	18.54771	6.723777	0.032
Stasis	-3.11724	2	14.23448	4.120294	0.106	-4.571803	2	19.14361	5.428795	0.06	-6.72348	2	21.44696	0	0.493	-4.228005	2	18.45601	6.632081	0.034
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-3.557093	1	10.11419	0	0.83	-5.190739	1	13.71481	0	0.908	-9.843752	1	22.6875	1.240544	0.265	-4.245298	1	11.82393	0	0.934
	-2.470977	4	52.94195	42.827768	0	-3.693892	4	Inf	Inf	0	-4.248584	4	56.49717	35.050208	0	-3.893203	4	Inf	Inf	0
	-2.516338	4	53.03268	42.918491	0	-4.46788	4	Inf	Inf	0	-6.192206	4	60.38441	38.937452	0	-3.044149	4	Inf	Inf	0
	Centroid size					Centroid size					Centroid size					Centroid size				
General Random Walk Unbiased Random Walk	-12.821195	3	43.64239	14.210656	0.001	-6.231582	3	42.46316	21.605924	0	-	3	41.33125	9.6769287	0.005	NA				
	-12.833135	2	33.66627	4.234535	0.107	-8.612142	2	27.22428	6.367044	0.038	11.665626	3	31.65432	0	0.614	NA				
Stasis	-10.715867	2	29.43173	0	0.892	-8.411578	2	26.82316	5.965916	0.046	11.827162	2	32.60882	0.9544957	0.381	NA				
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-21.932586	1	46.86517	17.433437	0	-8.761953	1	20.85724	0	0.916	-12.30441	2	32.60882	0.9544957	0.381	NA				
	-9.014697	4	66.02939	36.597659	0	-5.905099	4	Inf	Inf	0	54.370506	1	111.74101	80.0866869	0	NA				
	-10.094479	4	68.18896	38.757224	0	-6.082105	4	Inf	Inf	0	-6.303181	4	60.60636	28.952038	0	NA				
											10.740801	4	69.4816	37.8272772	0	NA				

Table S9 - Model comparison results for the four Principal Components and centroid sizes tested in the four datasets analyzed for alternative Scenario C.

	Neurocranial Analysis - Homo sapiens lineage					Neurocranial Analysis - Homo neanderthalensis lineage					Facial Analysis - Homo sapiens lineage					Facial Analysis - Homo neanderthalensis lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1					Principal Component 1					Principal Component 1				
General Random Walk Unbiased Random Walk	-3.956252	3	25.9125	7.403152	0.023	1.452319	3	27.09536	8.873461	0.011	-5.307035	3	28.61407	7.0423385	0.018	2.153486	3	34.30697	16.152946	0
	-5.254676	2	18.50935	0	0.951	-4.110951	2	18.2219	0	0.934	-7.24979	2	22.49958	0.9278492	0.379	5.486027	2	20.97205	2.818029	0.173
Stasis	-8.889958	2	25.77992	7.270565	0.025	-6.944458	2	23.88892	5.667015	0.055	-6.785865	2	21.57173	0	0.603	5.845116	2	21.69023	3.536208	0.121
Strict Stasis Punctuated	-107.479575	1	217.95915	199.449799	0	38.230481	1	79.79429	61.572393	0	20.162984	1	43.32597	21.7542377	0	7.410346	1	18.15402	0	0.707
Equilibrium Ornstein-Uhlenbeck	-2.426927	4	52.85385	34.344502	0	-1.674687	4	Inf	Inf	0	-2.932041	4	53.86408	32.2923521	0	2.874586	4	Inf	Inf	0
	-3.958492	4	55.91698	37.407634	0	1.474807	4	Inf	Inf	0	-6.059047	4	60.11809	38.5463628	0	2.130088	4	Inf	Inf	0
	Principal Component 2					Principal Component 2					Principal Component 2					Principal Component 2				
General Random Walk Unbiased Random Walk	-4.97333	3	27.94666	9.381776	0.005	NA					-3.847354	3	25.69471	14.774285	0.001	3.549893	3	37.09979	19.573584	0
	-5.282442	2	18.56488	0	0.547	NA					-4.041481	2	16.08296	5.162538	0.065	5.299083	2	20.59817	3.071965	0.158
Stasis	-6.485279	2	20.97056	2.405674	0.164	NA					-3.96022	2	15.92044	5.000016	0.071	5.668429	2	21.33686	3.810656	0.109
Strict Stasis Punctuated	-8.439816	1	19.87963	1.314748	0.284	NA					-3.960212	1	10.92042	0	0.863	7.096434	1	17.5262	0	0.733
Equilibrium Ornstein-Uhlenbeck	-2.885062	4	53.77012	35.205241	0	NA					-3.417165	4	54.83433	43.913906	0	1.402997	4	Inf	Inf	0
	-3.211468	4	54.42294	35.858051	0	NA					-3.713688	4	55.42738	44.506952	0	2.831789	4	Inf	Inf	0
	Principal Component 3					Principal Component 3					Principal Component 3					Principal Component 3				
General Random Walk Unbiased Random Walk	-6.230683	3	30.46137	15.035404	0	-7.642624	3	45.28525	26.509412	0	-7.444195	3	32.88839	10.671026	0.003	3.325862	3	36.65172	26.654625	0
	-6.515412	2	21.03082	5.604862	0.056	-7.648394	2	25.29679	6.520952	0.023	-7.824068	2	23.64814	1.430771	0.327	-3.34875	2	16.6975	6.7004	0.033
Stasis	-3.712981	2	15.42596	0	0.917	-4.907649	2	19.8153	1.039462	0.364	-7.108682	2	22.21736	0	0.669	3.331887	2	16.66377	6.666674	0.033
Strict Stasis Punctuated	-9.753378	1	22.50676	7.080794	0.027	-7.721252	1	18.77584	0	0.612	48.261616	1	99.52323	77.305867	0	3.331883	1	9.9971	0	0.934
Equilibrium Ornstein-Uhlenbeck	-2.422621	4	52.84524	37.41928	0	-4.341048	4	Inf	Inf	0	-2.568617	4	53.13723	30.919869	0	3.022851	4	Inf	Inf	0
	-3.463899	4	54.9278	39.501835	0	-4.656548	4	Inf	Inf	0	-5.901136	4	59.80227	37.584907	0	2.599629	4	Inf	Inf	0

	Principal Component 4					Principal Component 4					Principal Component 4					Principal Component 4							
General Random Walk Unbiased Random Walk	-3.010358	3	24.020716	15.090594	0	-1.159654	3	32.319308	25.615654	0	-6.830637	3	31.66127	9.557436	0.006	-	2.781395	3	35.56279	25.870648	0		
	-3.02731	2	14.05462	5.124498	0.065	-	1.7131858	2	13.426372	6.722717	0.032	-	7.051919	2	22.10384	0	0.67	3.192274	2	16.384548	6.692406	0.033	
Stasis	-2.741559	2	13.483119	4.552996	0.087	-	1.6851743	2	13.370349	6.666694	0.033	-	7.9215	2	23.843	1.739162	0.281	3.179406	2	16.358811	6.666669	0.033	
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-2.965061	1	8.930122	0	0.847	-	1.6851604	1	6.703654	0	0.934	-	12.301901	1	27.6038	5.499965	0.043	3.179404	1	9.692142	0	0.934	
	-2.125768	4	52.251536	43.321414	0	-	0.9743775	4	Inf	Inf	0	-	-5.367229	4	58.73446	36.630621	0	-2.2638	4	Inf	Inf	0	
	-2.642529	4	53.285058	44.354936	0	-	1.0803625	4	Inf	Inf	0	-	-5.326131	4	58.65226	36.548425	0	2.768841	4	Inf	Inf	0	
	Centroid size					Centroid size					Centroid size					Centroid size							
General Random Walk Unbiased Random Walk	-13.66249	3	45.32498	9.631531	0.005	-	-8.276043	3	46.55209	14.856097	0	-	-12.68625	3	43.3725	9.9994081	0.004	-	7.346718	3	44.69344	21.690842	0
	-13.846724	2	35.69345	0	0.639	-	11.026499	2	32.053	0.357008	0.386	-	-12.68654	2	33.37309	0	0.574	9.781522	2	29.56304	6.56045	0.035	
Stasis	-14.433676	2	36.86735	1.173903	0.355	-	11.956163	2	33.91233	2.216336	0.152	-	-12.99255	2	33.9851	0.6120129	0.422	9.801522	2	29.60304	6.600449	0.034	
Strict Stasis Punctuated Equilibrium Ornstein-Uhlenbeck	-30.546117	1	64.09223	28.398786	0	-	14.181328	1	31.69599	0	0.461	-	-52.76026	1	108.52051	75.1474251	0	9.834631	1	23.0026	0	0.931	
	-11.13153	4	70.26306	34.569612	0	-	-8.246495	4	Inf	Inf	0	-	-11.3235	4	70.64699	37.2739036	0	6.890603	4	Inf	Inf	0	
	-9.890604	4	67.78121	32.087759	0	-	-5.911439	4	Inf	Inf	0	-	-10.78614	4	69.57229	36.1991971	0	5.183312	4	Inf	Inf	0	

Table S10 - Model comparison results for the four Principal Components and centroid sized tested in the four datasets analyzed for alternative Scenario D.

	Neurocranial Analysis - Homo sapiens lineage					Facial Analysis - Homo sapiens lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1				
General Random Walk	-1.49778	3	32.99556	16.58121	0	-2.95961	3	35.91923	16.37802	0
Unbiased Random										
Walk	-3.20717	2	16.41435	0	0.974	-4.7706	2	19.5412	0	0.747
Stasis	-6.82172	2	23.64344	7.229098	0.026	-5.85177	2	21.70355	2.162341	0.253
Strict Stasis	-140.071	1	283.4747	267.0603	0	-17.9565	1	39.24629	19.70509	0
Punctuated										
Equilibrium	-2.99803	4	Inf	Inf	0	-1.10853	4	Inf	Inf	0
Ornstein-Uhlenbeck	-1.50261	4	Inf	Inf	0	-3.22542	4	Inf	Inf	0
	Principal Component 2					Principal Component 2				
General Random Walk	-5.72444	3	41.44888	22.74751	0	-4.57492	3	39.14984	21.85289	0
Unbiased Random										
Walk	-5.81429	2	21.62858	2.927208	0.15	-4.75228	2	19.50455	2.207599	0.197
Stasis	-5.52337	2	21.04674	2.345369	0.201	-3.64848	2	17.29695	0	0.593
Strict Stasis	-7.68402	1	18.70137	0	0.649	-8.02016	1	19.37365	2.076693	0.21
Punctuated										
Equilibrium	-4.23699	4	Inf	Inf	0	-3.1108	4	Inf	Inf	0
Ornstein-Uhlenbeck	-3.60475	4	Inf	Inf	0	-2.16014	4	Inf	Inf	0
	Principal Component 3					Principal Component 3				
General Random Walk	-2.13219	3	34.26437	25.25658	0	-2.14699	3	34.29398	14.83674	0
Unbiased Random										
Walk	-2.98418	2	15.96836	6.960562	0.028	-4.98779	2	19.97557	0.518334	0.291
Stasis	-2.27805	2	14.5561	5.548305	0.057	-4.85597	2	19.71193	0.254692	0.332
Strict Stasis	-2.83723	1	9.007798	0	0.915	-8.06195	1	19.45724	0	0.377
Punctuated										
Equilibrium	0.283433	4	Inf	Inf	0	-1.62325	4	Inf	Inf	0
Ornstein-Uhlenbeck	-1.83276	4	Inf	Inf	0	-2.12434	4	Inf	Inf	0

	Principal Component 4					Principal Component 4				
General Random Walk	0.671866	3	28.65627	21.90779	0	-5.34964	3	40.69929	20.95613	0
Unbiased Random										
Walk	-1.55066	2	13.10132	6.352842	0.039	-5.54528	2	21.09055	1.347395	0.257
Stasis	-1.55016	2	13.10032	6.351843	0.039	-5.6223	2	21.2446	1.501446	0.238
Strict Stasis	-1.70757	1	6.748474	0	0.923	-8.20491	1	19.74316	0	0.505
Punctuated										
Equilibrium	0.983266	4	Inf	Inf	0	-3.21799	4	Inf	Inf	0
Ornstein-Uhlenbeck	1.345545	4	Inf	Inf	0	-3.8545	4	Inf	Inf	0
	Centroid size					Centroid size				
General Random Walk	-6.45294	3	42.90588	19.03694	0	-11.4576	3	52.91526	23.04034	0
Unbiased Random										
Walk	-9.1632	2	28.3264	4.457463	0.094	-11.4833	2	32.96666	3.091748	0.176
Stasis	-10.1453	2	30.29062	6.421683	0.035	-9.93746	2	29.87492	0	0.824
Strict Stasis	-10.2678	1	23.86894	0	0.871	-34.9299	1	73.1931	43.31818	0
Punctuated										
Equilibrium	-5.44717	4	Inf	Inf	0	-8.94172	4	Inf	Inf	0
Ornstein-Uhlenbeck	-5.03021	4	Inf	Inf	0	-9.53169	4	Inf	Inf	0

Table S11 - Model comparison results for the four Principal Components and centroid sizes tested in the four datasets analyzed for alternative Scenario E.

	Neurocranial Analysis - Homo neanderthalensis lineage					Facial Analysis - Homo neanderthalensis lineage				
Model	logL	K	AICc	dAICc	Akaike weight	logL	K	AICc	dAICc	Akaike weight
	Principal Component 1					Principal Component 1				
General Random Walk	2.316302	3	Inf	Inf	0	NA				
Unbiased Random										
Walk	-3.804	2	23.60801	60.57026	0	NA				
Stasis	-5.74491	2	27.48981	64.45207	0	NA				
Strict Stasis	-44.8494	1	93.69873	130.661	0	NA				
Punctuated										
Equilibrium	-0.89759	4	-30.2048	6.757443	0.033	NA				
Ornstein-Uhlenbeck	2.481127	4	-36.9623	0	0.967	NA				
	Principal Component 2					Principal Component 2				
General Random Walk	NA					1.325269	3	Inf	Inf	0
Unbiased Random										
Walk	NA					-3.24779	2	22.49559	57.52259	0
Stasis	NA					-5.56059	2	27.12118	62.14819	0
Strict Stasis	NA					-21.7292	1	47.45837	82.48537	0
Punctuated										
Equilibrium	NA					0.995744	4	-33.9915	1.035515	0.373
Ornstein-Uhlenbeck	NA					1.513502	4	-35.027	0	0.627
	Principal Component 3					Principal Component 3				
General Random Walk	-1.01938	3	Inf	Inf	0	-2.03136	3	Inf	Inf	0
Unbiased Random										
Walk	-1.02476	2	18.04951	48.7372	0	-2.10231	2	20.20461	48.88414	0
Stasis	-0.95731	2	17.91462	48.60231	0	-2.08537	2	20.17073	48.85027	0
Strict Stasis	-0.95727	1	5.914537	36.60223	0	-2.08536	1	8.170726	36.85026	0
Punctuated										
Equilibrium	-0.94842	4	-30.1032	0.584538	0.427	-1.66023	4	-28.6795	0	0.532
Ornstein-Uhlenbeck	-0.65616	4	-30.6877	0	0.573	-1.78749	4	-28.425	0.254503	0.468

	Principal Component 4					Principal Component 4				
General Random Walk	-0.7716	3	Inf	Inf	0	-1.92564	3	Inf	Inf	0
Unbiased Random										
Walk	-0.95979	2	17.91959	48.41038	0	-4.38801	2	24.77602	54.25977	0
Stasis	-0.94286	2	17.88572	48.37652	0	-4.31919	2	24.63839	54.12213	0
Strict Stasis	-0.94285	1	5.885706	36.3765	0	-7.32086	1	18.64173	48.12547	0
Punctuated										
Equilibrium	-0.86437	4	-30.2713	0.219529	0.473	-3.0411	4	-25.9178	3.565948	0.144
Ornstein-Uhlenbeck	-0.7546	4	-30.4908	0	0.527	-1.25813	4	-29.4838	0	0.856
	Centroid size					Centroid size				
General Random Walk	-4.76674	3	Inf	Inf	0	-5.03632	3	Inf	Inf	0
Unbiased Random										
Walk	-7.54596	2	31.09192	55.30072	0	-5.3499	2	26.6998	50.2471	0
Stasis	-8.20709	2	32.41417	56.62297	0	-5.34037	2	26.68074	50.22805	0
Strict Stasis	-8.52013	1	21.04027	45.24907	0	-5.34037	1	14.68073	38.22804	0
Punctuated										
Equilibrium	-4.35135	4	-23.2973	0.911499	0.388	-4.56879	4	-22.8624	0.684879	0.415
Ornstein-Uhlenbeck	-3.8956	4	-24.2088	0	0.612	-4.22635	4	-23.5473	0	0.585